Setting Targets for Progress in Reducing Learning Poverty and Improving Developmental Reading Subskills: Towards an Evidence-Based Strategy to Accelerate Learning*

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Overview

Before the outbreak of COVID-19, the world was already in a learning crisis. More than half of children (53%) in low- and middle-income countries were already in learning poverty, which means that they were not able to read and understand an age-appropriate text by the age of 10. Historical trends in the first 20 years of this century suggest that in a business as usual scenario, developing countries will take close to 50 years to halve their current rate of learning poverty. COVID19 will likely slow this rate of progress even further. To tackle their learning crisis and reduce learning poverty, governments need to build a strong strategy to accelerate learning, with clear and ambitious targets. The ultimate goal will be to have all students learn to read and understand by the end of primary, with complementary intermediate targets at earlier grades as well, as embodied by the SDG 4.

To focus and strengthen global efforts, the Bank has launched a new operational global learning target: to cut the Learning Poverty rate by at least half before 2030. To support the achievement of these ambitious goals, the Bank introduced a Literacy Policy package outlining interventions that have proven successful in boosting literacy in several countries and subnational entities. This work is part of the operationalization of the learning target that involves the development and/or refinement of a set of global public goods that can be used to address common binding constraints across countries with high levels of Learning Poverty. Their application can foster more effective and aligned country programs to maximize country impact. The package of global public goods that will support the country-level interventions includes the Global Education Policy Dashboard, the LEAP platform

The purpose of this note is to present a menu of tools that can be used by countries in the process of building an evidence-informed strategy and plans to accelerate learning. In order to effectively mobilize action, a national learning strategy should be centered around clear, measurable, achievable, yet stretch goals and associated targets. Setting learning targets should not be viewed as a simple numerical or statistical exercise. To have meaning and be relevant to promote change, it should be a central element of a strategy to accelerate learning. The note focuses specifically on the development of targets for learning poverty, that is, the percentage of children reading with understanding by age 10, and what it will take for countries to accelerate their performance to achieve this objective.

Countries need a clear understanding of where they currently stand with regards to learning poverty and the potential constraints to learning in order to define policy priorities, using both implicit and explicit knowledge of what is feasible and more likely to be effective in a given context. This can then be combined with international experience and a clear understanding of pathways to improve performance. Such steps can help shape a strategy that explains the choice of a target by articulating the why and the how. This is key to define an agreed direction, motivate relevant stakeholders, and focus attention, helping ensure the technical, political, and financial resources required to accelerate learning towards an accepted target within a specific timeline. In what follows we summarize the **five main steps required** to develop targets for learning poverty as well as identifying key element of an evidence-based strategy to accelerate learning progress. These are:

1) **Understand where you stand**
   a) Review historical data on learning and schooling to establish a baseline or a reference value for the targets and understand, when possible, learning progress over time.
   b) Use external sources to benchmark against other comparable countries to understand the potential of reaching a target.
   c) Understand how much progress can be made by improving learning and schooling and potentially reduce learning inequalities.
   d) Where available, review existing data on the drivers of learning outcomes on service delivery, policies and politics affecting learners, teachers, school management, and inputs and infrastructure.

   Additional elements to consider:

      i) Many aspects of progress are deeply dependent on the characteristics of a given language, the writing system, the language of instruction and of assessment.
      ii) Population growth leads to an increase of the school-age population and thus a need for higher financial investments as well as considerations for feasibility of implementation of policies.
2) **Understand what can be done**
   a) Review existing evidence of interventions that could potentially impact learning in the country context, informed by international experience.
3) **Make explicit a theory of change**
   a) Clarify what actions would be needed to achieve progress in developmental subskills and learning poverty.
   b) Identify possible trajectories for how the target could be reached, defining resources, assumptions, internal and external factors that could affect the pathways of progress.
   c) Identify the required levels of political and financial commitment.
4) **Understand what pathways can be taken using simulations**
   a) Identify country-specific initial conditions, potential targets and required effort levels, and simulate different scenarios of how learning targets could be achieved and potential trade-offs.
5) **Define clear, measurable, and feasible stretch targets** based on the initial conditions, the theory of change and clear possible pathways to achieve them within a defined timeframe. Consider setting two types of targets:
   a) **An end-of-primary school target for reducing learning poverty**[1]
   b) **Targets for developmental subskills that should be acquired in the early grades of primary school**. These are:
      i) *Phonemic awareness*: the ability to hear and manipulate ("make") the sounds of words
      ii) *Letter- sound knowledge*: the ability to know what letters and combinations of letters represent the sounds of words and speech

[1] The accompanying "Guidance Note on Learning Assessments that Can Be Used to Measure Learning Poverty" provides essential information on the technical characteristics that allow a national assessment to be used to monitor progress in Learning Poverty.

iii) *Nonsense word or non-word decoding*: the ability to apply the rules of decoding correctly without using word knowledge from memory for help
iv) *Oral reading fluency*: the ability to read groups of words (phrases and sentences) with the appropriate speed and intonation (prosody)
v) *Reading comprehension*: the ability to read and correctly answer questions about the meaning of a text or passage
vi) *Listening comprehension*: the ability to listen to a spoken passage or story and correctly answer questions about it

Progress toward both the intermediate and final targets should be monitored in a timely fashion to inform its improvement and enable iterative policy adjustments when and where needed. To be relevant and useful for generating the required temporal change, learning and schooling measures need to be comparable over time. The process to set, monitor and revise targets to reduce learning poverty and increase developmental literacy subskills should, ultimately: (1) provide a robust picture of reading abilities of primary-school-aged children; (2) facilitate monitoring of progress to reduce learning poverty and meet SDG 4.1 targets; and, (3) provide actionable information on where and why some children are failing to develop as readers.

Introduction

The world is in a learning crisis, which is only made worse by conflicts and pandemics such as COVID-19. As per a recent World Bank report (World Bank, 2019), more than half of children (53%) in low- and middle-income countries fail to learn to read with comprehension by age ten and thus are in learning poverty. Also, the most recent historical trends suggest that it will take the world 50 years to halve the level of learning poverty in the developing world. COVID-19 is likely to slow down the historical rate of progress, as it deepens the learning gaps, and in many countries, increases the number of children in learning poverty.

Going forward, countries will need to reimagine their educational system and take the opportunity of the current pandemic and its triple-shock affecting the health, the economy, and the educational system to build back better. Several of the mitigation and remediation strategies can contribute to building back an educational system which is more resilient to crisis, flexible to the students' needs, and equitable as it protects the most vulnerable.

A critical element of this reimagining is a greater focus on foundational learning, both in early grade and at the end of primary. One necessary, yet not sufficient element to build alignment and a shared understanding towards this priority is to have a country-owned strategy to accelerate learning, centered around feasible stretch targets. The ultimate goal will be to have all students learn to read with comprehension by the middle of the early grades of primary, but more precise targets are also needed at earlier grades. Such targets should also simultaneously stem from and reinforce the political commitment ensuring all children learn to read. This political commitment should be informed by the best available data, knowledge and country specific insights.

This note intends to offer guidance for countries on the steps required to develop targets for learning poverty as well as identifying key element of an evidence-based strategy to accelerate learning progress. This note introduces some tools to assist in this process. The note proposes for countries to consider setting two types of **targets: (a) an end-of-primary school target for reducing learning poverty; and (b) targets for developmental subskills that should be acquired in the early grades of primary school.**

Reducing learning poverty requires students to read and understand a simple age-appropriate text. This implies reading short texts, locate explicitly stated information in them, grasp and interpret their main ideas, and form simple opinions and judgments about their contents. To do so, students should be past the stage where they sound out individual words. They need to be in the stage where they automatically and routinely recognize and connect the majority of words they will encounter in texts. Learning poverty measures their comprehension and inferential skills, but these depend on successfully acquiring early developmental reading subskills. Student who can routinely read age appropriate texts with comprehension will tend to read more and enjoy reading, increasing practice and knowledge as they enter the "self-teaching phase" of their literacy development. They will tend to become "independent readers" who can and do read and understand an increasingly broad array of increasingly difficult texts. By contrast, children who never master the early development subskills cannot progress to the self-teaching phase of reading or become independent readers. They will tend to read less, have less practice, and remain mired in learning poverty as a result.

The SDG 4.1 family of indicators has proposed a Global Proficiency Framework[2] (GPF), which states minimum proficiency levels (MPL) at early grade, end of primary, and lower secondary, associated with quality education and the ability to learn at each subsequent grade level. The science of learning literature also provides indications of key developmental milestones for critical subskills that are required for the development of reading abilities at each grade of primary (or stage or reading development) and through lower secondary school. Having all students at or above these MPL in the medium-to-long term is an appropriate goal for countries with students in learning poverty.

A strategy on why and how a country can accelerate learning should reflect not only on a set of targets for intermediate and final outcomes, but give a realistic timeline on how long it will take to achieve such targets, and what priority actions should be sought. Such strategy needs to be grounded on the country's initial conditions and how much effort, here understood, as technical, financial, and political commitment need to be mobilized and devoted towards the acceleration of learning.

This guidance note is organized into nine sections. The next three sections summarize why countries need to accelerate learning, why literacy should be understood as a progression and the importance of a clear strategy on how a country can accelerate learning. Sections 4 and 5, introduce steps 1 and 2 of the guidance note and present how to identify where a country stands, what can be done, and what additional elements should be considered when thinking about the initial conditions and how much progress can be expected. Section 6 summarizes the 3rd step and illustrate how a theory of change can be developed. Section 7 presents the 4th step of the proposed approach, it introduces a framework on how different elements of the education system are interconnected and can affect learning poverty, and the initial dynamic simulation model developed to help identify potential pathways a country might want to take, and implicit effort levels required to accelerate learning in the next 30 years. The 5th and last step is introduced in section 8, which summarizes the first elements to take into consideration when defining clear, measurable, and feasible stretch targets. The 9th and last section presents key takeaways.

The need to accelerate learning

High quality education is recognized globally as the foundation for development, growth, and poverty reduction. The Sustainable Development Goals (SDGs) set necessary but very ambitious targets for education coverage and quality. SDG 4.1 makes the commitment to "by 2030, ensure that all girls and boys complete free, equitable, and quality primary and secondary education leading to relevant and effective learning outcomes". This is measured, in part, by the proportion of children achieving MPL in grade 2/3 (SDG 4.1.a), at the end of primary school (SDG 4.1.b), and at lower secondary (SDG 4.1.c). Even before the COVID-19 pandemic led to global school closures, the depth of the learning crisis was evident. Strong reasons to question the feasibility of

[2] http://gaml.uis.unesco.org/wp-content/uploads/sites/2/2019/05/Global-Proficiency-Framework-18Oct2019_KD.pdf

fully reaching the current SDG targets spurred discussions of whether interim targets that could spur action for foundational learning were in order.

To highlight the problem, the World Bank introduced the concept of "learning poverty" (World Bank, 2019). The measure of learning poverty draws on data developed in coordination with the UNESCO Institute for Statistics; it is defined as not being able to read and understand a simple text by age 10. The concept brings together learning and schooling, by building on the SDG 4.1.1b MPL definition and adjusting it by the share of children out-of-school. This measure was used to define the Global Learning Target, introduced by the World Bank in October 2019, to cut learning poverty in the developing world by at least a half by 2030. This target aligns with the Human Capital Project's effort of building political commitment for accelerating investing in people and builds on the SDG 4.1.1 definitions and measures. The learning target assumes that countries could accelerate their performance to that of the top quintile of countries in their respective regions. This is a global target and as such should not be mechanically adopted by each country.

Instead, countries should build a strategy to accelerate learning, having clear targets at its center. Clear targets are a commitment to improve by a specified time and are used to assess and report achievement in relation to the desired level of performance. Targets indicate the extent of improvement a country is striving to achieve by a point in time, and provide a focus of efforts to achieve improvement, including a strategy development and implementation. This strategy needs to be built on the diagnosis of the current performance of their educational system and their ability to implement effective plans in response to the learning crisis and the current pandemic. Targets need to be ambitious, yet feasible, in order to align and incentivize a change in behavior of all relevant actors in the system to perform toward a common objective. If targets are too low and easily achievable, they don't provide a real incentive for a change in behavior, which will ultimately affect policies and practices (Newman et al., 2013). On the other hand, if targets are too hard to achieve or unrealistically high, they will disappear from political, technical, and public attention. Given differing contexts and conditions, the same levels of effort can very likely lead to different amounts of progress.

It is in this context that the World Bank has launched a number of efforts to help countries accelerate learning. They are:

- A country-tailored *literacy policy package* with country interventions that have proven to be effective in improving reading proficiency at scale
- A revised education approach that lays out the lines of actions needed for education systems to move forward in accelerating learning improvement and build effective, equitable, and resilient education systems
- An ambitious measurement and research agenda—covering measurement of both learning outcomes and their drivers and continued action-oriented research and innovation on how to build foundational skills

To bring these elements together and create an authorizing environment for action, countries need to have a clear strategy on why and how they can accelerate learning. At the center of this strategy a set of stretch targets are needed on how much countries can expect to reduce learning poverty and increase developmental literacy subskills, and how long it is likely to take to get there.

The recognition of the initial conditions and the intentionally of changing behaviors of critical actors of the system have proven to be a critical element of educational systems that have been able to rapidly improve their performance (Crouch, 2020; Loureiro et al., 2020). An evidence-based strategy can help motivate and align actors towards this change. Moreover, this can be the basis for countries to develop a plan of action with a clear theory of change on how they can improve reading abilities of primary-school-aged children, provide information on where and why some children are failing to develop as readers, and facilitate reporting on progress to reduce learning poverty and meet the SDG 4.1 targets. The choice of appropriate indicators will allow for countries to report on the SDG 4.1.1, monitor progress on national learning poverty, and support actions on teaching and learning activities to raise learning outcomes.

Literacy acquisition as a cumulative progression

Research clearly establishes the various ways in which learning in general, and literacy in particular, are progressive and cumulative processes.[3] As such, in order to have students or a student population performing above a specific threshold, is critical to gradually improve performance at foundational skills, and to take into consideration initial conditions.[4]

In this guidance note, we use the term foundational skills as an absolute concept, reflecting a specific set of skills that permit students to reach defined performance levels (such as reading a short, age-appropriate text with understanding) by a given age or grade level. The attainment of these performance levels should be observed preferably at early grade and sets the foundations for subsequent successful learning experiences; for example in the context of the UNICEF/MICS Foundational Learning Module. Moreover, we see literacy acquisition providing the foundations for progress in numeracy. Those who can successfully master early math exercises have gained some of the language and knowledge they require from learning to read and/or developing their oral language skills. We may have some inborn sense of quantities, but carrying out arithmetic operations and learning foundational math oral language and literacy skills.

Because performance on a subsequent milestone is related to possessing antecedent subskills, we see the minimum proficiency levels (MPL), as introduced by the SDG process, as a set of grade specific benchmarks. What is meant by minimum proficiency in this sense is a relative concept,

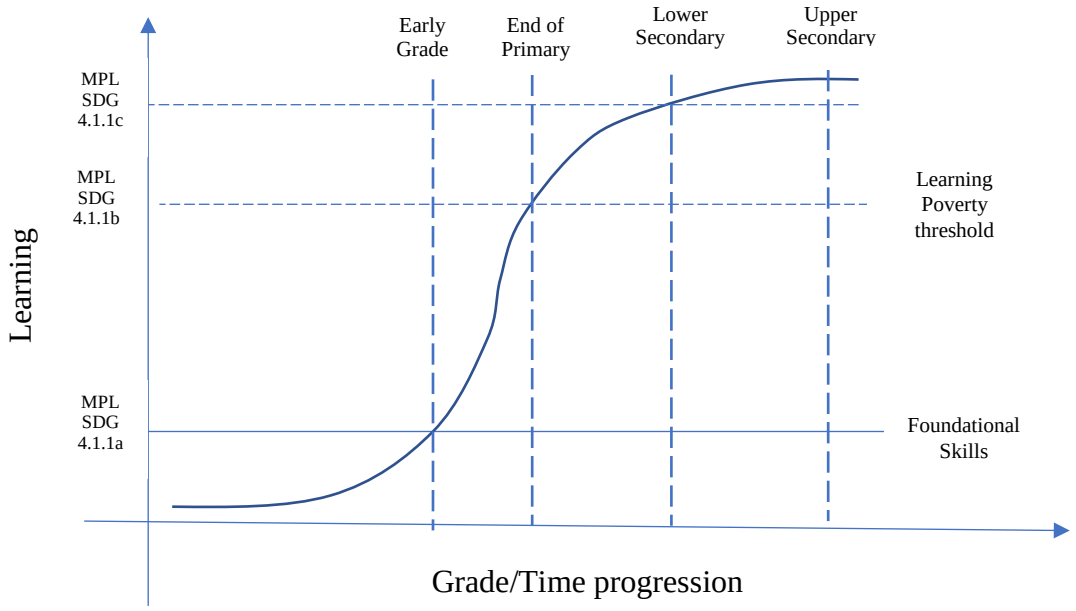
[3] From a developmental psychology perspective see Piaget (1936, 1957); from a policy perspective see the Plowden report (1967); from a measurement perspective see von Davier, M. & Lee, Y.S. (2019); and, from an empirical perspective see Williamson (2018), and Dunbar and Welch (2014).

[4] From a student perspective, the initial condition argument implies that one needs to be able to differentiate between learning that takes place at different levels of deprivation among the learning poor, and as an "education planner" one might be interested in assigning greater weight among those students who have weaker foundational skills (or are at the very bottom of the cardinal scale). A distributional-sensitive measure allows for that differentiation. From a population perspective, one can argue that countries that want to move their student population above the MPL, given the progressive and cumulative nature of learning, need to pay attention to the foundational skills of the their student population, and need to gradually create targeted interventions to lift those at the bottom of the learning scale. For that again, a measure that is distributional sensitive is very important. See Azevedo (2020) for a more detailed discussion of this point.

which is reflected by an increasing level of complexity at each grade, as defined by the GMAL in the context of the SDG monitoring and the Global Proficiency Framework. To the measured overtime, these set of skills require vertically integrated learning assessments, designed to capture a progression of competences but with linking items at each grade.

At early grades, the foundational learning progresses through a succession of more clearly defined minimum proficiency levels. What is more, learning tasks and MPLs are very likely to overlap across countries or education systems. All children need to learn the alphabet if they are in learning to read in a language that uses one; the basics of arithmetic are virtually identical

Figure 1 Illustration of a learning-grade progression



Source: Author's illustration

and the first tasks to be mastered are almost the same no matter where they are learned. However, as grades progress, the competences associated with the notion of foundational learning will start to differ and broaden. As this happens, and assessments will usually only be able to discriminate them learning levels for the increasingly small areas of overlap. For an illustration see Figure 1.

Progress in reducing learning poverty will partially depend on the ability to improve specific development subskills that contribute to reading with comprehension. Targets should, therefore, be set for each subskill for chosen points at each of the first three grades of primary school. Students who master these subskills will be well placed to read with comprehension and therefore escape learning poverty at its first measurement at the end of primary.

Reading with comprehension is the end goal of becoming literate. It is a complex aggregate of various subprocesses, liken to an orchestra playing in harmony. Each subskill contributes to the overall ability. The targets for subskills show if students are on track to master each literacy skill that precedes the mastery of the subsequent subskill. With sufficient levels of mastery of all the main skills, students succeed in reading and fully understanding age-appropriate texts.

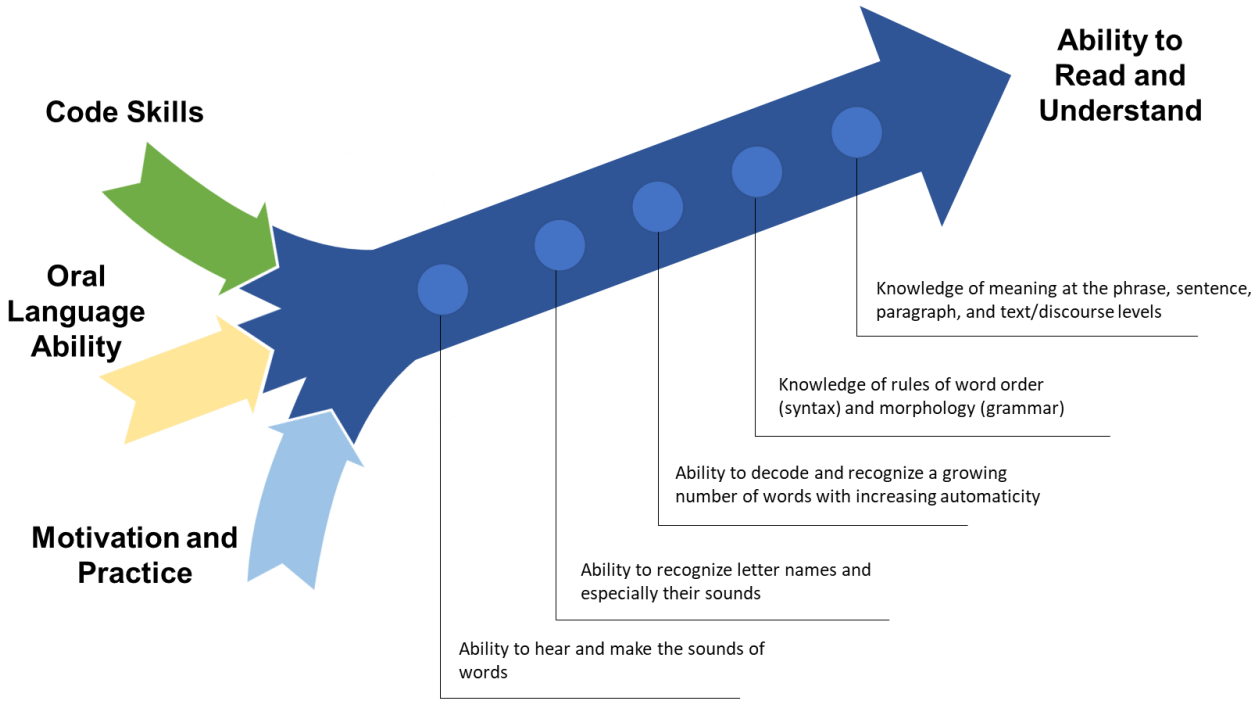
Six main subskills for which targets should be set. The six main reading subskills are:

1. ***Phonemic awareness****:* the ability to hear and manipulate ("make") the sounds of words
2. ***Letter-sound knowledge****:* the ability to know what letters and combinations of letters represent the sounds of words and speech
3. ***Nonsense word or non-word decoding***: the ability to apply the rules of decoding correctly without using word knowledge from memory for help
4. ***Oral reading fluency***: the ability to read groups of words [(phrases and sentences) with the appropriate speed and intonation (prosody)
5. ***Reading comprehension***: the ability to read and correctly answer questions about the meaning of a text or passage
6. ***Listening comprehension****:* the ability to listen to a spoken passage or story and correctly answer questions about it

Targets should respect the learning progression by grade. Students need to know letter sounds and basic words before they can read longer texts and understand them. Some subskills, like letter-sound knowledge, can be measured in grades 1 and 2 only if by grade 3 most or all students have mastered most or all letter sounds. Likewise reading comprehensions of texts may not be measured in grade 1 when students are concentrating on more basic subskills. The GPF provides references for MLP for select subskills by grade; ultimately countries will want to have all students at or above these minimum levels. The target setting exercise should help countries map out realistic pathways to achieve at least minimum proficiency for all students and use metrics for reporting the education development of children. Assessing a child's progression and acquisition of subskills involves the development of measures aligned to broad content standards and reflecting a level of cognitive complexity appropriate for the child's stage of development.

It is important to emphasize that targets for subskills are a starting point for action. Coherent packages of instruction with appropriate pedagogies need to be put in place or improved to ensure students are taught each subskill, can adequately practice it, and master it. Various layers of support, such as coaching and professional development, school leadership and other inputs, need to be in put in place in turn to support classroom changes that promote learning and students acquiring the ability to read. Figure 1 illustrates the language developmental trajectory to reach independent reading skills by combining code skills, oral language ability, motivation and practice.

Figure 2 Independent reading trajectory



What do we mean by "able to read and understand a simple text by age 10"?

The criterion for being able to "read and understand a simple text by age 10" is based on the standard of MPL from the 2019 GPF. This standard was created as part of the work of Global Alliance to Monitor Learning (GAML) led by UIS in the context of the SDG monitoring. This international benchmark will be used to identify the appropriate MPL for different cross-national and national assessments. The benchmarks for the middle of primary school are designed to correspond to the equivalent of a score of different international and regional learning assessments, and in a few countries their very own national learning assessment.[5]

The standard itself is stated both briefly and in expanded form[6]:

[5] In the case of PIRLS is this equivalent to a cut-off of 400 points; 595 of PASEC Grade 6 reading (2014); 510 SAQMEC Grade X reading; and, 513 LLECE Grade 6 reading.
[6] GAML definition will be updated when a new version will be made public.

Nutshell statement Students independently and fluently read simple, short narrative and expository texts. They locate explicitly-stated information. They interpret and give some explanations about the key ideas in these texts. They provide simple, personal opinions or judgements about the information, events and characters in a text.

Expanded statement In a short, simple narrative or expository text, learners read aloud at a pace and a level of accuracy that demonstrates understanding. They use previously-taught morphological (word level) and contextual (sentence or text level) clues to understand the meaning of familiar and unfamiliar words and to distinguish between the meanings of closely-related words. When reading silently or aloud, they locate explicit information in a paragraph. They use that information to make inferences about behaviors, events or feelings. They identify the main idea of a text if it is prominently stated and recognize common text types when the content and structure are obvious. They make basic connections between the text and their personal experience or knowledge.

Retrieving information: Use morphological or contextual clues to identify the meaning of most unfamiliar words, familiar words used in unfamiliar ways, different shades of meaning of closely related words, synonyms or basic figurative language. Locate most pieces of explicit information when the information is prominent and found within a single paragraph containing no competing information.

Interpreting information: Establish the main idea of a text most of the time, when it is stated prominently in the text. Make simple inferences by relating two or more prominent pieces of explicitly stated information, when there no competing information, in order to identify most behaviors, feelings, events and factual information.

Reflecting on information: Establish basic connections between the key ideas in a text and personal knowledge and experience.

http://gaml.uis.unesco.org/wp-content/uploads/sites/2/2019/05/GAML6-REF-2-MLP-recommendations-ACER.pdf

As is clear, the expected reading abilities at the MPL are complex skills that rely on mastery of earlier subskills. The ability for infer the meaning of unfamiliar words from morphological and context clues, for example, implies prior knowledge of decoding, vocabulary, word reading, syntax and background knowledge. Targets converge on reading for comprehension but in earlier grades should concentrate on the subskills that precede and contribute to this more complex and higher-level ability.

From data to action

To support country efforts to improve children's developmental subskills and ability to read with comprehension by the end of primary, countries need to have a clear strategy on why and how countries can accelerate learning. Such strategy should be built based on a theory of change which maps out how the identified actions will deliver an improvement in learning at both early grade and end of primary, of the magnitude required to reach the proposed targets. The theory

change should also indicate why these actions are likely to lead to these results. Without such theory of change, target might quickly become meaningless as they can either be unrealistically high or too low. It is critical to use data, information, knowledge both explicit and tacit to inform the theory of change and present them in a clear and concise strategy.

Box 1 shows the relationship among these components and how to combine them in order to inform decision making.

Box 1: From data to action: a hierarchical pyramid

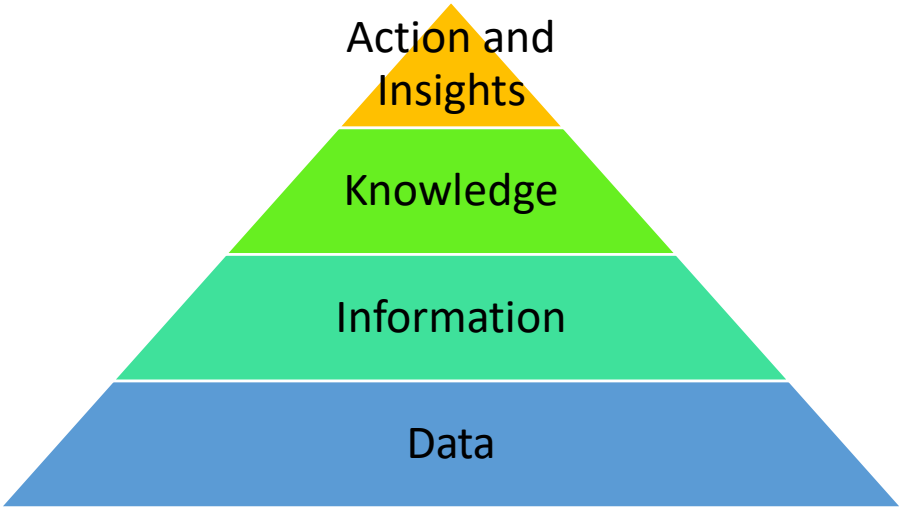
The presentation of the relationships among **data**, information, knowledge, and action in a hierarchical arrangement has been part of the language of information science for many years and has taken multiple forms and variations (Wallace, 2007). In our context we define data "as being discrete, objective facts or observations, which are unorganized and unprocessed and therefore have no meaning or value because of lack of context and interpretation" (Hartley, 2006). In the context of the process of setting learning targets, data can be seen as the process of collecting standardized learning assessments.

Information is differentiated from data in that it is "useful" or is seen as data applied to the process of answering *interrogative* questions (e.g., "who", "what", "where", "how many", "when"), thereby making the data useful for "decisions and/or action". In this formulation there is a functional, rather than structural, distinction between data and information. Using learning assessment as an example, only after the data is cleaned, standardized, and benchmarked against proficiency levels, it will have turned into information.

However, it is only when this information becomes **knowledge** that it can start to be useful for the policymaking or for a target setting process. Knowledge creation and interpretation is based on synthesizing the processed information, observing the system behaviors and the procedural knowledge and logic used in organizations or systems. Building on the example of a learning assessment we start to extract knowledge once we are able to establish temporal relationships between changes of indicators and actions or are able to identify relationships or hypotheses based on both explicit or tacit understanding of the world. Knowledge in this context can be seen as the synthesis of multiple randomized control trials of similar policy actions on how to improve pedagogical practices.

Insights provide a framework within which the knowledge gained has promoted an understanding of how the problem domain works. Analysts and decision-makers are able to see why the information that has been collated describes the patterns that it does and form an opinion that interprets and (to a certain extent can predict) what might happen in the future. Organizations uses knowledge to provide insight by taking into account ethical, political, regulatory and strategic constraints and considerations to frame the possible reasons for why indicators might differ across delivery units. Insight helps the organization to understand the problem domain and helps decision-makers have the confidence to decide which actions to take.

Figure 3 Model reference on how to turn data into action



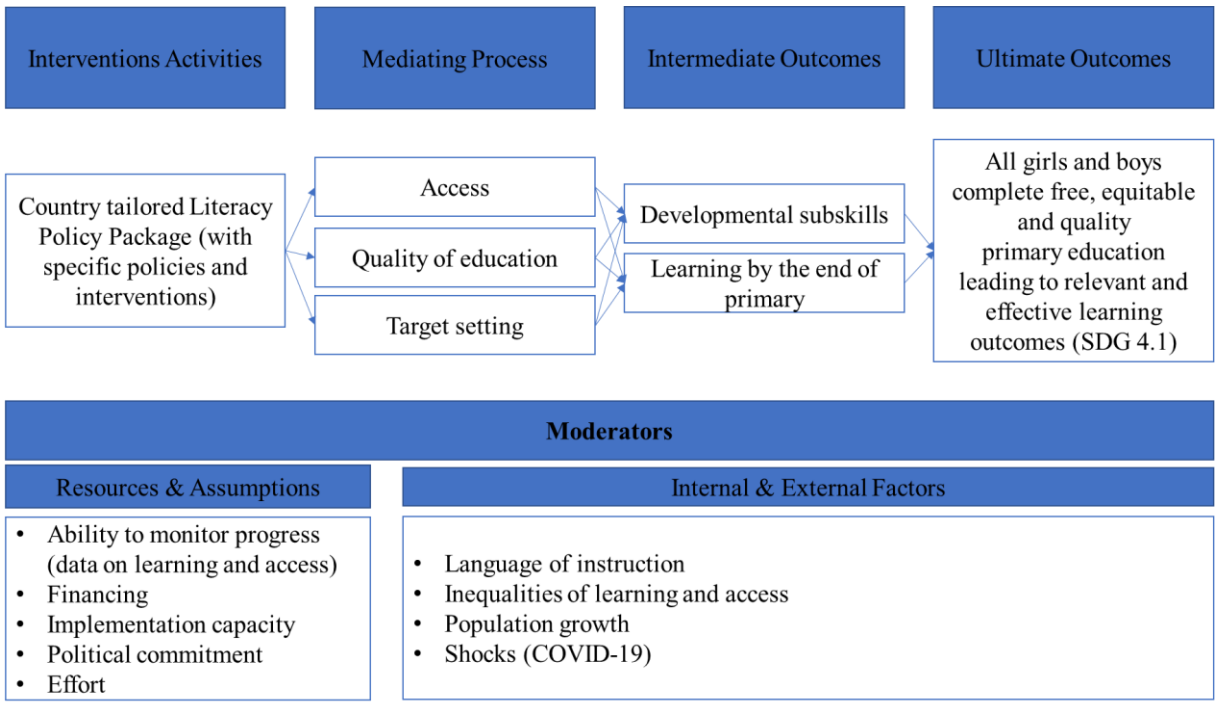
This hierarchy of data, information and knowledge is at the center of a target setting exercise, and the ability to identify and distinguish which elements are being used to inform action is of critical importance to build a strategy on why and how countries can accelerate learning. A critical element to facilitate this process, is the construction of a clear theory of change on how each country can translate the existing knowledge into actions which will drive a clear and measurable progress.

There are several frameworks to build a theory of change, in what follows we apply one of them to illustrate how data, information and knowledge can be combined to generate action to improve learning outcomes. The theory of change model we are proposing is an integration of theory based evaluation used for the first time by Carol Weiss and a logic model more focused on inputs and outputs. It starts with the choice of activities or action informed by the use of data, information, and knowledge and ends with measurable intermediate and ultimate outcomes. It is articulated in four main components:

- Interventions **activities (or action)** *What* are we doing? Does theory suggest that these activities will actually impact the mediating process?
- Mediating **process**: *How* is this program working? Does the theory support the ability of the mediators to impact outcomes?
- Intermediate and ultimate **outcomes**: *Why* are we doing this program? Does theory justify this outcome as relevant for a particular stage?
- **Moderators**: what factors might enhance or impede these connections from a theoretical or practical perspective
    - **Resources and assumptions:** What factors might affect the fidelity of the activities' implementation?
    - **Internal and external factors**: What factors might affect the strength of the connections between the activities, mediators, and outcomes?

To inform the first block of the theory of change, data, information and knowledge need to be combined to define actions that will lead to the mediating process and outcomes. Figure 3 provides a simplified high-level example of a theory of change that has as ultimate outcome to provide learning for all (SDG 4.1). Activities are country tailored interventions and policies based on the World Bank's Literacy Policy Package adapted to the country context with a shared understanding of the technical possibilities, implementation capacity, financial needs and the political commitment required at all levels. The ability to measure and track progress, strengthen data systems, improve the coverage and quality of data on learning are considered critical resources. Internal and external factors such as learning inequalities, the language of instruction, population growth, and possible shocks are factors that can affect intermediate and ultimate outcomes of achieving learning for all.

Figure 4 Theory of change



Box 2 : Sparking change at the national level from a global agenda

Global agendas and goals have value in their ability to draw attention to development issues and monitor progress. But their success in causing progress hinges on whether they effectively influence the implementation of national policies. A review of the post-2005 national development strategies of 50 countries presented limited reasons for optimism. Seyedsayamdost (2018) found that the Millenium Development Goals have been reflected in national planning documents, especially for the poorest countries, but that had no apparent influence on how governments spend their money.

Advocacy, communication, and social mobilization have been touted as the missing link between *de jure* and *de facto* influence of global targets on national policies. Described as the demand side and accountability drivers of programming for achieving results, they have received growing attention from international organizations and became a staple of global health initiatives, such as tuberculosis control (USAID, 2011), nutrition (SUN, 2014), and health promotion (WHO, 2016). One of the UNICEF's core change strategies for contributing to the SDGs is Communication for Development (C4D), defined as "an evidence-based and participatory process that facilitates the engagement of children, families, communities, the public and decision-makers for positive strategic context social and behavioural change in both development and humanitarian contexts through a mix of available communication platforms and tools" (UNICEF 2018).

Over the last decades, the poverty focus of the World Bank is arguably a successful example of change at the national level driven by a global agenda. Poverty reduction had been a strategic objective of the organization since the 1970s, but we focus on two more recent elements of country engagement strategies to draw lessons for the education sector.

- **The Poverty Reduction Strategy Initiative**, launched in 1999, promoted a country-driven, comprehensive, and long-term process to achieve measurable results. It comprised two key elements: (1) a country-authored Poverty Reduction Strategy Paper (PRSP) which drew on broad-based consultations with stakeholder groups and a thorough diagnosis of the causes of poverty and sources of growth in the country; and (2) the alignment of all external assistance to support the goals and priorities of the PRSP. An early evaluation of the initiative indicated that progress was heterogeneous by individual country circumstances and recommended a reorientation toward improving domestic processes, encouraging customization of PRSPs and curbing excessive emphasis on documentation (World Bank & IMF, 2005).
- **The Poverty Focus of Country Programs** framed by Country Partnership Frameworks (CPF) that draw upon the analytical work of a Systematic Country Diagnostic (SCD). The SCDs were designed to go beyond poverty diagnostics into providing actionable guidance for strategy and policy design, providing critical input into the CPF formulation process. An evaluation of this approach found it robust, albeit sizable variation across countries and weak feedback loops (IEG, 2015).

Crisis as critical junctures. Change in complex systems occurs in slow, steady progress an in sudden, unforeseeable jumps (Green, 2016). Events that present 'critical junctures' force leaders to question long-held assumptions and policies and make them more willing to take risks associated with innovation (Acemoglu and Robinson, 2012). The widespread school closures due to COVID-19 can be seen as one of such window of opportunity to create constituencies for change, mobilize stakeholders and transform attitudes and norms to respond to the learning crisis that preceded the pandemic.

Step #1 and #2: Understand where you stand and what can be done

Countries should set targets with reference to both where students are now, where they want them to be within a specific timeframe, and what policy action are available to accelerate learning in a particular country context. Targets should be created (if and when they do not exist) or updated in light of the available evidence both in terms of specific learning tasks (and their associated subskills) as well as access, and should be informed by the policy options, effort level and political commitment of any given country.

The available information should be used to provide a clear diagnosis of students' current abilities and how well progress toward becoming "independent readers" from the time they begin formal instruction to at least the middle of primary school, as well the ability of the educational system to attract and maintain children engaged with the school system. Most students require three years of quality, explicit instruction to master the development subskills that combine to allow them to be independent readers by the middle to end of primary. Independent readers can "read to learn" across a variety of texts and have largely finished their initial period of "learning to read" through daily explicit instruction.

The following subsections present the steps and considerations to define what it will take for a country to accelerate learning with links to interactive dashboards to inform the different elements to build a clear theory of change to inform the target setting exercise. The steps are meant to provide an illustration of different elements of a rapid diagnostic of the education system which should be taken to inform the strategy and a choice of target.

1. Benchmark learning and schooling against relevant country groupings.

Countries should use the best and most relevant available information to benchmark their performance data with those of other comparable countries. Benchmarking is a valuable way of understanding the country's learning and schooling performance and potential of reaching a target by making comparisons with other existing data (Newman et al., 2008). Carrying out benchmarking on the latest available data and historical rates of progress allows countries to set feasible ranges for targets knowing how ambitious those targets are. For example, a target could be too ambitious if would require a level of performance better than 80th percent of the observed data for countries with similar characteristics.

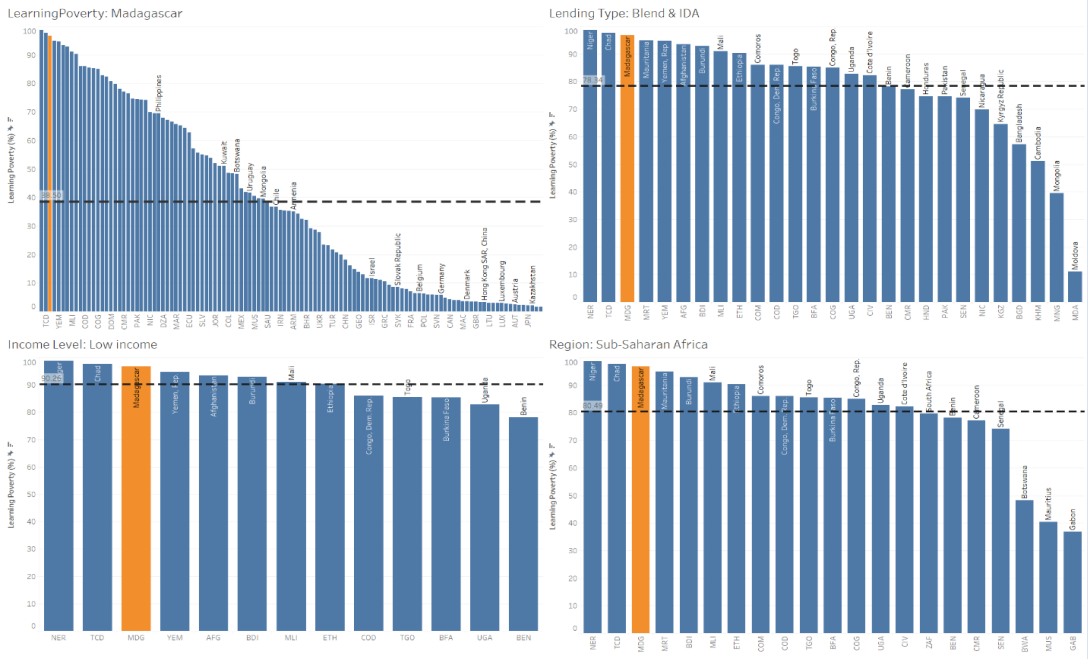
The benchmark value can be of different natures, such as regions, income groups, lending classification, or a country(ies) of choice. This information can be used to assess if a country should or should not be more ambitious. This will depend on to what extent the conditions which have led this country to over(under) perform are present (or not) in the near future, and if there is significant evidence of political commitment and/or knowledge on what works in this particular country context. Is important to note that for early skills, individual language characteristics make the rates of early progress vary widely. Even if all student abilities and learning conditions were equal, rates of progress would vary by language. No general rules can say how fast children will learn under given conditions.

Box 2 shows an example of benchmarking using Madagascar as country of reference for the learning poverty target. The box illustrates how a moderate level of ambitious is recommended when the country performance is lower compared to the benchmark groups.

Box 2: Leaning poverty benchmark: Madagascar

Figure 4 shows how the learning poverty level of Madagascar compares against four different benchmark groups, namely, the World, IDA and Blend, low income countries and Sub-Saharan countries. This exercise suggests that Madagascar learning poverty levels are extremely high, not only in a global perspective, but also in terms of the other three benchmark groups. These results suggest that a moderate level (lower than the top quintile) of ambition might be the most appropriate unless there is a strong financial and political commitment and knowledge of what policies and implementations would be most effective in promoting learning for all.

Figure 5 Learning Poverty Benchmarks



A review of existing successful intervention is an important part of good target setting. This steps should start by reviewing interventions that have proved to be successful in the country and then by reviewing those from other countries. Special caution is needed when reviewing and considering interventions from other countries. Country A may have been able to progress very rapidly by using a 10-hour per week supplementary "Teach at the Right Level" program. Country B may have instituted scripted lessons and coaching support for all national teachers.

Country C may have switched to mother-tongue instruction in primary school[7]. Each country should consult these experiences and the specific changes in subskills resulting from each one in order to assess which one of this policy options are likely to be the most suitable in their specific context.

Fidelity of implementation will affect rates of progress. When a country devises a quality plan for making all student literate by age 10, progress will depend significantly on the fidelity with which the plan is carried out day by day in the classroom. In the case of structured lesson plans, for example, measures of fidelity of implementation routine show faster progress—in many cases much faster progress—when teachers scrupulously deliver the high-quality lessons in the "structured pedagogical materials" that constitute part of the intervention (Piper et al, 2018).

[7] The World Bank's Literacy Policy Package includes an expanding summary of several successful experiences from different countries to accelerate learning.

Box 3 present the experience of Madagascar from the point of view of progress in individual reading subskills through a successful intervention. Madagascar's experience highlights the need for countries to consider both intervention quality and intensity, as well as baseline skills, to gauge whether they can make progress like Madagascar, and, if so, for what subskills with what improvements over current baselines.

Box 3: The case of Madagascar and the Mahay Mamaky Teny (MMT) Project to improve developmental sub-skills.

From April to July 2018, Madagascar implemented the Mahay Mamaky Teny (MMT) Project. The Project improved instruction and support to teachers in the first grade of primary school in 60 schools, reaching about 800 students. An equal number of students served as a control; selection was random at the level of the school.

Teachers were given high-quality scripted lesson plans in Malagasy (the language of instruction in this part of Madagascar). They were given addition support throughout the implementation period to help them carry out instruction as it was designed to be done. Student abilities on subskills were measured at the start and finish of the 10-week period.

After only 10 weeks, students who received the treatment on average learned five (5) additional letters sounds with respect to students in the control group. Overall treatment students learned nine (9) letter sounds versus only four (4) in the control group—125% more learning. Likewise, students in the treatment group learned on average 4 more syllables than the control group. They read 100% more correct familiar words per minute, increasing to 7 words from 3 in ten weeks versus the control that went from 2 to 4 correct words per minute. Oral reading fluency of the student in the treatment likewise rose by two correct words-per-minute more than the control group for a one-minute passage, and 1 additional word per minute for a 2-minute passage. Reading comprehension gains were likewise greater in the intervention group, but the effect was not statistically significant. This is as expected as a 10-week intervention cannot be expected to change reading comprehension abilities significantly. Interestingly, listening comprehension, which depends on oral language abilities in Malagasy, did not change at all between to the two groups. The focus of instruction were the decoding skills, and the changes to these were large and statistically significant.

2. Understand how much progress can be made by improving schooling and learning.

Countries should understand their gaps in achievement, attainment and completion in order to focus their efforts, identify policy levers, and set targets accordingly. Attaining any ambitious learning target will require improving both access to school and the effectiveness of classroom practices, although the degree to which each will be effective depends on each country's starting point. At pre-school, early grade and end of primary attendance and completion are both critical, as minimizing age-grade distortion.

The learning poverty indicator brings together schooling and learning components: it combines the share of children that haven't achieved minimum reading proficiency (as measured in school) and the proportion of children who are out of school (and are assumed not able to read proficiently). This means that, two countries with the same level of learning poverty can have two very different margins to improve performance depending on their gaps in terms of enrollment and learning. For example, DRC, Togo and Burkina-Faso, have the same level of learning poverty, however, the relative importance of school enrollment is quite different. While DRC can potentially have a 50% reduction in learning poverty through increasing enrollment in school, Togo can only reduce learning poverty by 6% through this channel. This is because Togo is closer to universal enrollment.

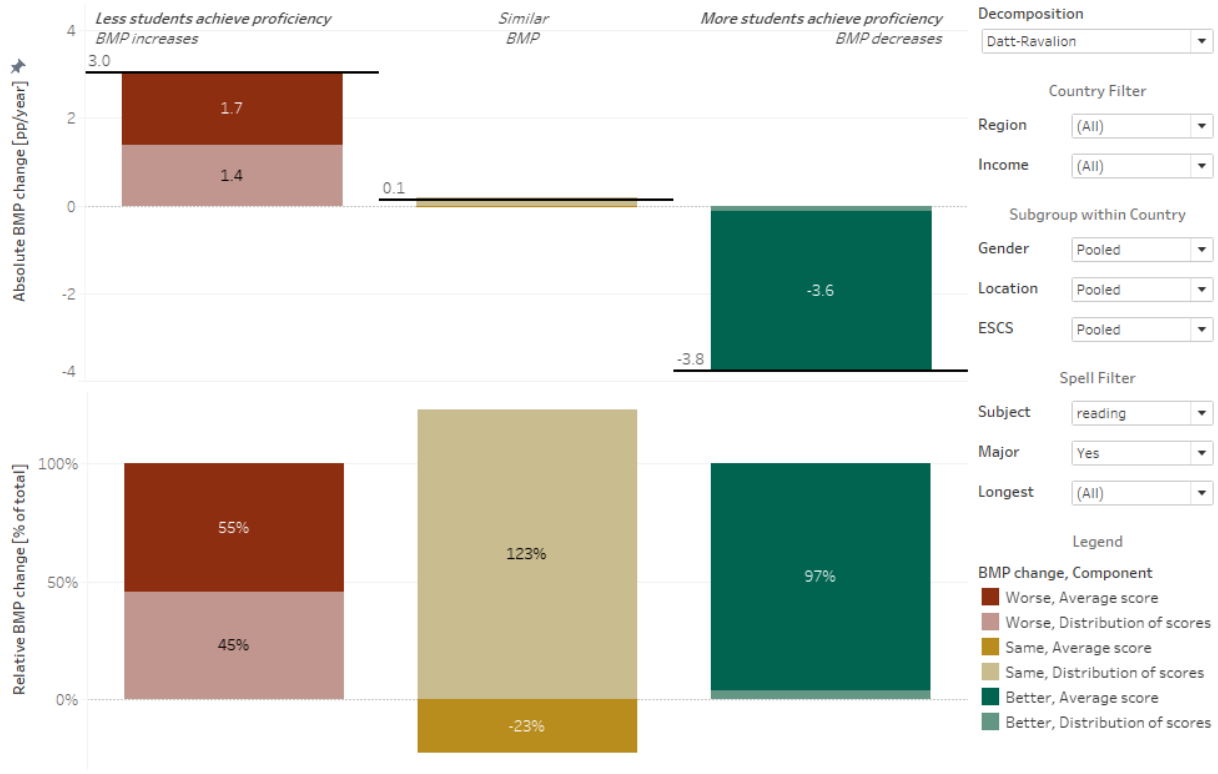
However, it is important to note that expanding enrollment without any changes to the learning process simply shifts children from not learning while out of school to not learning while in school (Kaffenberger et al., 2020) with no or minimal changes in learning poverty. In order to see a decrease in learning poverty, students that gain access to school also need to achieve MPL. If the students who gain access are distributed below the MPL in the same way as existing students, then we can expect the shift to positively impact learning poverty. Understanding these gaps and the way they can impact learning poverty will help countries set their expectations of different schooling and/or learning interventions.

In the case of countries with very high levels of learning poverty, a meaningful complementary target might be to reduce the learning deprivation gap, measured as the average distance of learners below the MPL, in respect to this threshold. The understanding of this measure of learning inequality is also important as it has a direct implication on how many different levels of ability below the MPL will a specific country need to accommodate. If most students below the MPL are located at just one level below the threshold of reference, a country might need to prioritize structured lesson plans which are able to accommodate those competences. However, if a country has an equal of amount of learning poor students distributed across three competence levels below the MPL of reference, the country will need to offer differentiated content and training of the teachers to be able to adapt their lessons to students across these more heterogenous student population.

Within each dimension – schooling and learning – we can break down progress to better understand it. Since learning poverty is a measure with a focus on the children failing to reach proficiency, **countries can attain progress either by improving the outcomes of the average children or by changing existing inequalities**. A decomposition of the change in the share of students who cannot read proficiently using data from multiple PISA rounds finds that both factors play a role, but not symmetrically. In episodes when proficiency improved, changes in the average test scores were responsible for 90% of the progress, while when proficiency worsens, the changes in average scores and inequality each accounted for half of the retrogress. This is illustrated in Figure 5, which summarizes the decomposition for reading in over 300 observations (each corresponding to a country and pair of years of participation in PISA)[8].

[8] For more details and an interactive version of Figure 5, please see Azevedo and Goldemberg (2020a)

Figure 6 Absolute and relative contributions to changes in the share of learning deprived students



Source: elaborated by EduAnalytics, based on OECD/PISA data
Methodology: [1] Ravallion, M. & Datt, G. (1992). Growth and Redistribution Components of Changes in Poverty Measures: A Decomposition with Applications to Brazil and India in the 1980s. Journal of Development Economics. 38. 275-295. [2] Jenkins, S.P., van Kerm, P. (2005) Accounting for income distribution trends: A density function decomposition approach. Journal of Economic Inequality 3, 43–61.
Notes: each baraverages multiple countries and pairs of years of participation, marking the annualized change in the share of students below minimum proficiency (BMP) decomposed into contributions from the change in the average score (dark color) and the change of the distribution (light color). The top panel reports absolute contributions while the bottom panel reports relative contributions. The red bars mark countries in which the most recent round was worse than the earlier round; that is, BMP increased at least 0.1 percentage point per year, while the green bars represent countries that have improved by at least 0.1 percentage point per year, and yelow bars represent countries with changes smaller than 0.1 percentage points per year in module. *Major* filters for rounds in which the subject was the major focus. *Longest* filters only the longest spell of a country and subgroup that meets the other filters.

3. Understand inequalities in schooling

Student attraction and retention can be extremely important when trying to access policy options, the level of ambition of learning targets and the monitoring of early grade performance. This information helps countries understand where to focus efforts and if ambitious learning targets should be accompanied by interventions to attract and retain students at early grades. Two countries with the exact same out of school rates can have very similar or extremely different school enrollment age profiles or differences in access to schooling by age groups such as Honduras and Angola and Ethiopia and Sudan respectively (Box 4).

One critical element in this process is school attainment and engagement, since enrollment does not guarantee that students are attending classes, and that when they attend classes that they engage in a meaningful manner with the teacher and peers. Data on these elements might be difficult to collect, however, classroom observation tools such as TEACH and the Global Education Policy Dashboard are able to capture the extent to which students are on-task; the digitalization of administrative records can also be of help to monitor attendance. When possible, countries need to be able to understand to what extend this should be part of the strategy, and what proxy data might be available.

Student attraction and retention by different age groups can be related to gender, socio-economic background, geographic characteristics, and migrant status, among others. For example, differences in access to schooling by gender of different age groups can be a critical element in the ability of countries to reach their targets. Overall, data from the latest available household survey of over 100 countries, controlling for household fixed effects, suggest that for the end of primary age range (10-14), most low- and lower-middle income countries are pro-boys as it shown in Figure 29 in the Annex. In these cases, interventions that can encourage girls to attend school by creating a safe environment at the primary school age should accompany an ambitious learning target, especially in countries with a large gender gap. Again, guaranteeing increased access is not enough. Access need to be accompanied by learning in school to impact learning poverty.

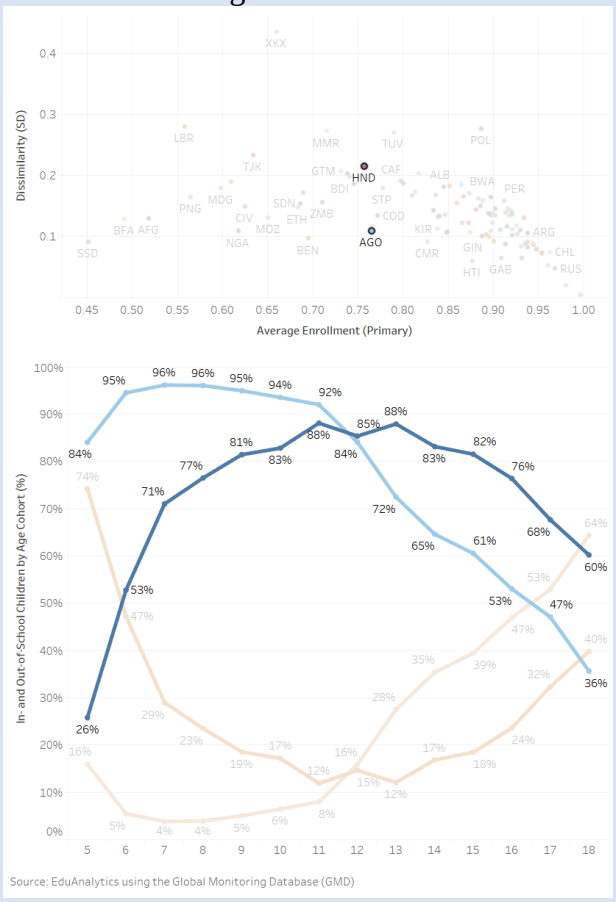
Box 4: Differences in school enrollment by age: Honduras and Angola VS Ethiopia and Sudan

Figure 5 shows in the top panel a scatter plot with the average enrollment by age and a measure of dissimilarity of school enrollment across different age groups, while the bottom panel shows the average school enrollment by age for selected countries. This data was produced using the latest available household survey from these countries and can be used to identify good benchmark countries for their respective educational systems. Honduras and Angola are two countries with the exact same share of children in school (around 76%). However, Angola has much lower age inequality than Honduras, which is clearly reflected in the bottom panel. This result suggests that Honduras would be able to bring a significant share of children into their system at an earlier age. 95% vs 53% of children age 6 are in school in Honduras and Angola, respectively. However, Honduras has a greater problem in keeping their children enrolled through the end of Primary, since by age 14, Angola has almost 20% more children in school than Honduras.

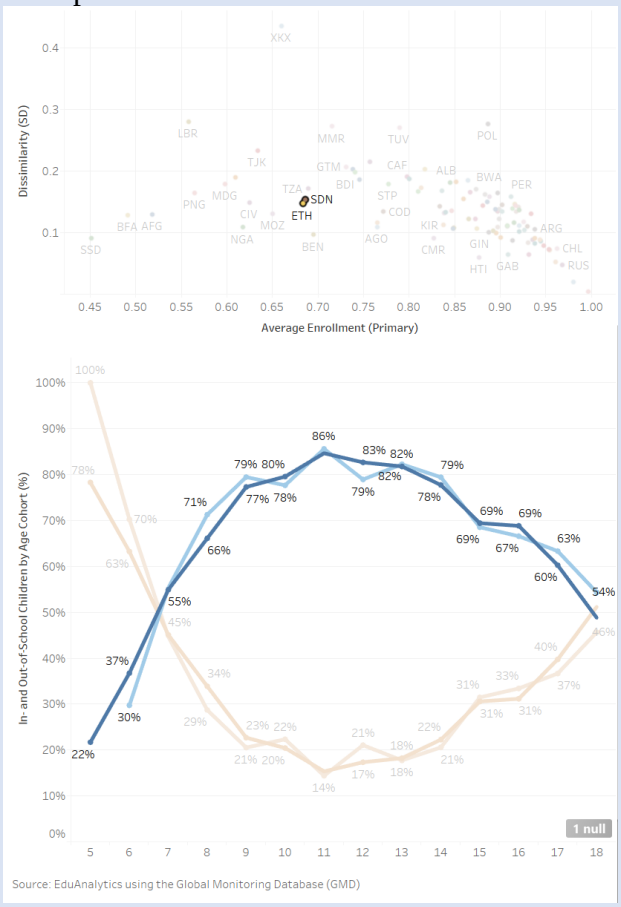
On the contrary, Ethiopia and Sudan are countries with very similar average enrollment and age-enrollment heterogeneity, as a consequence in the bottom panel we can see that the two age distributions of children in school are quite similar. This suggests that the two countries may have similar challenges related to student attraction and retention within their respective educational system.

Figure 7 School Enrollment by Age

Honduras and Angola



Ethiopia and Sudan



4. Understand inequalities in learning (horizontal inequalities).

Within country inequalities in learning by gender, location, socio-economic status, migrant status, access to ECE, age-groups should be taken into consideration when exploring policies to accelerate learning and setting learning targets as target achievement would be linked with significant focus on interventions that tackle these inequalities. These inequalities can be defined across single or multiple dimensions and might help understand where to focus attentions and if potential solution on how to tackle learning poverty and improve developmental subskills already exists within a specific country. In this respect, inequalities are both a weakness as well an opportunity for the education system. As a weakness, they show how systems have failed to equalize learning opportunities. However, such heterogeneity can also indicate the existence of elements of practices and policies within the system which can be replicated and/or scaled-up.

We have made an interactive dashboard available, which allows to identify the relationship between average learning and its within country dissimilarity (a brief description of the methodology used can be seen in Annex 6). As countries are selected, it is possible to drill down on the main sources of this inequality and their relative contributions.

Box 5: Sources of learning inequality: Brazil, Brunei, and Qatar

We have chosen three countries with the same share of students are a specific minimum proficiency level, but three very different levels of within country inequalities, namely Brazil, Brunei, and Qatar. As can be seen (Figure 6), in the case of Brazil, most inequality is gender and socio-economic status related; for Brunei access to ECE and social economics status stand out, while for Qatar most inequality is across the gender and migrants status dimensions. These inequalities highlight the need for country teams to analyze and discuss with counterparts what resources are available to one gender (or socioeconomic group) compared to another in the case of Brazil, or examine factors lead to unequal access to ECE in Brunei.

Figure 8 Sources of learning inequalities

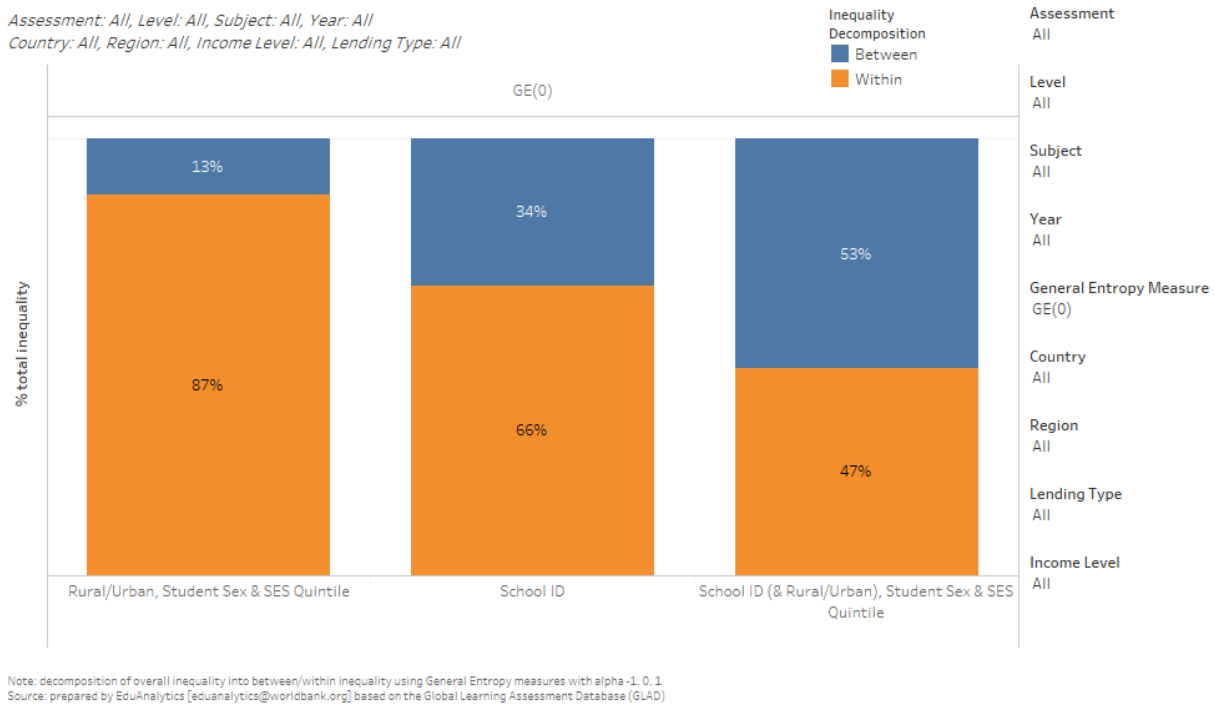
Another example of within country inequalities are spatial differences in learning. These are important as they enable the spatial targeting of specific policy packages and when temporal comparisons are available enable the identification of best practices from within an educational system. The latter is a critical element for the identification of what works, and the potential

packaging, replication and scale of efforts associated with significant improvements in the reduction of learning poverty and increase of developmental subskills.

There is also inequality within groups, known as *vertical inequality*. Differentiating these two types of inequalities – between groups (horizontal inequality) and within groups (vertical inequality) – is valuable for policy design, since the tools and approaches required to deal with each are quite different. It is also vital to understand the magnitude of these two types of inequality.

On average, half of the inequality is between students in the same schools with the same sex and socio-economic status quintile. This is illustrated in Figure 8, which reports the inequality decomposition of data from 109 countries using inequality indices of the Generalized Entropy class, which are subgroup consistent and additively decomposable.[9]

Figure 9 Between- and within-group inequality decompositions



Note: decomposition of overall inequality into between/within inequality using General Entropy measures with alpha -1, 0, 1
Source: prepared by EduAnalytics [eduanalytics@worldbank.org] based on the Global Learning Assessment Database (GLAD)

[9] For more details and an interactive version of Figure 8, please see Azevedo and Goldemberg (2020b)

Box 6. Brazil and spatial inequalities of Learning Poverty

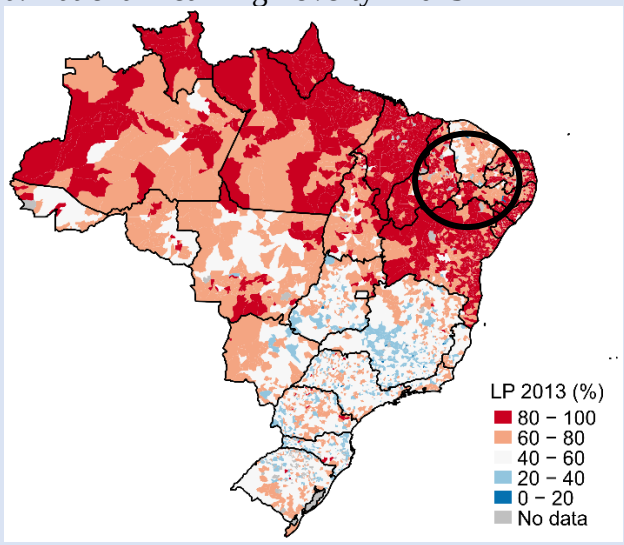
Using data from the Brazilian National Learning Assessment (NLA, *Prova Brasil*) and the Education Management information system, we were able to create a national learning poverty measures which captures both the out-of-school population and share the 5th grade students achieving the Brazilian minimum proficiency level as per the NLA scale.

Given the census nature of the Brazilian NLA and the temporal comparability of the learning scale we are able understand the spatial distribution of learning poverty in Brazil in two points in time, which allows the appreciate on how learning poverty has changed both temporally and spatially. One particular region of Brazil stands out, namely the state of Ceará, one of the poorest states in the North-East of Brazil (highlighted in Figure 7). While this success cannot be attributed to any single policy or program, it is grounded on a series of reforms towards results-based financing and the provision of technical assistance to the municipalities education boards. These results are known in Brazil and have informed the design of programs to improve quality of education at the end of primary.

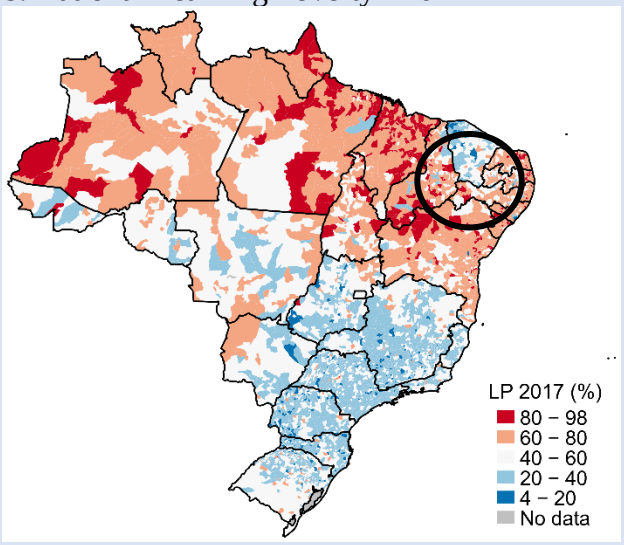
This example shows the importance of understanding geographical differences in education performance to enable spatial targeting and to identify replicable best practices within the country, such as the case of Ceará.

Figure 10 Learning Poverty by Brazilian Municipality (national definition)

a. National Learning Poverty - 2013



b. National Learning Poverty - 2017



Source: Authors' calculation using IBGE and INEP/MEC data
Notes: The LP number for Brazil is calculated at the municipal level, using the microdata from Prova Brasil, INEP School Census and IBGE population estimative. The MPL threshold used was 200 points in Portuguese.

5. Understand inequalities in learning distribution within country (vertical inequalities)

Learning poverty is defined through deprivations of schooling and of learning.[10] Each requires a specific threshold or standard from the education domain. The deprivation of schooling is ordinal and has enrollment as its threshold. Its measurement is simple, since children attending school are directly observable, and the measure is dichotomous, since a child can be in only one of two states—in school or out of school.

The deprivation of learning is more complicated. It cannot be directly observed and is measured as a cardinal latent variable using large-scale standardized assessments, which are used to derive a measure of minimum proficiency based on a desired and agreed set of competencies, leaving a potential space for ambiguity.

The headcount rate uses the number of children below either deprivation threshold divided by the total number of children in the age category. This ratio, learning poverty, is extremely simple and clear for policymakers to interpret, given the observable nature of school enrollment and the use of an agreed common standard of proficiency defined in the context of the SDGs.

Countries can improve this measure by reducing the learning deprivation as they raise proficiency levels for children below the minimum proficiency level threshold, or they can reduce schooling deprivation by expanding coverage and bringing their out-of-school population into the system.

However, the learning poverty headcount ratio has limitations. It seems plausible that children or education systems with lower scores among the poor are worse off, other things being equal, a fact that the share of children in learning poverty is not sensitive. The learning poverty gap or learning deprivation gap, are measures which capture the average learning shortfall among students below the minimum proficiency level. This measure indicates the average increase in learning required to eliminate learning poverty.

But any average gives an incomplete picture in an unequal world. By construction the gap measure is not sensitive the changes in the learning inequality among the learning poor or deprived students. To tackle this limitation, the learning poverty severity or learning deprivation severity measures can be used. This measure captures the inequality of learning among the learning poor population and can indicate how flexible the education system should be to both identify student needs and offer appropriate learning opportunities. Understanding such heterogeneity can be of critical importance for an effective strategy to reduce learning poverty.

One important empirical question remains. Are these complementary measures empirically relevant? That depends on whether countries with:

- The *same* learning poverty level have *different* learning poverty gaps (figure 8, panel A).
- The *same* learning poverty gaps have *different* learning poverty severity (figure 8, panel B).

[10] See Azevedo (2020) for a more detailed discussion of the properties of the learning poverty measure.

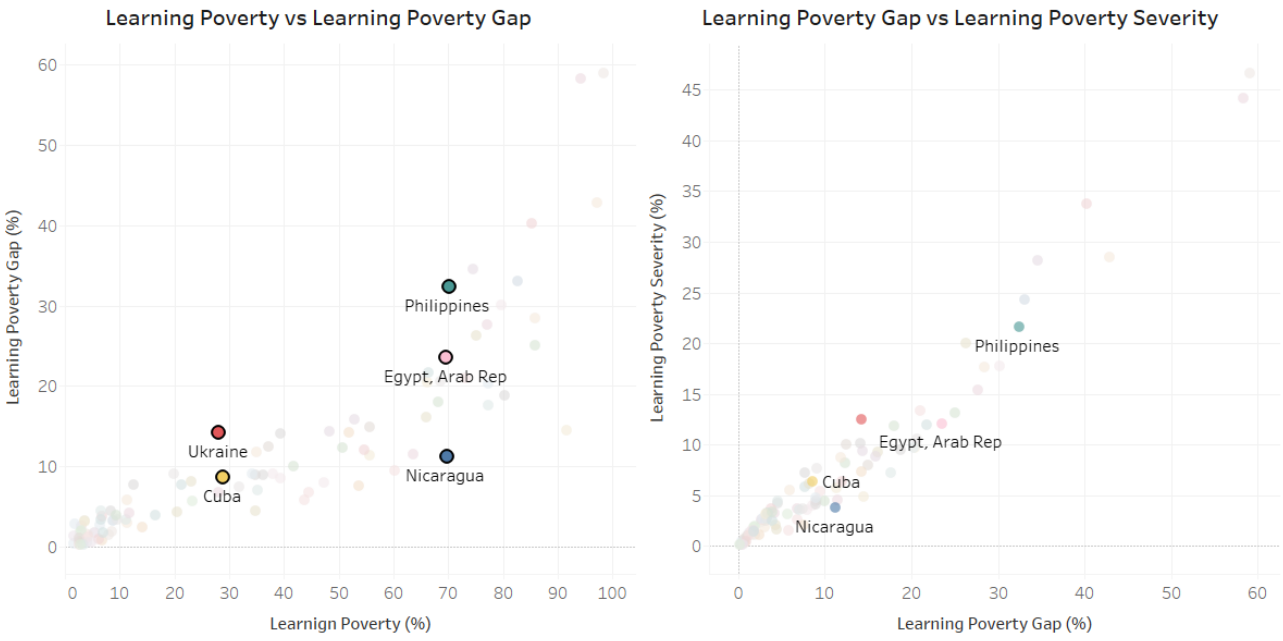
Figure 8 illustrates those points using the latest available data from 99 countries in the learning poverty database with indicators available for the learning poverty gap and learning poverty severity.[i] The figure shows a wide range of learning poverty gaps among the poor in countries with similar levels of learning poverty (panel A): Several countries have around 70% learning poverty, but the Philippines's learning poverty gap among the poor is almost three times Nicaragua's. This suggests that the effort required to tackle learning poverty in the Philippines might be greater than in Nicaragua.

But this is not the whole story. It's also important to look at inequality or learning poverty severity. For example, learning poverty severity in Nicaragua is almost 10 times that in the Philippines, suggesting a far greater level of heterogeneity among the learning poor students in the latter. This finding supports the empirical relevance of the measures and the importance of clarity on which specific properties are needed when choosing one. For policy, the strategies to reduce learning poverty could differ considerably if the levels of the learning poverty gap or learning poverty severity are drastically different.

Figure 8. Relationships between learning poverty, the learning poverty gap, learning poverty severity, the learning deprivation gap, and the learning severity gap

A. Countries where students are at the same level of learning poverty, require very different levels of effort (learning poverty gap).

B. Countries that require the same average effort (learning poverty gap); have very different levels of learning poverty inequality among students below the MPL.



Note: Learning deprivation gap and learning deprivation severity refer to measures computed exclusively from information from the learning dimension of the indicator. Learning poverty gap and learning poverty severity also take into consideration out-of-school information. Each point represents one country assessment (N = 99).
Source: Azevedo (2020) http://hdl.handle.net/10986/34654

Strategies to reduce learning poverty could differ considerably if the levels of learning poverty gap or learning poverty severity are drastically different. Countries with the same level of learning poverty but higher learning poverty severity will need far greater flexibility in learning (and schooling) strategies to adapt to the needs of children with a wider range of learning (and

schooling) needs than countries with the same level of learning poverty but a higher learning poverty gap.

One interesting aspect of learning severity is the much greater sensitivity to the out-of-school problem, something lost in the headcount ratio and not necessarily captured by the learning gap. The "education planner" can adjust this parameter to have a measure more or less sensitive to different preferences of the educational system or different policy objectives to tackle the weakness of students just below the minimum proficiency level or to prioritize students far below this threshold with very weak foundational skills.

Countries with the same level of learning poverty but a higher learning poverty gap will need a far greater effort to bring children above the MPL. At the same time, countries with the same learning poverty gap but different learning poverty severity will need far greater flexibility in learning (and schooling) strategies to better align their education systems with student needs.[ii] They can accomplish this by setting clear goals, instructional coherence, teacher support and contextual salience.

To tackle learning poverty it will be critical to meet students where there needs and strengths are. In this regards, it will be critical to monitor changes in the learning distribution among the learning poor, given that evidence suggests that a significant source of inequality is within groups. For that, learning poverty severity is the appropriate measure. The use of these complementary measures is supported by both their properties and empirical relevance.

Other factors to consider

As discussed in section 3, an increase in developmental subskill and learning by the end of primary is a combination of country tailored interventions and policies, but some internal and external factors might affect the process to reach the desired outcomes. In the following subsections we describe a few components that could affect the effectiveness of identified policies and potential targets.

Population growth

Population dynamics– the combination of decreasing mortality rates and increasing birth rate– can provide two countries at the same level of learning poverty, with two very different trajectory of the number of children which will need to be educated within a 15 to 30 year timeframe. One of the immediate results of population growth is the rapid increase of the school-age population. The higher the growth rate of early school age students in a country, the more effort in term of financial investment is needed to maintain and achieve ambitious learning targets. Population growth could be a powerful factor preventing improvement in education quality and learning and needs to be taken into consideration when setting targets.

Two countries with the same learning poverty trajectory (Figure 8) might have very different trajectories on the number of learning poor (Figure 9) in the medium run (initial 4 to 6 years)

depending on their population growth (Figure 10). In the case of this example, in spite of the same trajectory in the rate of learning poverty in the first six years, in the case of the country with the green line, it will take five years for the number of children in learning poverty to start to decline. Moreover, in the long-run those differences will represent different requirements from the educational system, which might either accelerate or slow down the subsequent rate of progress.

Taking into account population growth, targets should be defined as is one of the reasons why targets should be defined as a rate, not as absolute numbers and also communication in terms of number of children should be handled carefully as it needs to take into consideration population growth.

Figure 11 Learning Poverty with different Population Assumptions

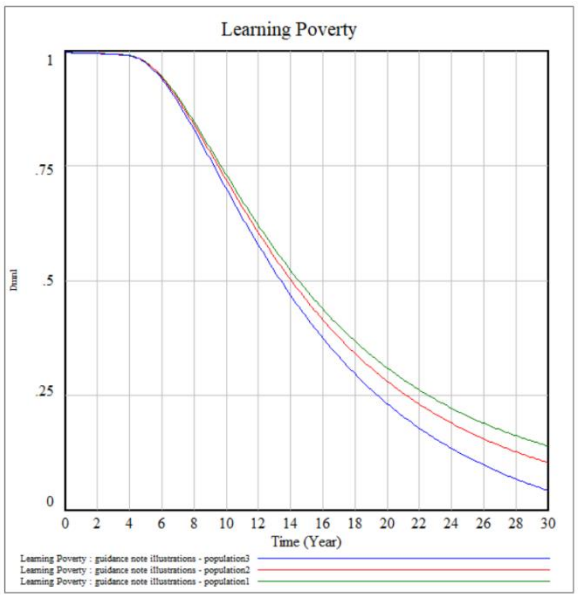


Figure 12 Number of Learning Poor with different Population Assumptions

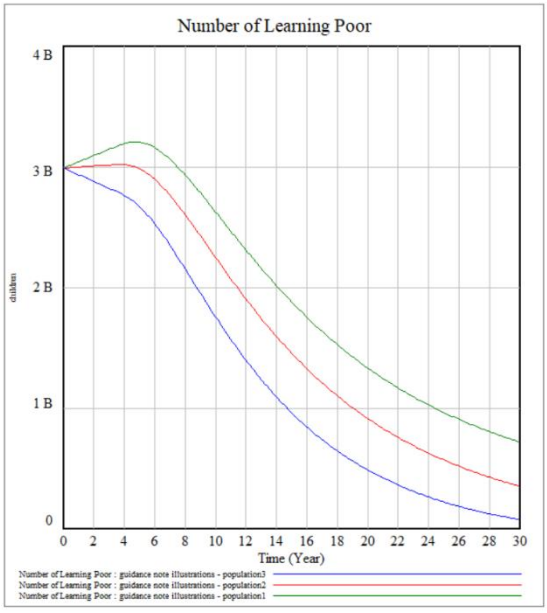
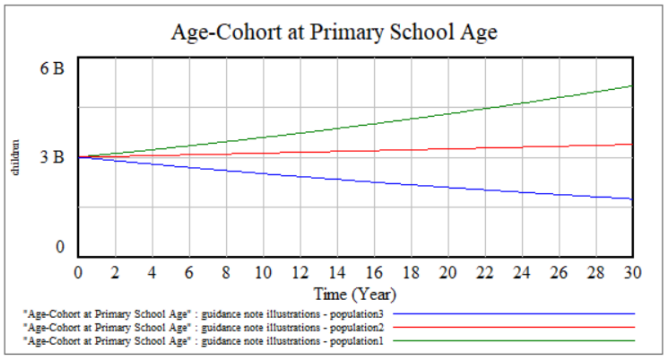


Figure 13 Population Assumptions



Language characteristics and policies for language of instruction assessment

Countries need a clear understanding and strong strategy around what are the instructional and assessment practices related to the language of instructions and assessments. Understanding the national language landscape on the number of languages spoken, their distribution among students and proficiency levels of teachers is core for setting achievable learning targets. The ability to teach in the home language and to ensure well-aligned assessments and a successful transition to a single official language of instruction are key for achieving ambitious learning targets.

Language issues affect targets in a variety of ways. First, some languages and their writing systems are simply more difficulty to learn in their initial stages than others. Languages whose sounds map easily to the letters used to represent them are termed "transparent". Children initially progress faster in the early stages of learning transparent languages like Spanish (versus "opaque" languages like English). However, when learning conditions are good, student abilities converge by about 4th grade; students of "opaque" languages catch up as both groups begin to regularly and independently read with comprehension.

Second, monolingual settings differ from multi-lingual settings. When children speak and/or must learn to read in two or more languages, initial progress is slower than that of monolingual students, all other conditions being equal. This assumes that policies are supporting children to learn in language they are familiar with and speak; this is not always the case. Optimal language of instruction policies focus on securing literacy first in the language a student best speaks and understands.

Given the added challenges of becoming literate in a multilingual context, targets may need to be more modest than those for monolingual settings. The extent to which goals are more modest and achieved more slowly will depend on the specifics of the given situation. Factors bearing on the potential rates of progress include the number of languages involved, the initial proficiency levels of students and teachers, the similarities or differences of the language pairs and their respective writing systems, the availability of teaching and learning materials for the languages pairs or groups, and the overall quality of language of instruction policy and policy implementation. We do not expect students who speak one language at home, learn initially in a second at school, and are quickly transitioned to a third language to be measured using the same benchmarks as students whose speak and use one language at home and at school over their entire school careers.

The above holds as well for dialects of a single languages as well as for different languages. In the case of dialects, the differences between the spoken language and the school language may be relatively minor, and they are likely to share a given writing system. Nonetheless, students have more work to do to reach fluency in if their language of instruction starts as or transitions to a dialect or language other than their L1 or mother tongue.

Language of instruction issues in foundation learning have implications for assessment and target setting, especially when transitions between languages are abrupt. Students may be tested in the official language of instruction in a given grade when this has become the official language of instruction. For example, students may transition or "switch" to learning in French or

English rather than a local language in third grade, and then may be assessed in French or English. The assessment will reflect the level of language knowledge, not the level of mastery of the subject of the assessment. For example, students may have mastered basic arithmetic, but not be able to perform or explain arithmetic operation in French (the new language of instruction).

In light of these complications, language and learning policies should coordinate language of instruction policies into all aspects of policies that affect foundational learning. Careful consideration of adjustment to targets is required, along with potential adjustments to assessment policies when these occur at or near a language transition point.

Box 7: Language of instruction, the case of Burundi

Burundi moves from being Africa's top performer in 2nd Grade in both math and reading, to one of the worst performers in in terms of learning poverty by the end of primary when children transition to a single official language (while preserving their relative performance in math by the end of primary) (see Table 1 for more details). This result suggests the importance of an effective policy to manage the transition in the language of instruction and how that can potentially impact the countries' performance to demonstrate results in their efforts to reduce learning poverty and increase developmental skills.

Burundi's worse performance in reading at the end of primary can be found in terms of average score (the country drops from 1st to 3rd place using PASEC data) but it is even more drastic in terms of learning poverty, where the country drops to 8th place (Table 1). It is important to note that in math Burundi is ranked 1st in both grades. The substantial worsening of Burundi's relative position in reading is likely driven by a combination of language transition (from Kirundi to French), choice of indicator and the fact that learning poverty is affected by what happens below the cut-off. Burundi is ranked 3rd, 8th, or 1st depending on what indicator is used to define its performance, namely, the average score, the learning poverty rate, or the learning poverty gap. These results suggest that most learners in Burundi reduce their learning gap significantly more relative to other PASEC countries, but fall short from reaching the level of comprehension required for reading and understanding an age appropriate text in French.

Table 1 - Country Ranks on PASEC 2014/2015

	Reading Rank (Mean Score)		Math Rank (Mean Score)		Learning Poverty Rank	
Grade	Early Grade	End of Primary	Early Grade	End of Primary	Ratio	Gap
Benin	9	4	9	5	3	4
Burkina Faso	3	2	4	3	5	2
Burundi	1	3	1	1	8	1
Cameroon	4	5	5	6	2	7
Chad	7	9	6	9	9	9
Congo, Rep	2	7	2	7	6	6
Cote d'Ivoire	6	6	8	8	4	5
Niger	10	10	10	10	10	10
Senegal	5	1	3	2	1	3
Togo	8	8	7	4	7	8

Source: PASEC 2014/2015; MPL: PASEC reading Level 4.

COVID19 and other shocks

The learning poverty target – which was to at least halve learning poverty to 27% by 2030 – was predicated on the assumption that countries could accelerate their performance to that of the 80th percentile of countries in their respective regions. If we were to assume that countries could accelerate their performance to this level as they re-open schools and address the challenges created by COVID-19, the world will not halve Learning Poverty by 2030 – it will at best reach the learning poverty target by 2034 (Azevedo et al., 2020).

Simulation based on historical rates of progress using the best available data such as the one provided for learning poverty do not model factors influencing progress in each country – pandemics, policy shifts, conflict, migration, and any other shocks. Unexpected factors that are not included in the simulations highlight once more the need of having a solid measurement system to track progress over time and of adjust targets to what is feasible at country level.

In case of unexpected shock, learning targets in each country need to reflect and be adjusted in light of the policy response to cope with the shock, mitigate damages, and ideally turn recovery into an opportunity to build back better. Targets need to be accompanied to clear plans for remediation programs and ideally by programs that can continue to produce benefits beyond the period immediately following the shock.

Step #3: Build and populate a Theory of Change

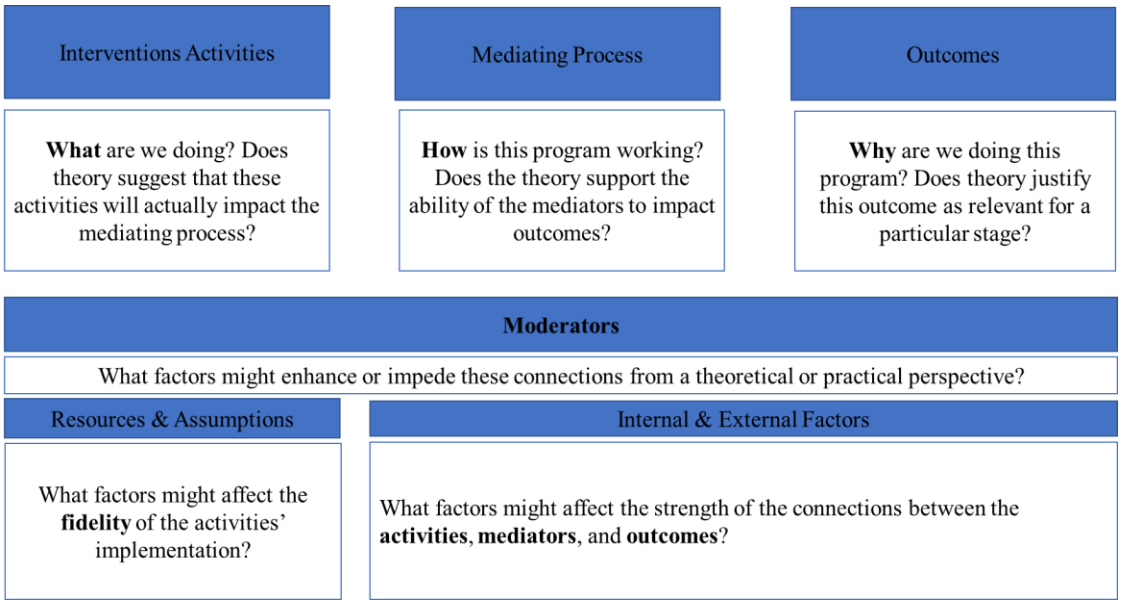
The last step to set learning targets is to build a country owned theory of change to examine the possible activities and assumptions of how a change is expected to happen in learning.

As described in the data to action section, before populating the theory of change each country needs to use data, information and knowledge to inform the choice of actions and activities to be implemented. Additionally, the Learning Target Simulation model offers a way to support the generation of insights by analyzing how different elements can interact with one another and can be introduced in the theory of change.

The general example of the theory of change presented at the beginning of this note can serve as a guide on how to populate each section. For example, language of instruction can be considered as part of the mediation process if intervention activities include policies to first teach students in the language they teach and understand, could be an external factor if not included in any policies and interventions or simply not be relevant for the country context.

Figure 23 presents the suggested theory of change to be populated. Once the ultimate outcome is defined, countries need to work backward through the steps and intermediate outcomes. After defining the outcomes, countries need to consider which interventions activities will make this change happen by thinking of each intermediate outcome and linking it with the mediating process and each activity. Then, consider the features that make activities effective and successful, internal and external enablers that need to exist to make the theory of change work. Again, all the process should be informed by data, knowledge, evidence, and a deep diagnosis of the education system. This way, the number that will be chosen as a target will be accompanied by a strong strategy on why such number is appropriate for the country context, and should shape the monitoring and evaluation agenda of this strategy.

Figure 14 Theory of change to be populated



The theory of change should be developed during the planning stage but can also be useful for monitoring and keeping track of the process. If a theory of change already exists, countries can benefit from reviewing and revising the theory of change to the current circumstances. A well-built theory of change will help countries identify key activities and actions and how to monitor the process, create strong commitment, and consider all the resources, assumptions, and internal and external factors to reach their targets.

Step #4: Understand what pathways can be taken using simulations

In order to synthesize knowledge, and facilitate the process of generating insight and action, it is often important to make explicit the mental models on how the different elements described up-to this point can interact with one another. This is important as the knowledge and understanding are unlikely to be the same across different countries, as the availability of data and information is likely to be extremely heterogenous. Nevertheless, we need to be able to provide the best possible advice, and the help build a theory of change which can be used to inform the choice of learning targets.

This section presents the main principles and general elements of a learning target framework and accompanying dynamic simulation model that can be used by teams and country counterparts. The main objective of this resource is to complement the diagnostics work and international experience to provide a dynamic framework with the support of numerical simulations, to help build a shared understanding on the critical elements required to achieve learning at early grade and at the end of

primary, highlight the main interdependencies, and identify how they might reinforce or undermine one another. This tool can be a useful step toward the choice of a learning target and help inform some of the critical elements of a clear theory of change on how it can be reached.

The use of system dynamics (SD) has been increasingly recognized as a powerful method for understanding and addressing complex human capital related issues, especially in the health sector. In a recent literature review, Darabi and Hosseinichimeh (2020) show that over the past four decades, SD has been applied to a wide range of healthcare problems, such as disease-related modeling, organizational modeling, and regional health modeling. The use SD among health practitioners in developing countries is also a reality. In the past 20 years WHO has hosted an international partnership on health policy and system research to improve health in low and middle-income countries supporting over 326 projects in over 73 countries[11].

The application of SD modeling in education is not unprecedent, however, is not as extensive as in the field of health. Authors such as Clauset, Jr and Gaynor (1982) and Sterling (2013) present how the SD perspective and the use of computer simulations can be of value to the education sector. The authors point out that a common flaw of many education reforms is to fail to see the sector as a system and assume a strong separability of its different elements as they design and implement policy reforms. Others have applied SD and computer simulation to address specific questions, such as the closing of the achievement gap (Johnson et al, 2020), the understanding of reinforcing inequalities by a typical school (Gaynor, 2011), or how to improve primary educational enrollment in a developing country (Pedamallu et al, 2010). [12]

Regarding the value of SD and computer simulations in the context of education, Johnson et al (2020) show that a working simulation can be used when important information such as known quantitative relationships, scales and formulations are not available, and that those model to run policy experiments which can generate meaningful insights for decision makers.

In the context of this guidance note, it is important to set clear boundaries for proposed framework and resulting model, which still a work in progress. It is not the intention to produce a complete representation of the learning process and all policies and practices that can change learning and schooling in a country. Further, for now this model does not capture how social-economic characteristics such as age, gender and social-economic status affect and is affected by the dynamics of these subsystems and can either mitigate or reinforce learning inequality. Finally, we assume that policy effort, here understood as political, technical and financial endorsement to change a particular element of the subsystem, will be both a necessary and sufficient condition to reach any given target.

It is also important to be clear that this is not a statistical exercise which will predict the level of learning poverty of a country within some level of probabilistic confidence. These simulations are based on a theoretical model, which uses data and judgment to populate its initial conditions and parameters, and dynamically simulate trajectories on how the system and its subsystems will

[11] https://www.who.int/alliance-hpsr/en/

[12] See Pedamallu et al (2012); Messaoudie et al. (2018) for other examples of applications of SD in education.

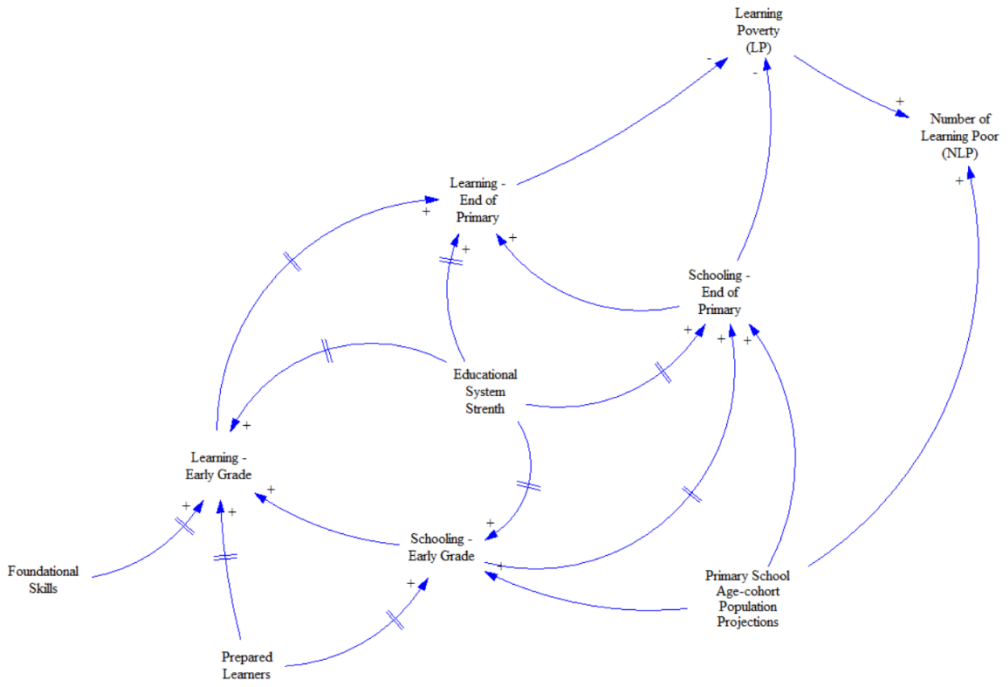
evolve within a particular timeframe. As discussed by Gaynor (2011) results from simulations are theorical and not empirical and need to be interpreted as such. However, they can provide the theoretical foundation for further empirical research, and that each parameter of the model can be the object of potential experimental research.

Hence, the objective of this exercise is to generate a structured conversation among policy makers, World Bank team member, and development partners regarding country's initial conditions, likely parameter values, and how those different assumption interact as the generate distinct trajectories of the system's performance. These results and conversations should help strengthen the strategy on how countries can accelerate learning, and also provider feedback on how the conceptual framework can be improved.

For the purposes of the framework, learning poverty in any given country is a function of several interconnected subsystems which might operate with significant delays, levels of policy resistance, asymmetries and synchronicities. Figure 11 illustrate a high-level map of the main subsystems, the direction of their relationship and if we expect delays from actions to results. They are:

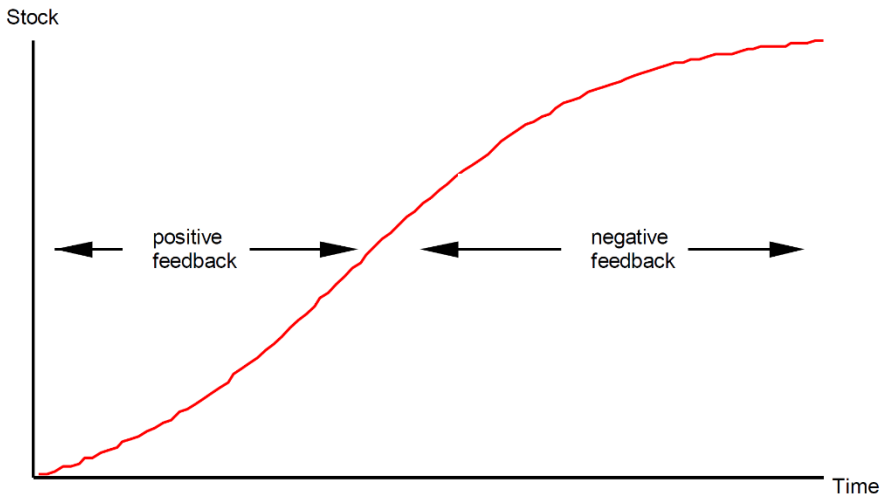
- **Learning at the end Primary**, here defined as grades 4, 5 and 6, is a function of **Learning at Early Grade** and schooling. The latter is a necessary, yet to sufficient condition for learning. **Schooling at the End of Primary**, will be a function of the progression of students from Early Grade to the End of Primary, the completion of end of primary, and students that drop-out prior the reaching the end of primary. All these elements will be affected by the size of the **Primary School Age-Cohort**.
- **Learning at Early Grade** (grades 1, 2 and 3) is a function, inter alia, of the ability of the system to adopt and diffuse the right teaching practices on **Foundational Skills**, how **Prepared Learners** are when they reach early grade school age, and **Schooling at Early Grade**, also understood as a necessary yet not sufficient condition. Schooling should capture elements such as mobilization of students into early grade, completion of early grade, and its complement the drop-outs of early grade. **Schooling at Early Grade** will also be affected by how **Prepared Learners** are when they arrive at school and the size of the early-grade-age population cohort.
- The **Educational System Strength** is a critical element at the center, which affects Learning and Schooling at both Early Grade and End of Primary.
- One last consideration is that the **Number of Learning Poor** will be affected by the **Learning Poverty Rate**, but also the number of **Primary-School Age-Cohort**.

Figure 15 High Level Framework



A critical element to the dynamics of the simulation approach is the notion of **positive and negative feedback**, illustrated by a typical S-Shaped or logistic growth curves (Figure 12). Every system initially exhibiting exponential growth will eventually approach the carrying capacity of its environment. Any positive feedback process will generate exponential growth and will eventually be counterbalanced by a negative feedback force, which will then stabilize the growth process. S-shaped growth can be observed in a wide variety of phenomena, from the adoption of new technologies and practices, the spreading of knowledge, fads or even rumors, market saturation, epidemics, as well as the physical and intellectual development in small children. Several of subsystems of the model will be built with this behavior in mind. In the context of learning targets, we are simply saying that in the beginning we should expect higher rates of progress either in terms of improving learning or bringing children to school. However, as the system progresses, negative feedback elements will slow down the rate of progress asymptotically as the system approaches its limits.

Figure 16 S-Shaped Growth



Another critical source of dynamics in the modelling strategy are **delays**. These simply reflect the fact that it takes time to measure and report information. It takes time to make decisions. And it takes times for decisions to affect the state of the system. Some of these delays will be material, as it takes time for a child to go from the completion of early grade to the end of primary, or informational, as they represent a gradual adjustment of practices, perceptions and beliefs in a system, such as the time that it will take for teaching practice of foundational skills or the strength of the educational system to take place. The main idea is that policy response is not immediate. Delays can be of different lengths, for example achieving the MPL at the end of early grade will take less time than reaching the MPL at the end of primary given the lower complexity of the tasks expected to be performed by the students. Or alternatively because the shorter time horizon required to observe results, as children will reach the end of early grade within three years, while it will take them six or seven to reach the end of primary.

One third and critical element in the modeling strategy is the **multiplicative** nature of the relationships within and across several of the subsystems. Relationship of different elements can be additive or multiplicative. Although there will always be an operating point in which both approximations will generate a similar value, they will increasingly diverge as the system moves away from this operating point. The additive formulation assumes that effects of each input are strongly separable and a perfect substitute for one another, meaning that the impact of a change in any one input is the same no matter what the values the other inputs have. However, an additive formulation can never capture nonlinear relationships, such as when there are strong complementarities across the elements and extreme values of any input dominates all other effects. Examples in the model are foundational learning subskills, or the relationship between learning at early grade and end of primary, or the compounded effected of early grade completion and end of primary completion, or the elements that determine the educational system strength. In all those cases, one element depends on the other in a multiplicative formulation.

In what follow we will briefly describe and illustrate the main elements of each subsystem, some of their main assumptions and properties, endogenous and exogenous parameters and dynamic behavior.

1. Educational System Strength

We define this indicator as a multidimensional measure between 0 to 1, where 0 denotes the lowest and 1 is the highest possible level of Educational System Strength. The choice of components of this measures builds on the World Bank revised education approach, and captures four main elements, also defined at indicators that vary continuously between 0 and 1, namely: (1) quality of inputs and infrastructure; (2) teachers skills and motivation; (3) curriculum adaptability to teach at the right level; and (4) school management capacity. The first three elements are highly complementary and have a multiplicative relationship. Management capacity is a critical enabler and contributes by either delaying or accelerating change (see Figure 13 for the visual representation of this relationship for different scenarios of the effort to improve management capacity).

Each of these elements of the overall Educational System Strength follow their own individual dynamics, characterized by a nonlinear first-order system. Every system initially can exhibit an exponential rate of improvement, however as the system approaches its limits to growth, it goes through a nonlinear transition from a regime where positive feedback dominates to regime where negative feedback dominates. Each of these subsystems have three parameters, namely, the initial conditions, which is the starting point of any given country, the target level or desired level of outcome for that country, and an effort parameter, which captures, the technical, financial and political feasibility for the chosen target, given its initial conditions and country context. Figure 14 presents the causal diagram of the school management capacity subsystem and different trajectory of change for different levels of the effort parameter. We use the same causal diagram structure for all four components of the Educational System Strength.

Figure 17 Educational System Strength

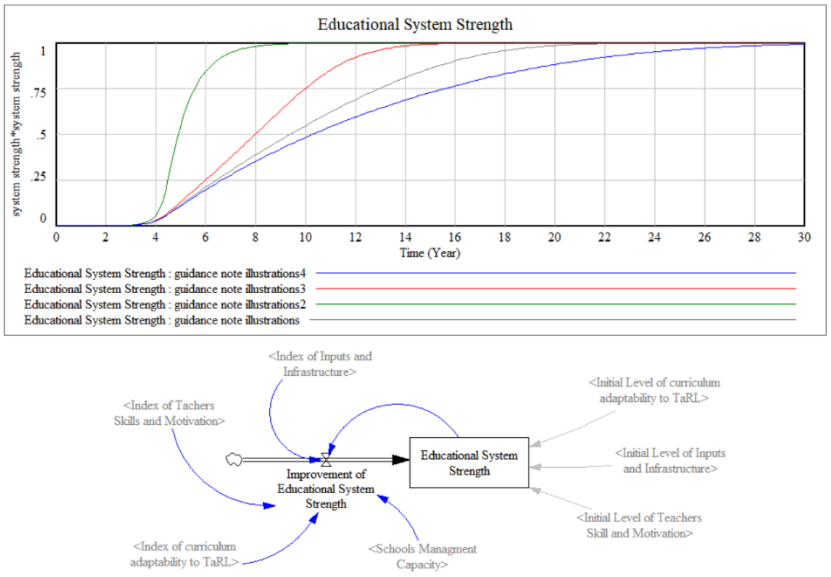
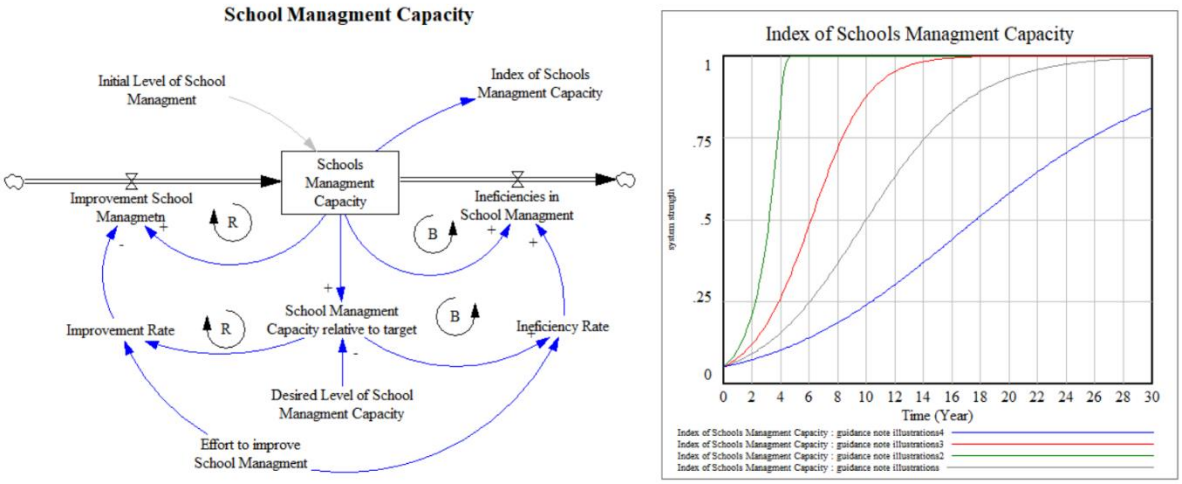


Figure 18 Causal Diagram for the School Management Capacity Subsystem



2. Quality of Foundational Learning

As discussed earlier in this note, the acquisition of reading ability is a function of a few subskills. For now, for illustration purposes only, we assume that this ability is a function of three subskills (in a future version of this model we can expand the number of subskills), namely: (1) competence in hearing, identifying, and manipulating sounds; (2) ability to map sounds to symbols; and, (3) knowledge of word meaning and syntax broadly defined. In all of those, we assume that there are

known teaching practices with demonstrated effectives which are documented and described the World Bank LPP.

Given that those are development milestones, the main objective in those subsystems is to maximize the adoption and diffusion of those practices. The synthetic, Foundational Skills indicator, is also a multidimensional measure built based on a multiplicative relationship across the three[13] subskills, given the understanding that those are highly complementary skills, and that no single skills can substitute the other. Educational System Strength also contributes with this final measure as an enabler, and can either accelerate or delay the adoption good practices on Foundational Learning (see Figure 15).

We use the Bass Diffusion Model to represent the process of adoption of teaching practices on each of those subskills. This formulation has become one of the most popular models for the adoption of new technologies and new product growth and is widely used in marketing strategy, management of technology and other fields (Sterman, 2000, chapter 9.3.3). When the growth process begins, positive feedback depending on the word of mouth (i.e. social exposure or imitation) is absent or weak because there are no or only a few adopters. Initial growth is driven by other feedbacks outside the boundary of a simple diffusion model. There are several channels of awareness that can stimulate early adoption of good practices besides word of mouth or related to feedback effects that depend on the size of the adopter population. These include knowledge sharing efforts, such as capacity building, training, dissemination of teaching material and evidence of its effectiveness.

When a new teaching practice is introduced and the adopter population is zero, the only source of adoption will be external influences such as knowledge sharing activities. The effect of knowledge sharing will be the largest at the start of the diffusion process and steadily diminish as the pool of potential adopters is depleted. The two main parameters of this model are the knowledge sharing effectiveness and the contact rate (or the availability of opportunities for the social exposure of what works). If both knowledge sharing and social interactions are zero, there will be no diffusion, and the system will be at equilibrium at its initial condition. Figure 16, provides a causal diagram for the adoption of sound manipulation teaching practices, and plots a graph of the temporal evolution of adopters when knowledge sharing and word of mouth are positive (red line – all other illustrations) and zero (blue line – illustration 4). We use the same causal diagram structure for all three elements described in this subsystem.

[13] This can be expanded to a larger number of subskills, without any loss of general points made with the current model.

Figure 19 Quality of Foundational Skills

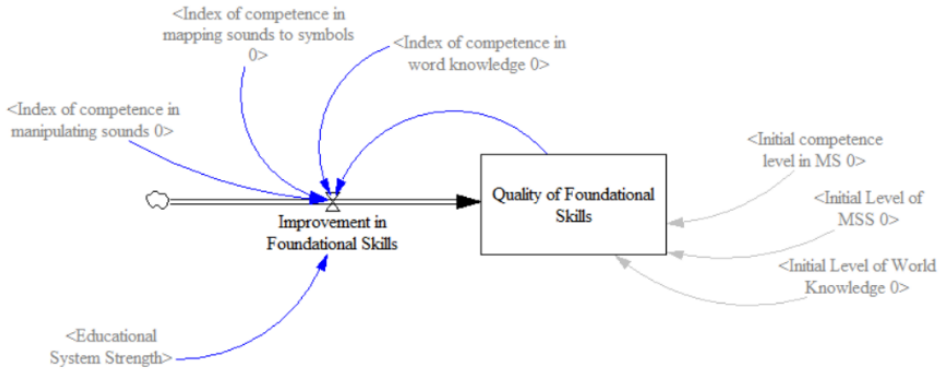
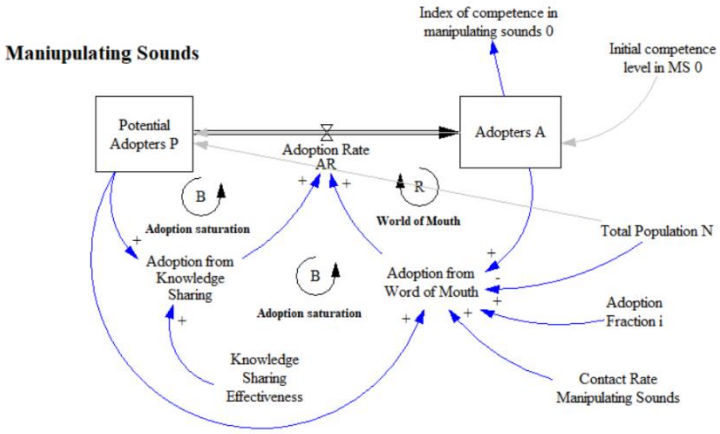
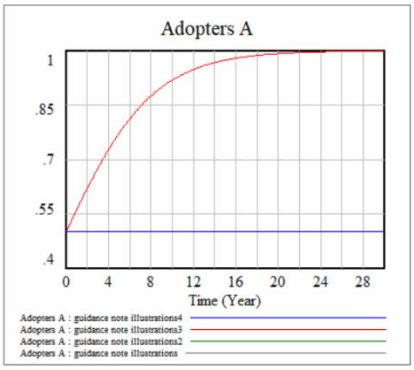


Figure 20 Causal Diagram for the Adoption of Sound Manipulation Teaching Practices





3. Schooling - Access to Education

In this subsection we describe how we model the dynamics of schooling using a cohort structure building on stocks and flows, as children progress from being prepared for learning until the completion of the primary education cycle. At any given point in time, a new cohort of children enters the early-grade-age and this rate is given by the population growth model. A share of this children will enter early grade based on the rate of children "prepared for learning". Once children enter early grade, they have three possible outcomes, they can drop-out of early grade before completing it, they can complete early grade and not progress to end of primary, or they can complete early grade and progress to the end of primary. This flow will be determined by two parameters, namely, the Early Grade Completion Rate and the Early Grade Progression Rate. The actual number of children who transition to the End of Primary cycle, will be given by the product of the Early Grade Completion Rate and the Early Grade Progression Rate, while the number of dropouts is determined by the complement of the early grade completion rate, and the number of children that complete early grade but do not progress, is given by the product of the early grade completion rate and the complement of the early grade progression rate. Once children reach the End of Primary cycle, there are two possible outcomes, namely children may continue or drop-out before completing primary. Both outcomes, are determined by the End of Primary completion rate. Figure 17 illustrates this stock and flow subsystem and its main parameters.

In the context of the model, the four critical variables are the early grade preparedness rate, the early grade completion rate, early grade progression rate, and the end of primary completion rate. Figure 18 presents the causal diagram used for the End of Primary completion rate (the same model structure was used for all three other rates). This model has three parameters, namely, the initial condition (such as the latest available end of primary completion rate), the target or desired level of the share of children in completing end of primary, and the effort level, to reach the desired target, here also understood as the combination of technical, financial, and political conditions to reach this target. The Educational System strength will also play a role on how fast or slow changes might take place in this parameter.

The choice of these parameters will generate an endogenous dynamic on the progression of children in school at each of the two segments (i.e. Early Grade and End of Primary). Figure 19 illustrate how the share of children that completed End of Primary will change based on the share of children that have progressed from Early Grade to Primary and changes in the rate of End of Primary completion.

Figure 21 Cohort Model of Schooling

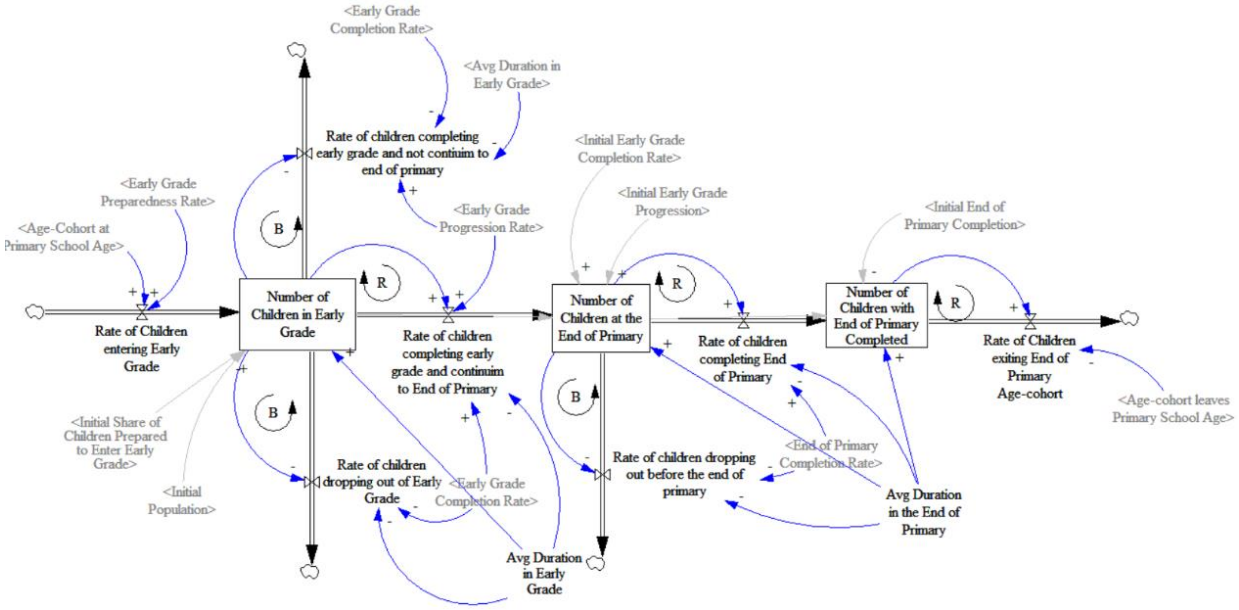


Figure 22 Causal Diagram for the End of Primary Completion Rate

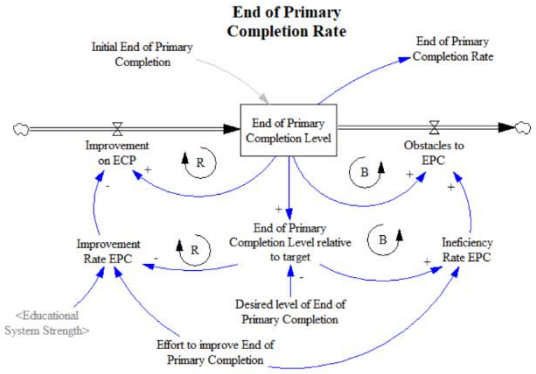
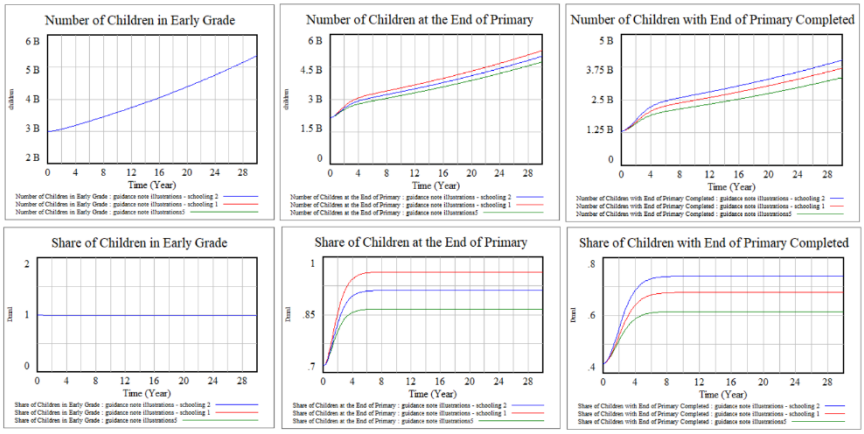


Figure 23 Simulation of the Evolution of Number of Children in School and Share of Children in School at Early Grade, End of Primary and End of Primary Completed



4. Learning - Quality of Education

In this subsection we present how we model learning, here defined as the share of children above the MPL and how it is interconnected with other subsystems of the simulation. As in other subsystems, the cumulative distribution of children above the MPL at both Early Grade and End Primary also follows an S-shaped curve. This implies that share of students above the MPL (here used as a proxy for the quality of the educational system) will rise exponentially, peak, then fall as the system approaches its limit, which is 100% of children above the MPL. Following Kermack and McKendrick (1927) formulation, this model contains three stocks: the share of learners below MPL; the share of learners acquiring content knowledge[14]; and, the share of learners above the MPL (Figure 20).

The greater the share of children acquiring content knowledge, the greater the MPL rate and the smaller the share of children required to acquiring knowledge. The share of children below the MPL is reduced by the learning rate. The share of children acquiring knowledge accumulates the learning rate less the rate in which learners reach the MPL, and the share of children above the MPL accumulates the rate learners reach the MPL. This construction reflects the notion that it takes time for students to learn, and the stock of students "in learning" is a function of the entry and exist rates. Namely, the rate in which students start to acquire content knowledge, and the rate students reach the MPL, which is determined that the length of time in which students stay "in learning".

The MPL rate can be modeled in several ways, in this model we use the Average Duration of Learning, which represents the average length of time it takes for students to reach the MPL (given the available teaching practices of a particular educational system, including student repletion and

[14] This is an "intermediate state" between being below and acquiring content knowledge and being above the MPL (after having acquired content knowledge). Given that this is a dynamic model, is simply reflect that "learning" takes time, and students do not transition from one state to the other instantaneously.

age-grade distortions). The learning rate is a function the number of learning opportunities, the quality of the teaching and the total number of students in a particular learning segment of the system. If learning opportunities are zero children will not learn. If the time it takes for students to reach the MPL in this system is too long, children will not learn.

One important aspect of this model, is that following the science of learning literature, any country will have a specific share of students who will reach the MPL with minimal effort from the educational system, at the same time, there will also be a specific share of learners who will require an extra effort from the educational system to reach the MPL (Moats, 2020). Those two shares are exogenous parameters in the model.

Another critical element in the model is the Early Grade-to-End-of-Primary passthrough. This indicator can be understood either as how much alignment there is among the learning that take place at Early Grade and at the End of Primary. The stronger this relationship the faster progress as the end of primary will take place, however, if this relationship is zero, no learning will take place at the End of Primary, suggesting that the content knowledge at Early Grade is a necessary condition for students to acquire the content knowledge at the End of Primary. Some of the reasons why this number can be low is the language of transition, which might disrupt the learning continuity if poorly managed, or a mismatch and misalignment of the curriculum of Early Grade and the End of Primary.

One last aspect of this model is that both learning at Early Grade and End of Primary happen with a delay, which is higher for the End of Primary than at Early Grade, due to temporal differences and distinct levels of complexity of the required competences. One additional point is that the level of Educational System Strength can either increase or reduce this delay, and in the case of Early Grade so can the Quality of Foundational Skills.

Figure 21 illustrates the dynamic of learning in an educational system for different scenarios of Educational System Strength and Quality of Foundational Learning practices.

Figure 24 Structure of the SIR epidemic model adapted for learning

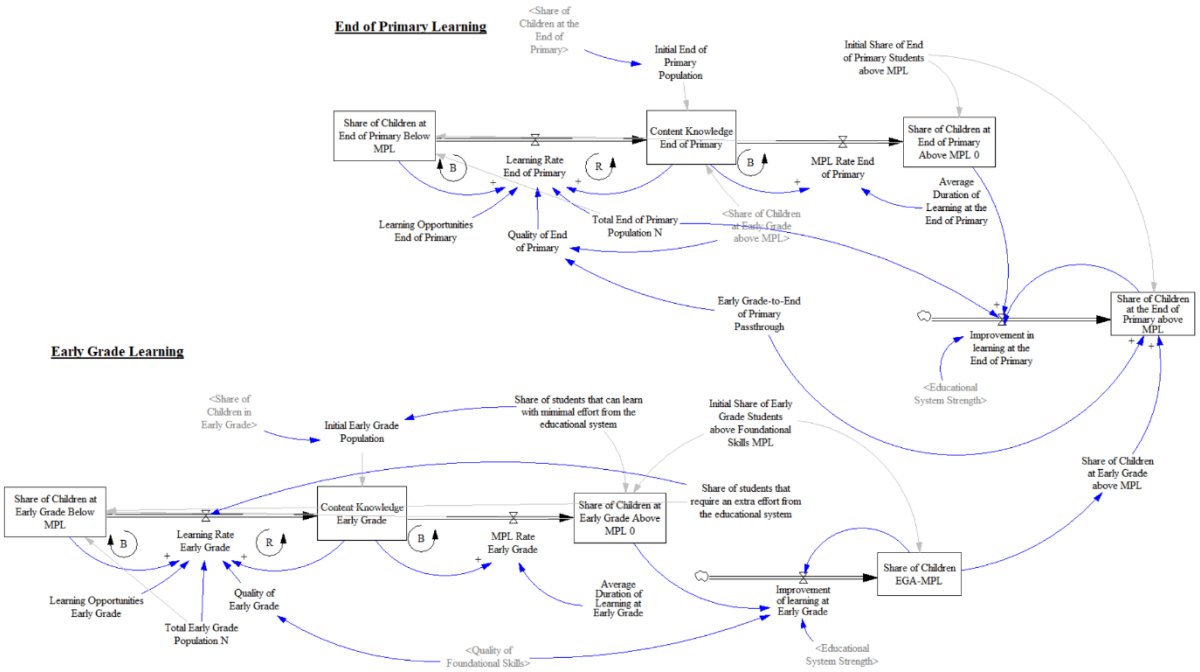
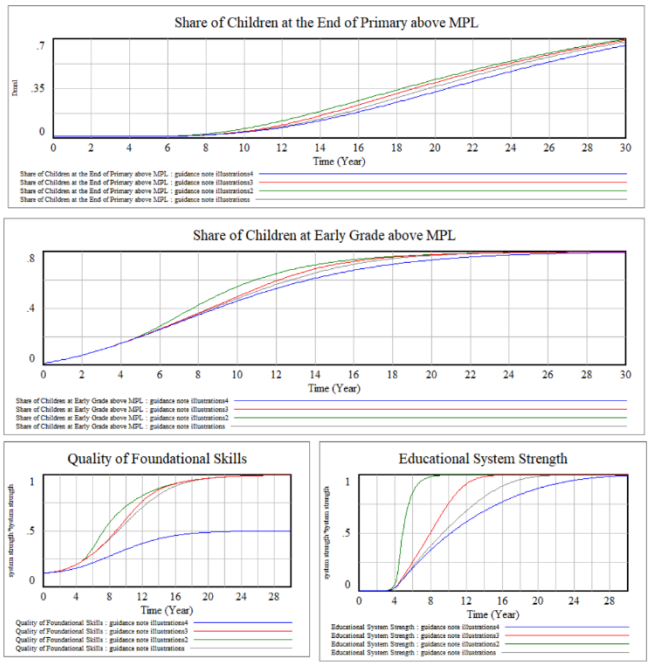


Figure 25 Evolution of Learning at Early Grade and End of Primary by different scenarios



5. Learning Target Simulation Dashboard

The last element of the model is the Learning Target Simulation Dashboard (LTSD). This resource brings together all the elements of the simulation model (see Figure 22), to enable a simple analysis of different trajectories informed by different assumptions regarding the distinct policy options and or initial conditions. The objective of this tool is to run ex-ante simulations of different policy actions to understand the assumptions for the educational system to deliver a particular rate of progress both at early grade and at the end of primary, to what extend improvements at early grade might affect results at the end of primary, and what goals are likely to be more feasible given different assumptions. As the validity of this theoretical model is strengthen, this tool can also be used to help prioritization of action and to identify parameters in which greater understanding is needed, helping set the evaluation agenda aimed at helping the country accelerate learning.

Figure 26 Learning Target Simulation Dashboard (LTSD)

Step #5: Define clear, measurable, and feasible stretch targets

The fifth and last step of this process is to define clear, measurable, and feasible stretch targets based on the initial conditions, the theory of change and a clear pathway to achieve them in a defined timeframe. Targets should be set for each subskill for chosen points at each of the first three grades of primary school. The GPF provides references for MPL for select subskills by grade; ultimately, countries will want to have all students at or above these minimum levels.

Countries should choose targets that are compatible with their initial conditions and that reasonably reflect their ability to make progress over time and build back better after the pandemic. Historical data can be used to establish a baseline or a reference value for setting

learning targets and understand learning progress over time. Progress in achieving the targets is not expected to be equally distributed across countries, since the starting position will vary for each country. Countries will make progress against their targets at different rates. A target is a political number which should be country-owned and should reflect a realistic increase in the level of performance possible given national capacity, policy options, and country context.

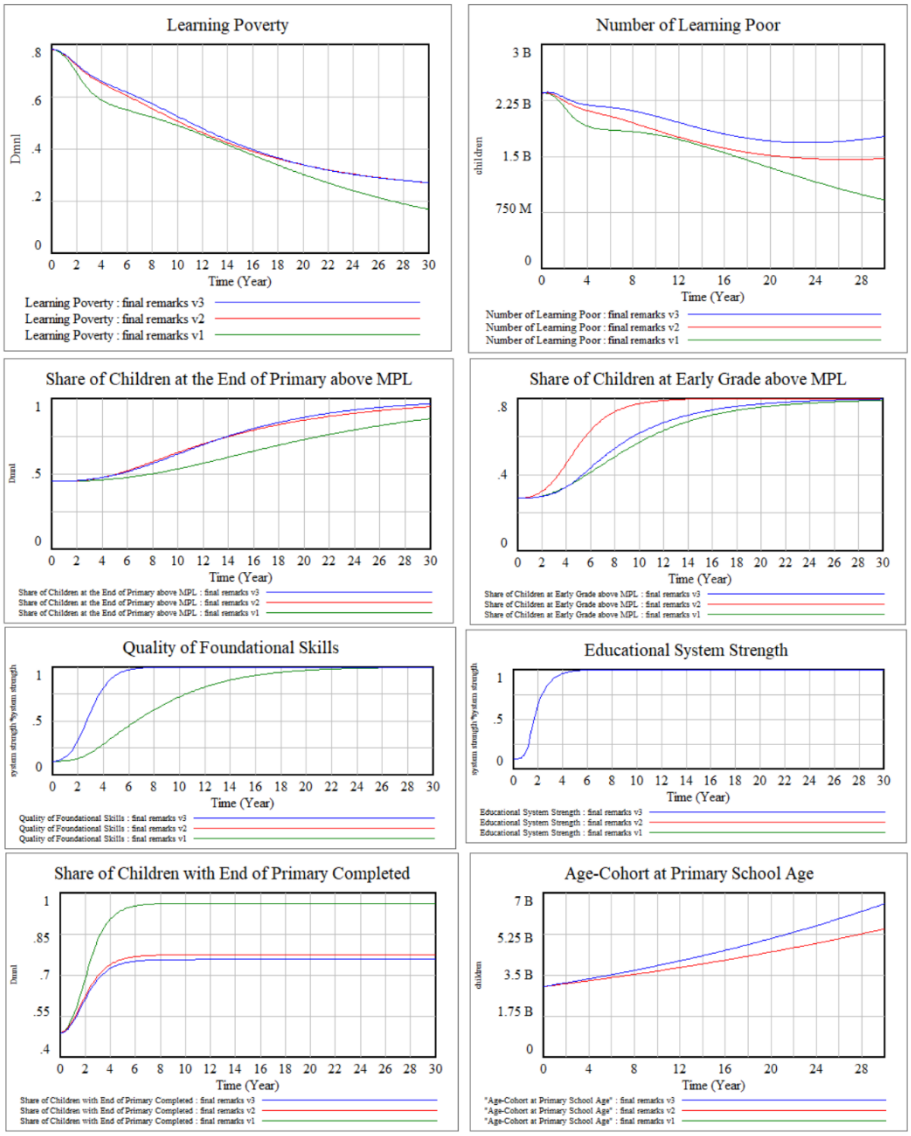
If no data or indicators exists for a country, available knowledge from similar countries can be used and combined with the tacit understand of the specificities of a particular country context to generate insights and actions[15]. Those should be framed in a clear theory of change, which should inform the appropriate targets. Close adherence to reachable targets for each subskill, along with an analysis of the actions that can positively "move-the-needle" on each skill, should be a critical element on the strategy on how countries can accelerate learning. On-going work from various sources provides examples of how fast subskills have changed in sets of countries for which data exist. The Research Triangle Institute (RTI) is leading one of many efforts to consolidate and make available this data. USAID's "EGRA Barometer" is another tool that provides access to specific data measurements, often with explicit grade-to-grade changes analyzed.

One important premise of this guidance note is that a useful target setting exercise is more than the production of a number to be achieved within a particular time frame. It should be informed by the country's initial conditions and potential policy options, and presented as a clear strategy to justify it. As Figure 24 illustrates, there are multiple ways a country, departing from the same initial conditions, might be able to halve learning poverty within 15 years. The combination of data, indicator, knowledge and an explicit metal model is of critical importance to identify a clear theory of change, and the critical resources and assumptions required, which mediating factors are possible, and what might be the most relevant intermediate outcomes.

The simulations below present scenarios built on slightly different assumptions of effort and policy complementarity. Scenario 1 (in green) shows a strategy which relies significantly on improvements in access; Scenario 2 (in red) illustrate a strategy where improvements in learning at both early grade and the end of primary will drive the process; and Scenario 3 (in blue) shows a case in which best practices in the teaching of foundational learning subskills are most rapidly diffused. Moreover, the choice of options might also have different implications depending on the population assumptions and will yield different tradeoff in the short and medium run.

[15] The accompanying "Guidance Note on Learning Assessments that Can Be Used to Measure Learning Poverty" provides essential information on the technical characteristics that allow a national assessment to be used to report on Learning Poverty.

Figure 27 Illustration Results



The final choice of a target can be determined by triangulating theory with practice, and combining the results of the policy simulations using the LTSD model, also reflected in the Theory of Change, against a series of interactive dashboards that can be used to project the expected rate of progress given different historical data. This would allow to compare the theoretical effort levels assumed in the LTSD model with historical data, in terms of percentile of performance empirically observed. This could be the final check.

If the implied percentile of performance-based on a set theoretical scenarios is two low, it is recommended to go back to the theory of change and simulation model and chose more ambitious parameters. On the other hand, if the resulted rate of change is too high, reaching historically unprecedent levels for similar countries, this information can be used to either revise its theory of change and theorical assumptions, or identify strong elements which could support this very ambitious choice.

Given the proposed five steps, countries should start with a clear understanding of its initial conditions, knowledge of what can be done, and a theoretical understanding of what might be possible. The simulated trajectory should be triangulate with historical data, which will ascertain to what historical percentile of performance that value corresponds. This will help externally validate the choices implied in the theory of change, and identify if the chosen trajectory is sufficiently ambitious, but not too excessive.

Hence, setting the right target can be summarized as:

- **Baseline/starting point**. Countries where baseline student abilities are very low can progress faster than countries where baseline skills are more advanced. Each unit of progress in general requires more time and effort as the aggregate skills in the cohort converge on minimum proficiency for all students.
- **Intensity of the interventions/changes**. Greater progress comes from larger and more intense efforts. Countries willing to implement a complement set of interventions that include introduction of structured pedagogy, training, coaching, and support for teacher, frequent monitoring of progress, and feedback and adjustment based on assessment can select a higher target than a country implementing fewer changes to the status quo.
- **Quality of interventions and alignment with evidence from the science of reading**. Interventions that follow the best evidence-based guidance from the science of reading, including strong adherence to the optimal scope and sequence of learning tasks will likely progress fastest. Countries where content and pedagogy are unaligned or not based on the evidence of what works will make slower progress and may not accelerate with respect to the status quo.
- **Characteristics of the language and writing system**. Even when all other things are equal, rates of progress in literacy depend in part on the characteristics of the given language, its writing system, and how these fit together. Students learning a highly "transparent" language like Spanish or Italian will progress faster with their code skills. Other features of the languages such as morphology and syntax affect how quickly students can progress to being independent readers.

Conclusions

One critical assumption in any plan will be the ability of a country to monitor progress in both learning and schooling. If country data or substitute comparators do not exist, one critical element of any strategy will be the creation of such information. To be meaningful, such data need to be comparable over time to be able to track progress of the same or different student cohorts. Several instruments, such as EGRA- or ASER-like assessments, can be used to measure developmental subskills. International learning assessments such as PIRLS, TIMSS, LLECE, PASEC[16] can be used to measure learning poverty[17]. Good quality national learning assessments, when properly benchmarked and with clearly interpretable proficiency levels, which preferably are temporally comparable, can also be used when available.

Different instruments to measure developmental subskills have different advantages and drawbacks for a variety of goals; many instruments require adaptation to the specific conditions and goals of a given assessment survey. Once identified and adapted, care should be taken to conserve comparability as data is collected over time. Targets for improvement over the baseline should "stretch" the students to do better, but avoid unrealistic expectations for improvement. For examples, if the averages first grade student now knows only a half a dozen letter sounds by the end of first grade, it is likely unrealistic to set a goal of knowing two dozen letter sounds or more for children by the end of first grade. An achievable and maybe realistic target for developmental sub skills would be to have all students go from half a dozen to a dozen. In some cases, a country's students may be close enough to the minimum proficiency levels of the specific developmental skills to use the GPF's (in progress/in draft) definition of minimum proficiency. Countries are encouraged to consult the GPF for setting goals as well as for aligning global reporting. In other cases, most of a country's students may be so far below minimum proficiency that interim targets are more appropriate.

The target setting exercise for early grade reading and end of primary described here may also serve as an opportunity to update national assessments of reading, where such updates are warranted. Again, countries should be mindful of achieving targets related to global reporting and targets related to articulating and monitoring the progression of skills through the early grade sequence of instruction.

It is also critical to have clarity on what is the domain of change in which targets are being set, as they can be a specific student population, a particular age-cohort, or different age-cohorts in specific grades. Most learning assessment measure learning at a specific grade for different students-cohorts. Those assessment are often not design to track the temporal progress of a specific group of students over time, such as student longitudinal tracking studies done in the context of program evaluation, nor the some student cohort across different grades, in cases where the system measures the learning at both 3rd and 6th grade every three years, such as LLECE. The

[16] More detail information on how to measure learning poverty can be found in the Learning Target Technical Note (forthcoming).
[17] Reliance on international assessment can affect the target setting and progress monitoring process.

assessment of different cohorts at the same grade allow us to track to what extend the quality of the educational system is improving or not, overtime. However, the temporal tacking of specific students cohorts will allow a clear understanding on how its improvements in early grade are supporting the progress at the end of primary.

Average progress in reading ability is a complex construct describing a developmental process. What it means to make progress changes with age; strong reading skills in a seven-year-old may or may not translate to below minimum proficiency for a 10-year-old, particularly in light of the quantity and quality of subsequent instruction. Many aspects of progress are deeply dependent on the characteristic of the given language and writing system. In addition, choice of text difficulty, specialized vocabulary, and background knowledge all influence performance, often in idiosyncratic ways. Progress tends to vary with the amount and quality of instruction, but both these factors are difficult to define and to measure. The "depth" of the orthographic system—whether it is "shallow" and therefore regular or "deep" and possessed of many exceptions—can significantly affect rates of progress.

A vertically integrated scale system would allow countries to link assessments to one scale that spans all grades to describe student growth over time and create a framework and metric for reporting the educational development of students. Building a comparative vertical scale entails defining content standards that define continuous learning and measuring progress toward those standards with valid and reliable assessments.

Where integrated systems are too ambitious to build, countries should at least ensure to monitor progress with regular assessments and ensure temporal comparability of measures to be able to track progress over time. Ideally, targets to reduce learning poverty and increase developmental literacy subskills should provide a robust picture of reading abilities of primary-school aged children, facilitate reporting on progress to reduce learning poverty, meet SDG 4.1 targets, and provide information on where and why some children are failing to develop as readers.

This is a living document which will be refined as it is used by our country teams.

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Annexes

1. How is Learning Poverty measured?

Learning Poverty is measured at the end of primary school. It brings together schooling and learning by adjusting the proportion of kids in school below a proficiency threshold by the out-of-school population. Acceptable measures of learning poverty come from **international, regional, and national assessments that are aligned with the Global Alliance for Monitoring Learning (GAML) minimum proficiency level and the Global Proficiency Framework for Reading.** The accompanying "Guidance Note on Learning Assessments that Can Be Used to Measure Learning Poverty" provides essential information on the technical characteristics that allow a national assessment to be used to report on Learning Poverty.

Since Learning Poverty measures comprehension and inferential abilities, it can be measured using texts that students read **silently**. Hence it is compatible with **paper- and computer-based assessments** that do not require each test taker to be assessed individually by a trained assessor.

2. What is the Global Learning Target?

The World Bank Global Learning Target was determined by using the Learning Poverty historical data to identify a Business as Usual (BaU) rate of change of Learning Poverty using all data available from 2000 to 2018. This exercise suggested that the average rate of progress, for the countries with multiple-comparable Learning Poverty estimates, is less than one percentage point per year.

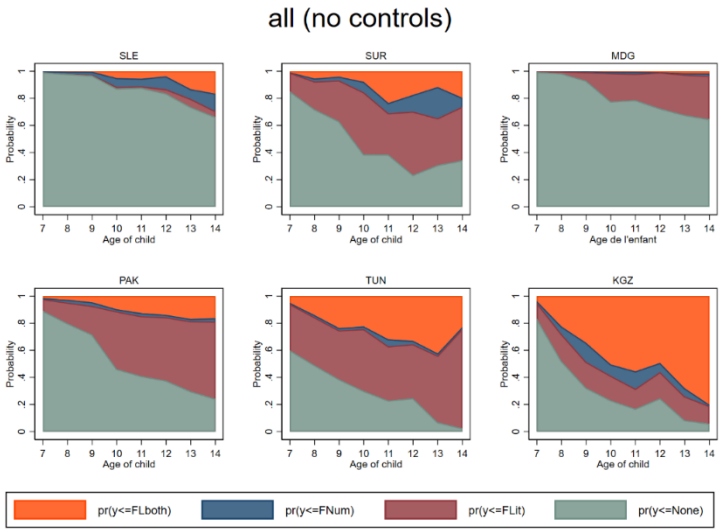
The World Bank Global Learning Target is to at least halve the share of children who fail to learn to read with understanding by age 10. The process of setting this target required identifying a level of effort that would be higher than the BaU scenario, yet achievable. After a number of simulations, the choice was to aim for countries to perform at the top quintile of their respective region.

3. Why reading?

Even if all foundational skills are important there are several reasons why choosing to focus on literacy:

- Reading is a student's gateway to learning in every other area. When a child becomes proficient in reading, that unlocks the door to the vast knowledge codified in text of all types.
- Reading proficiency can serve as a proxy for foundational learning in other subjects as proficiency rates in reading are highly correlated with proficiency in other subjects. Analysis for the complementary of reading and math using MICS shows that in most countries children are able to demonstrate proficiency in reading before math. Once they demonstrate proficiency in math, they are proficient in both. There are limited cases (Sierra Leone) where a larger share of kids is just proficient in numeracy.

Figure 28 - Complementarity of reading and math



Source: Authors' calculation using the MICS database.

4. Student vs System level analysis (Simpson's paradox).

The magnitude of the relationship between early grade and end of primary is likely to be affected by the level of aggregation. It is often assumed that systems with a strong early Grade (2nd and 3rd Grade) performance will also have a strong end of primary (4th, 5th and 6th) both at system and student level. However, the empirical evidence of this relationship using large scale learning assessments suggests a significantly more nuanced message.

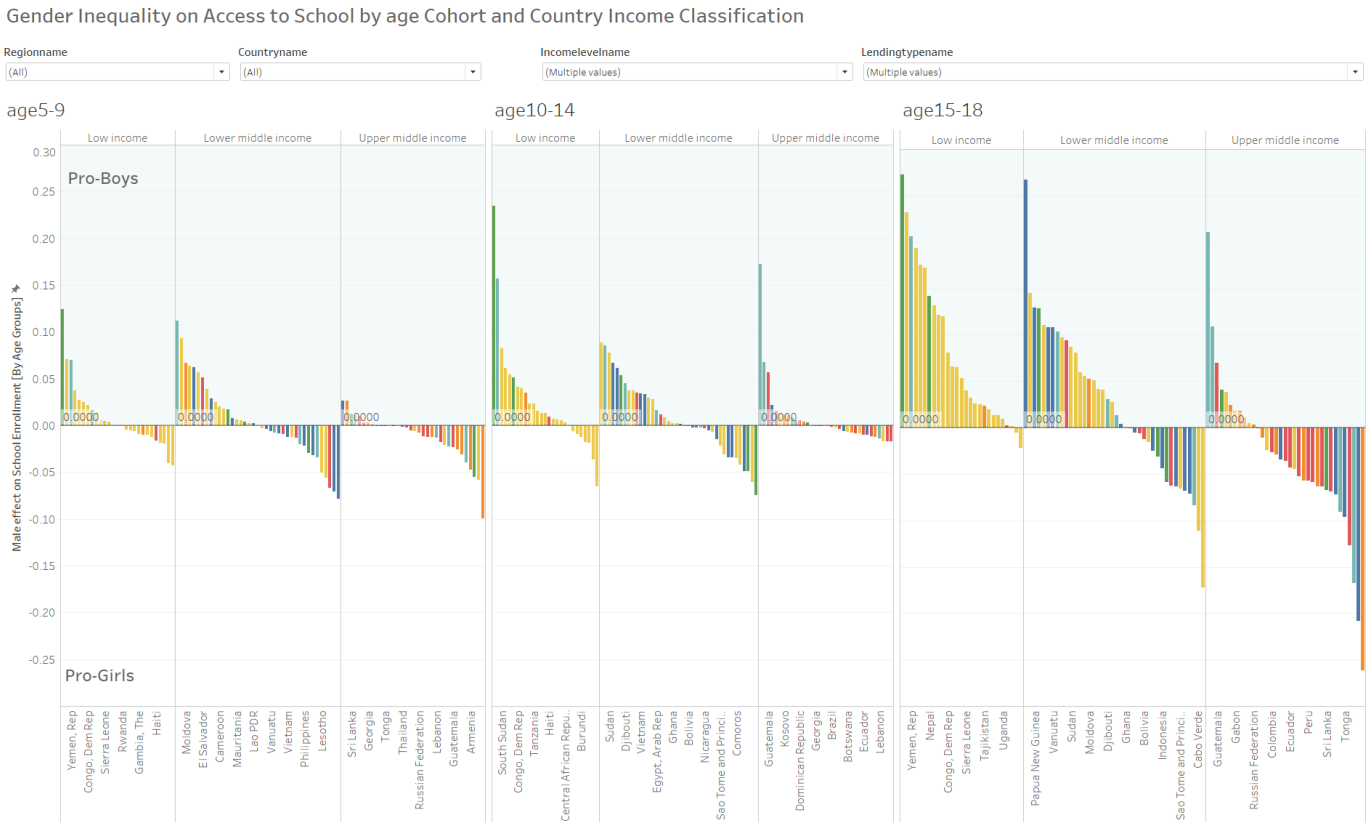
In Latin America, US Schools across Districts and US Schools across States have a correlation between early grade and end of primary that ranges from 0.87 to 0.76. Nevertheless, in the States of Ceará, Brazil, or Kansas, US, it is 0.43 and 0.46, respectively.

Using panel data for more than 260,000 students from the state of Ceará, Brazil, we can estimate both the aggregate (at the municipal level) and student level relationship between performance at early grade and end of primary (Figure 8). There is quite a significant variation of municipal performance, with some municipalities clearly being able to improve their learner's performance significantly more than others**.** For illustration purposes, we have selected eight municipalities, at different levels of performance, in which we drill-down on this relationship at the student level.

As can be seen, at the student level, this relationship no longer holds, and we find municipal systems with negative, positive and no relationship between performance at early grade and end of primary. The interpretation of these results at the student level should also be done with caution, since it is not obvious that a positive relationship at the student level is also desirable. Results of systems such as Camocim, Quixad e Sobral, are quite regressive since better students in 2nd Grade are on average the ones in which the system is able to add greater value by 5th grade. A system such as Ipueiras and Ipaumirim, seem to provide greater equality of opportunities as children with any 2nd Grade performance level are equally able to improve their abilities by 5th Grade. The last example are municipalities such as Nova Olinda and Abaiara which seem to be extremely progressive and are able to add greater value to their learners in relative worse initial conditions. It is worth noting that Brazil is one of the most language homogenous countries in the world, and issues related to the transition for a local language to a dominant language are not present.

5. Gender access inequality by age cohort and income classification

Figure 29 Gender Access Inequality by Age Cohort and Country Income Classification



Note: [Link to the interactive DataViz]

6. Equity Adjusted Coverage Rate (EACR) and Shapley Decomposition

The Equity Adjusted Coverage Index (EACR) is a measure of the availability of services, discounted or "penalized" by how unfairly the services are distributed among the population. The EACR calculations in this paper generate three indicators:

- **Coverage**: Overall level of availablity/access of the indicator across the pouplation
- **Dissimilarity (D-index)**: The difference in access rates for a given service for groups defined by circumstance compared with the average access rate for the same service for the population as a whole.
- **Equity Adjusted Covergae rate (EACR)**: Average access rate in the population, penalized by the degree of dissimilarity in coverage across different types of indicators.

The variation between calculated EACR values for different units of observation or changes across time can be decomposed in to three effects:

- **Scale**: Changes related to the expansion of the overall coverage of a particular good or service
- **Equalization**: Changes on distribution of access
- **Composition**: Changes in the relative importance of different groups in society (i.e. demographic changes)

The D-index can be decomposed using the Shapley decompositoin which identifies the contribution of each circumstance to inequality in access to opportunities.

The Shapley decompostion decomposes the main explanatory factors of the dissimilarity

Constructing the Equity Adjusted Coverage Index[18]:

1. A separable logistic model is estimated based on whether the individual i has access to a given indicator (etc, bank account usage, savings). Different specifications were chosen for circumstances; categorical for age and income and binary for the other indicators. The coefficent estimations were oibtained as a result of the logistic regression.

2. With the coefficent estimates, the probablity of achieve the MPL was predicted for each individual in the sample. Probability ($\hat{\mathrm{p}}_i$) is based on the predicted relationship of $\widehat{\beta_k}$, and a vector of the circumstances x_{ki} .

$$\hat{\mathrm{p}}_i = \frac{Exp\left(\widehat{\beta_o} + \sum_{k=1}^{m} x_{ki}\,\widehat{\beta_k}\right)}{1 + Exp\left(\widehat{\beta_o} + \sum_{k=1}^{m} x_{ki}\,\widehat{\beta_k}\right)}$$

3. The coverage rates, C, were computed

$$C = \sum_{1}^{n} w_i\,\hat{\mathrm{p}}_i$$

[18] The mathematical framework of the Equity Adjusted Coverage Index is based on "Do Our Children Have A Chance?Index", Molinas Vega et al. (2010) pg 49

where $w_i = \frac{1}{n}$ or other sampling weights.

4. The Dissimilarity index D was computed

$$\widehat{D} = \frac{1}{2C}\sum_{i=1}^{n} w_i |\,\hat{\mathrm{p}}_i - C|$$

5. The penalty was computed, $P = C * \widehat{D}$

6. The EACR was computed EACR = C – P for each financial service

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[i] All learning assessments used are anchored in a standard deviation of 100 points, this should be sufficient to have the FGT-class of measures to be minimally comparable. Of course, within country temporal comparisons, assuming temporal comparability of the assessments, are the ideal case. All gap measures are relative to the test-specific MPL. One interesting aspect is that once the gap conversion is made, the measure becomes test-independent, and can be presented independently of any scale. One important assumption when doing cross country comparisons, which is shared with global poverty monitoring, is that the learning (income) marginal sensitivities of the cardinal variable are the same. So, improving one learning point, is equally hard (or equally well captured) across all assessments (or different measures of income and consumption).

[ii] Hwa, Y., Kaffenberger, M. and Silberstein, J. 2020. Aligning Levels of Instruction with Goals and the Needs of Students (ALIGNS): Varied Approaches, Common Principles. RISE Insight Series. 2020/022. https://doi. org/10.35489/BSGRISE-RI_2020/022