EdTech Hub

Clear evidence, better decisions, more learning.

unicef para cada infancia

HELPDESK RESPONSE 46

Understanding the Potential of EdTech to Measure and Mitigate Learning Losses in Latin America and the Caribbean

Date December 2022

Authors Natalie Wyss
Christina Myers

DOI 10.53832/edtechhub.0110

UKaid from the British people

THE WORLD BANK

About this document

Recommended citation

Wyss, N., & Myers, C. (2022). *Understanding the Potential of Using EdTech to Measure and Mitigate Learning Losses* (Helpdesk Response No. 46). EdTech Hub. https://doi.org/10.53832/edtechhub.0110. Available at https://docs.edtechhub.org/lib/FUBDMTM8. Available under Creative Commons Attribution 4.0 International, https://creativecommons.org/licenses/by/4.0/.

Licence

Notes

EdTech Hub is supported by UK aid (Foreign, Commonwealth and Development Office), Bill & Melinda Gates Foundation, World Bank, and UNICEF. The views expressed in this document do not necessarily reflect the views of UK aid (Foreign, Commonwealth and Development Office), Bill & Melinda Gates Foundation, World Bank, and UNICEF.

Reviewers

Arjun Upadhyay, Rachel Chuang Shi, and Caitlin Coflan

Acknowledgements

This report was commissioned by UNICEF and produced under UNICEF and EdTech Hub's global partnership. Many thanks to UNICEF LACRO colleagues, including MiRi Seo, Maria Jose Velasquez Flores, and Vina Barahman for their support and input in developing this report. We would also like to thank Diana Calderón and the UNICEF Mexico team for their support developing the case study on Learning Passport Mexico.

About the EdTech Hub Helpdesk

The Helpdesk is the Hub's rapid response service, available to FCDO advisers and World Bank staff in 70 low- and lower-middle-income countries (LMICs). It delivers just-in-time services to support education technology planning and decision-making. We respond to most requests in 1–15 business days. Given the rapid nature of requests, we aim to produce comprehensive and evidence-based quality outputs, while acknowledging that our work is by no means exhaustive. For more information, please visit https://edtechhub.org/helpdesk/.

Contents

Abbreviations and acronyms

AMPL	Assessment for Minimum Proficiency Levels
AR	Adult Retrospective
CCS	Contemporaneous Cross Section
EGMA	Early Grades Mathematics Assessment
EGRA	Early Grade Reading Assessment
FLM	Foundational Learning Module
ICT	Information communication technology
LMIC	Low- and middle-income country
LAC	The acronym 'LAC' refers to 'Latin America and the Caribbean' region, which encompasses all 36 countries from the Bahamas and Mexico to Argentina and Chile
MICS	Multiple Indicator Cluster Survey
PIRLS	Progress in International Reading Literacy Study
PISA	Program for International Student Assessment
SDI	Service Delivery Indicator
SEND	Special education needs and disability
TIMSS	Trends in International Mathematics and Science Study
TP	True Panel

Executive summary

This document summarises current understandings about using technology to measure and mitigate Covid-19-related learning losses. It aims to guide UNICEF offices throughout the Latin America and Caribbean (LAC) region about how to gauge learning losses and inform school reopening. This work found few EdTech[1] approaches to measuring and mitigating learning losses and even fewer specific to LAC. Therefore, to meet its objectives, this piece explores 1) current understandings about measuring learning losses, 2) leading guidance on mitigating learning losses, and 3) how tech- and non-tech approaches can measure and mitigate learning losses.

To do this, we begin with Section 1, which presents an overview of learning losses generally and the significance of understanding these shifts in learning trajectories in light of the Covid-19 pandemic, including informing learning recovery programmes and policies, gauging the education impacts of Covid-19 school closures, preparing educators for returning to classrooms, updating parents and caregivers, and supporting students to get back on track with their learning. This section also explores the specificities of Covid-19-related learning losses in the LAC region, including regional and national differences in responses to and outcomes of Covid-19 school closures.

Section 2 describes how learning losses can be quantified by exploring measurement and modelling. It describes current approaches to system- and classroom-level assessments of learning outcomes, learning gaps, and learning losses. It mentions current approaches to modelling Covid-19-specific learning losses as they relate to and contrast with the measurement of generalised learning losses. This section also looks at methods of measuring learning losses, including non-tech- and tech-based approaches. In terms of specific non-tech approaches, it explores the diversity of standardised assessments and learning profiles that can and have been used to measure learning losses. In terms of tech-enabled tools, it discusses computer-adaptive testing and tech-supported comparative judgement. The section then touches on the specifics of measuring learning losses in the LAC region and links to a proposed framework to adapt existing techniques for measuring learning losses in the LAC region.

[1] The term "EdTech" (short for education technology) is used throughout this report to describe technologies (including hardware, software, and digital content) that function for educational purposes. Low-tech / non-digital modalities, such as radio, television, and SMS, are also included in this definition.

Section 3 dives into mitigating Covid-19-specific learning losses by discussing how EdTech approaches align with standard guidance on recovering learning after the pandemic. This section closely examines the Learning Passport in Mexico as a case study of a programme that has considered learning losses to design and implement an EdTech intervention in the region. The section discusses personalised digital learning and EdTech tools developed to tackle learning losses in the LAC region. This section also introduces evidence-based approaches to mitigating learning losses, namely remedial education, accelerated learning, and teaching at the right level — and discusses how technology can help support and implement these approaches in practice.

Finally, Section 4 concludes with a description of policy-based guidance for mitigating learning losses and how considering learning losses could be relevant to the LAC context and policy leaders. This guidance includes

- The (re)allocation of funding to initiatives for mitigating learning losses;
- Policy-level prioritisation of pedagogical approaches that are effective for learning recovery;
- Supporting robust teacher professional development (TPD) around mitigation and the use of EdTech to tackle learning losses;
- Focusing on outreach efforts for students, parents / caregivers, and communities to encourage a return to school.

This section also emphasises the collective responsibility of policy leaders and education systems to understand and address learning losses and the application of EdTech to achieve these objectives.

Purpose of this document

This document was produced in response to a request from the UNICEF Latin America and the Caribbean Regional Office (LACRO) submitted to the EdTech Hub Helpdesk in December 2021. The UNICEF team requested a resource that summarises what is known about the use of technology and other approaches to measure and mitigate learning losses related to Covid-19 impacts on education in the LAC region. This resource aims to support UNICEF country offices and partners in the LAC region to assess learning losses and inform school reopening and the development of hybrid education strategies.

Notably, our research found that there are limited EdTech approaches to measuring and mitigating learning losses, and fewer still that are specific to the LAC region. As a result, the following piece outlines

1. What is understood about learning losses and how they can be quantified;
2. What common guidance and evidence suggest are the most effective ways to mitigate Covid-19-specific learning losses;
3. How established EdTech tools and non-tech-based approaches can be leveraged and applied to both processes.

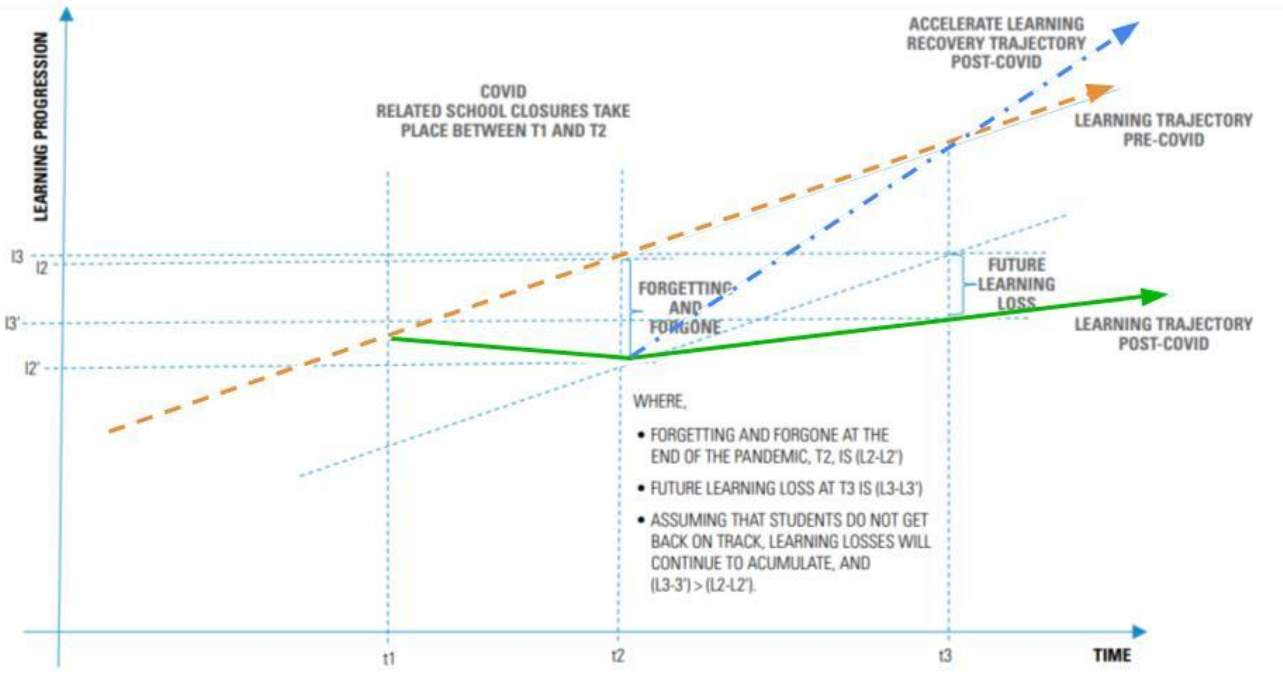
1. Defining and understanding learning losses

The term 'learning losses' describes the decline of knowledge or skills related to gaps or pauses in formal education. Before the Covid-19 pandemic, much of what was understood about learning losses related to disruptions to formal schooling, such as summer breaks, teacher strikes, student drop-out, or interruptions caused by natural disasters and crises. More recently, 'learning losses' has also referred to the decline in knowledge and skills due to the education disruptions caused by the Covid-19 pandemic.

Measuring learning losses can be used to understand educational gaps and to identify student needs to tailor remedial learning opportunities. This can be vital as students who fall behind in their academic progression due to interruptions are more likely to drop out of school after returning to it (↑Mendez Acosta & Evans, 2020). Research has shown that students can face lifelong setbacks if school interruptions are not followed by re-enrollment strategies that measure and mitigate levels of learning losses (↑Andrabi et al., 2020).

Understanding learning losses is imperative to informing returns to school and is a critical step towards actioning mitigation measures and learning recovery plans. Without understanding and adapting for learning losses incurred over the course of school closures, education systems risk entrenching these losses and impacting individual and national long-term success. Figure 1 below illustrates the implications of Covid-19-related learning losses and the cost of inaction.

Figure 1. *Hypothetical learning progression illustrating the implications of Covid-19-related learning losses and how mitigation measures such as accelerated learning programmes can support learning recovery. Source:* ↑World Bank et al., 2021.



Here, the dashed gold line represents pre-pandemic learning trajectories, and the solid green line represents the impacts of learning losses due to Covid-19 school closures — the difference between these two slopes then represents learning losses. Finally, the dashed / dotted blue line represents the potential to mitigate learning losses with accelerated learning.

In addition to the above considerations, measuring and understanding learning losses can benefit returns to school by:

- Providing **data and evidence on the educational impacts** of learning disruptions to inform global, national, regional, and local education recovery plans and policies.
- **Preparing educators and teachers** for working with students returning to school, including addressing immediate academic needs, understanding current learning levels, and strategising for learning recovery plans.
- **Offering insights to caregivers** about student needs and necessary modes of support for learning recovery.
- **Helping students get back on track with learning** with approaches tailored to their needs.

1.1. Understanding learning losses in the LAC region

As experienced across the world, the Covid-19 pandemic led to extensive school closures throughout the LAC region. At the peak of the pandemic, school closures meant that 154 million students, more than 95% of those enrolled, were made to navigate the uncertainty of interrupted, truncated, or prematurely ended schooling (↑UNICEF, 2020). From February 2020 until February 2022, roughly 273 and 225 days per child in the LAC region were lost to these closures, limiting student access to in-person learning and the multitude of other developmental and support services schools offer (↑Azevedo et al., 2022, p. 8).

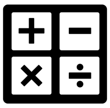
National governments across the LAC region responded to school closures with remote and blended learning solutions, most commonly relying on EdTech strategies (↑ECLAC, 2021). However, due to pre-existing education challenges and inequities, digital divides, and programmatic drawbacks, these responses had a variable impact on sustaining academic progression (↑ECLAC, 2021; ↑Gabriela Alvarado, 2022; ↑UNDP (2020); ↑Vegas, 2022).

Given the challenges of accommodating public health needs and implementing distance education, the LAC region continues to contend with learning losses. A World Bank report illustrated that after ten months of school closure (the entire academic year of 2021), 71% of lower-secondary students were predicted not to be able to understand a text of moderate length, as compared to 55% before the Covid-19 pandemic (↑World Bank, 2021). Learning losses for students from low-resource settings were also reported to be particularly accentuated in the LAC region. Recent evidence from the World Bank and UNICEF shows that 4 out of 5 students in this region cannot understand simple stories (↑World Bank, UNICEF, 2022). The socio-economic education achievement gap[2] widened in the LAC region by 12% due to the Covid-19 pandemic (↑World Bank, 2021). Another predictive study found that the likelihood of secondary school completion in the LAC region declined from 56% to 42% but varied somewhat based on country (↑Neidhöfer et al., 2021). These differences are in some part likely to be linked with the variation in school closures (lengths, responses, and mitigation approaches) and the income and education level of parents and caregivers.

While evidence underscores the serious impact of education interruptions throughout the region, learning losses vary from country to country. These

[2] The socio-economic education achievement gap is a global assessment scale measuring disparity in academic achievement between students from high and low socio-economic status backgrounds.

national-level impacts in Brazil, Mexico, Columbia, and Chile are summarised below.

	In São Paulo, **Brazil**, research has shown that students learned only 28% of what they may have if face-to-face instruction had continued (↑Lichand et al., 2022).
	In **Mexico**, Covid-19-related school closures were found to contribute to learning losses in reading and numeracy, i.e., increased learning poverty[3] in reading (25%) and numeracy (29%), and increased education gaps by gender and socio-economic status (↑Hevia et al., 2022).
	In **Colombia**, educational inequities based on student characteristics (such as gender and socio-economic status) increased significantly, especially depending on access to the internet, digital devices, and school type (public or private) (↑World Bank, 2022).
	In **Chile,** students scored lower on standardised tests than pre-pandemic cohorts in 75% of cognitive and academic developmental areas, including language and social-emotional skills (↑World Bank, 2022).

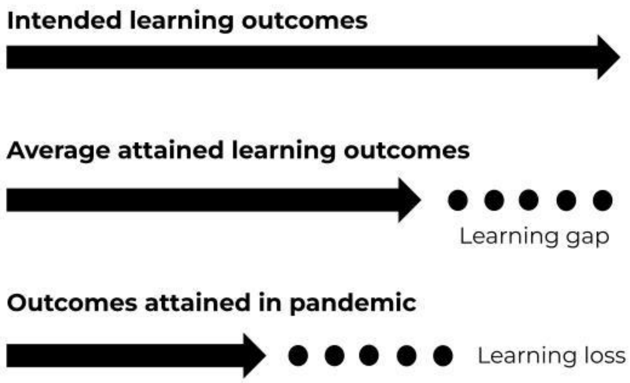
Education systems in the LAC region are confronted with reintegrating students who have spent a substantial time away from school and helping them (re)orient to physical school environment processes. In order to manage the process of reintegration and reorientation successfully, these systems must understand students' learning levels and preparedness to return to in-person learning and physical school spaces. Research currently indicates that roughly 60% of LAC countries have established strategies for supporting education recovery and remedial learning, with about half reporting that they have already carried out learning assessments to inform those processes (↑UNICEF, 2022). These assessments have consistently focused on primary (89%) and secondary school students (72%), with the most significant gaps occurring for preschool / primary children (17%) (↑UNICEF, 2022). These insights underscore concerns that roughly half of LAC countries have yet to carry out similar assessments, highlighting a significant need for data on learning losses and informed mitigation strategies.

[3] According to the World Bank and UNESCO Institute for Statistics, "Learning poverty means being unable to read and understand a simple text by age 10. This indicator brings together schooling and learning indicators: it begins with the share of children who haven't achieved minimum reading proficiency (as measured in schools) and is adjusted by the proportion of children who are out of school (and are assumed not able to read proficiently)" (↑World Bank, 2019).

2. Measuring Covid-19-related learning losses

In order to estimate learning losses, it is essential to understand what learning outcomes *would* have looked like if education disruptions had not occurred — by looking at expected and average historic learning outcomes. This understanding helps distinguish between measurements of learning losses (newly accrued education setbacks) and learning gaps (historical differences between aspirational and recorded learning outcomes, as shown in Figure 2).

Figure 2. *Learning gap vs learning loss. Source:* ↑World Bank, 2022



Much of what is understood about learning losses due to Covid-19-related school closures relies on information from surveys or questionnaires, standardised test scores, and other forms of real-time data collection (↑Neidhöfer et al., 2021). These analyses mainly focus on comparing current data with information collected before the pandemic to predict differences in educational outcomes. Importantly, this kind of assessment can be done at system and classroom levels which can yield different insights about paths forward.

Figure 3. *System-level vs classroom-level assessment of learning losses* (↑World Bank, 2022)

System level	Classroom level
▪ Can clarify the scale of learning challenges, historic learning trends, and inequalities in student learning ▪ Can help gauge how much learning was lost and what specific content was lost	▪ Can provide insight on individual student's academic progression ▪ Can help educators and teachers adapt teaching approaches and pedagogical practices to meet students needs ▪ Can inform the development of personalised and remedial instruction approaches

Importantly, much of the work currently available on Covid-19-related learning losses, how to understand and quantify it, and how to address or mitigate it, is based on modelling work. Because of the nature of the pandemic, when information was needed quickly, and data was scarce or insufficient, modelling provided a useful means of understanding the educational impacts of school closures. Modelling uses existing data along with principles about learning losses to simulate the learning outcomes of school closures and assess the potential of mitigation efforts (↑Cummiskey, 2020; ↑Cummiskey et al., 2020; ↑Kaffenberger & Pritchett, 2021). More information on the distinction between measuring and modelling learning losses and specifics about modelling is available in Annex 1.

Some studies on learning losses are solely interested in measuring the educational impacts of the pandemic, but a fair portion of current studies aim to use these education measurements to predict other socio-economic outcomes like losses in human capital (↑Buffie et al., 2022; ↑Hanushek & Woessmann, 2020). Notably, much of this work has come from high-income countries, including the United States, Belgium, the Netherlands, Switzerland, and the United Kingdom, and is based on large-scale standardised testing data (↑Christodoulou, 2020; ↑Donnelly & Patrinos, 2020; ↑Education Endowment Foundation, 2022; ↑Engzell et al., 2021; ↑Evans et al., 2021; ↑Tomasik et al., 2021).

Although the fundamental method of these measurements is similar (i.e., comparing pre- and post-Covid-19 educational data), the information collected and how it is acquired often differs from region to region. Importantly, these measurement activities can involve non-tech and EdTech approaches, which offer their respective benefits and limitations.

2.1 Non-tech-specific tools

Data from both national and global standardised tests are commonly used to measure learning losses, especially in the periods following Covid-19-related school closures (↑Maldonado & De Witte, 2021). These measurements are then used to highlight learning inequities between individual learners, student cohorts, schools, regions, or countries. Here, we discuss standardised assessments and learning profiles as tools for gauging and understanding learning levels.

Standardised assessments

Standardised assessments vary in structure, scope, implementation, and measurement methodology (↑Himelfarb, 2019). Notably, the categorisation of these assessments also varies, but generally includes:

- At system level
  - **Large-scale assessments,** which determine large-scale academic performance data and illuminate learning trends at a system and often global level, to inform high-level decision-making. Examples of these assessments can include large-scale global tests like the Program for International Student Assessment (PISA) or Trends in International Mathematics and Science Study (TIMSS) (↑Cresswell, 2016; ↑World Bank, 2022).
  - **High-stakes examinations,** which are assessments with results that have significant consequences for students — passing has benefits like grade progression or skill certification while failing has negative or limiting consequences. Examples include college entrance examinations, high / secondary school exit examinations, and professional licensing examinations. (↑UNESCO, 2022)
- At classroom or school level
  - **Diagnostic assessments,** which are administered before students begin a formalised learning process (like the beginning of a school year) to understand their skill or knowledge level and inform educators.
  - **Formative assessments,** which are iteratively delivered over a specified period to gauge students' continual progression and inform responsive instruction.
  - **Summative assessments,** which are administered at the end of an education cycle (like the end of a school year or academic level)

to understand student content mastery (↑Munyan-Penney & Barone, 2020).

Results from these assessments can be used to understand the aggregate scale of learning losses and also who has been most impacted by learning disruptions. For instance, results from students with special educational needs and disabilities (SEND) or those who are a part of underserved or minority communities may underscore the heightened impacts these students faced during school closures (↑World Bank, 2022).

Figure 4. *Indicative list of assessments currently used globally and in the LAC region*

- System level (global)
  - Program for International Student Assessment (PISA)*
  - Trends in International Mathematics and Science Study (TIMSS)*
  - Progress in International Reading Literacy Study (PIRLS)*
- Classroom level (LAC)
  - Medición Independiente de Aprendizajes (MIA) (México)
  - Sistema de Avaliação do Ensino Básico, SAEB (Brazil)
  - Prova Brasil (Brazil)
  - Sistema de Medición de la Calidad de la Educación (Chile)
- Classroom level (global)
  - Service Delivery Indicators (SDI) Learning Assessment (Bhutan, Cameroon, Democratic Republic of the Congo, **Guatemala**, Guinea-Bissau, Kenya, Madagascar, Malawi, Moldova, Mozambique, Niger, Nigeria, Senegal, Sierra Leone, Tanzania, Togo, Uganda)
  - Early Grade Reading Assessment (EGRA) (Piloted in The Gambia, **Nicaragua** and Senegal)
  - Early Grade Mathematics and Reading Assessment (EGMA and EGRA) (Administered in, for example, the Democratic Republic of Congo, Dominican Republic, Ghana, Iraq, Jordan, Kenya, Liberia, Malawi, Mali, Morocco, **Nicaragua**, Nigeria, Rwanda, and Zambia)
  - Foundational Learning Module (FLM) included in the Multiple Indicator Cluster Survey (MICS) (Global, including **Belize, Costa Rica**, Ghana, and Kenya)
  - Assessment for Minimum Proficiency Levels (AMPL) by UNESCO Institute of Statistics (Burkina Faso, Burundi, Côte d'Ivoire, Kenya, Senegal, Zambia)

**indicates assessments already adapted for digital delivery*

Learning profiles

In addition to assessment-based measures, learning profiles can also be a valuable tool for understanding the current state of learning, including learning losses. Learning profiles capture the dynamic learning processes over time, including learning attrition and retention, rather than more static assessments that evaluate a fixed moment of learning progression (↑Kaffenberger & Pritchett, 2021). Different types of learning profiles can be created from various data sources, many of which have become more widely available in recent years (↑Kaffenberger, 2019).

In particular, these kinds of analyses can offer insights beyond traditional assessment data, including:

- Information on learning *progression* over time and nonlinear learning trajectories (↑Crouch et al., 2021);
- Holistic perspectives and evidence on the development of foundational skills, especially in the early years of schooling;
- Inclusive and representative insights on progress towards universal learning goals (↑Kaffenberger, 2019).

These profiles are also useful in contexts where there is limited reliable data on learning outcomes, as they can use cross-sectional data on various ages or grades not necessarily collected with education measurement in mind (e.g., public health data) (↑Kaffenberger, 2019).

Figure 5. *Types of learning profiles*

The three primary types of learning profiles include:

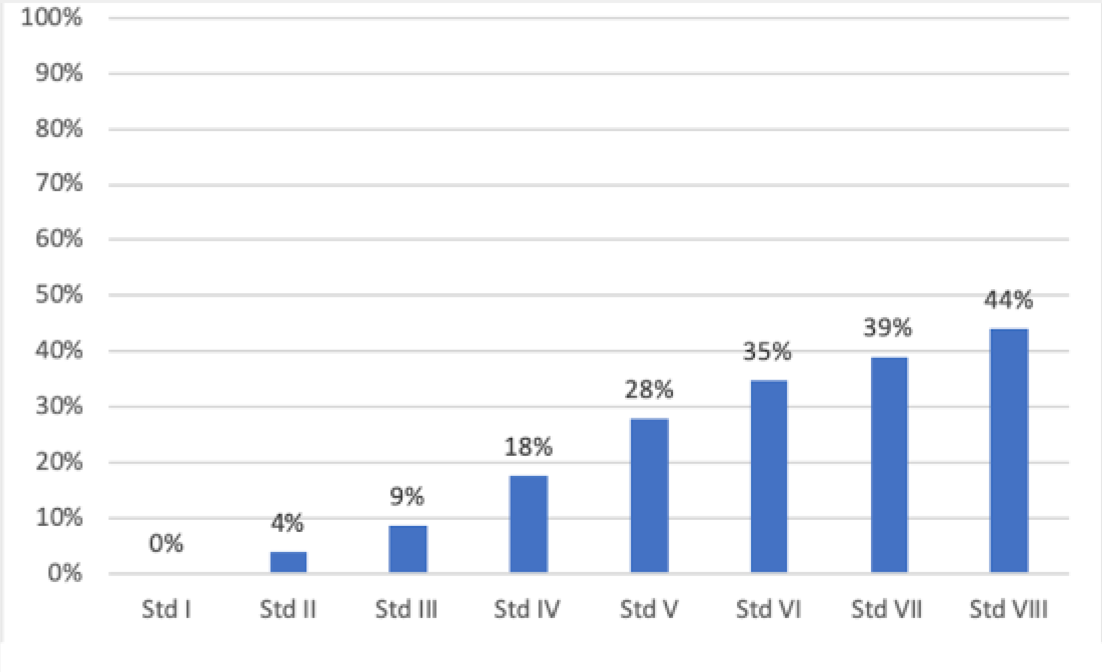
- Contemporaneous Cross Section learning profiles (CCS)
- Adult Retrospective (AR) learning profiles
- True Panel (TP) learning profiles.

Adult Retrospective learning profiles illustrate the learning achieved and retained into adulthood by examining a cross-section of adults who completed differing levels of schooling. While AR learning profiles may be useful to understand learning losses in the future, the data necessary for them is not yet available for those affected by pandemic-related learning losses, as they have not yet reached adulthood. Therefore, CCS and TP profiles offer the most potential for understanding current Covid-19-related patterns of learning losses.

CCS learning profiles demonstrate acquired learning for a cross-section of students based on assessment results over time, which allows for the analysis of learning trajectories. In contrast, TP learning panels use longitudinal data of the same cadre of students over their educational careers and provide insight into cohort learning and learning retention (↑Kaffenberger, 2019).

The figure below is a **contemporaneous cross-section (CCS) learning profile** from the *2018 Annual Status of Education (ASER) report in India*. It draws on data for a cross-section of children ranging in age and grade. It shows the percentage of children at each grade level who can solve division problems. Since this is a skill taught in Standard III / IV, this data provides an understanding of whether children at that grade level, and those who are older, have learned and retained that skill. By repeatedly assessing this same skill at the same level of difficulty, a CCS such as this could demonstrate how learning is changing over time.

Figure 5a. *Learning profile from ASER surveys: Percent of children in each grade who can correctly solve numerical division problems (a Standard III/IV skill).* Source: ↑ASER Centre (2018) as cited in ↑Kaffenberger (2019, p.4)



Examples of CCSs include (as referenced in ↑Kaffenberger, 2019):

- Learning Equity Requires More than Equality: Learning Goals and Achievement Gaps between the Rich and the Poor in Five Developing Countries (↑Akmal & Pritchett, 2019)
- Annual Status of Education Report (rural) 2018 (↑ASER Centre, 2018)

Examples of TP learning panels include (as referenced in ↑Kaffenberger, 2019):

- Indonesia got schooled: 15 years of rising enrolment and flat learning profiles (↑Beatty et al., 2018)

- Pakistan — Learning and Educational Achievements in Punjab Schools (LEAPS): insights to inform the education policy debate (↑Andrabi et al., 2008)

The measurement approaches described above are not tech-based and also use data from non-tech-enabled approaches (e.g., traditional paper-based learning assessments). However, in part due to pandemic-related EdTech adaptations, some of these tools have recently incorporated digitally-enabled elements like EdTech synchronous and asynchronous assessments (↑T4 Education & EdTech Hub, 2022). These adaptations include the digitisation of some elements of PISA, the SAT exam, PIRLS, and TIMSS (↑AlSheikhTheeb et al., 2022b).

Importantly, however, there are ethical considerations that complicate the use and reliability of digitally based assessments. Regarding ethics, there are concerns about student privacy and data security in digital assessment processes (↑Ironsi, 2021; ↑Luna-Bazaldua et al., 2020; ↑SURF, 2020). It is essential to consider these risks carefully when strategising digital assessment approaches. In addition, tech-based assessments are not feasible in all contexts and require careful consideration before they are developed or implemented, including analysis of the potential respondents' levels of digital literacy (↑AlSheikhTheeb et al., 2022b).

2.2 Tech-enabled tools

Tech-enabled tools offer a promising avenue for measuring learning losses as education systems embrace digital approaches in response to Covid-19 disruptions. However, there are currently limited tech-enabled tools for measuring learning losses, as most governments, schools, and research institutions rely on the approaches presented in Section 1. Some of the most promising and impactful approaches to measuring learning losses using technology are presented below.

Computer-adaptive testing

Computer-adaptive testing is mostly used via computers or laptops. It is based on facilitating tests that capture data from students to match their estimated ability or knowledge levels. These tests use adaptive technologies that adjust to student aptitude or proficiency. For example, if a test taker answers a question correctly, an adaptive test will then make the following question more challenging; conversely, if the question is answered incorrectly, the next question will be easier.

This approach is also used in some intelligent tutoring systems, like ALEKS.[4] This tool uses assessment data to inform tutoring and academic support for students based on their needs. Notably, in a US-based study, the ALEKS tutoring system improved high school students' algebra performance by 38.3% (↑Adam et al., 2021). Importantly, these tests are also often used to accurately measure ability and knowledge levels based on a standardised scale (↑Linacre, 2000).

Some foundational benefits and cautions related to these kinds of approaches are presented in Figure 6 below.

Figure 6. *Advantages and disadvantages of computer-adaptive tests*

Advantages	Disadvantages
Time-saving for test takers, which can improve the quality of data collected and reduce the cost of student seat-time for assessment (↑Weiss & Kingsbury, 1984). Significant potential for students with SEND as these tests can detect patterns and adjust to directly evaluate special needs and disabilities (↑Stone & Davey, 2011).	Significant costs related to the development of computer-adaptive testing as a large dataset of questions and computer-based algorithms are often necessary for robust results (↑Weiss, 2004). Using computers to assess educational levels might influence the quality of the data collected, as different levels of digital literacy could impact students' abilities to enter desired answers (↑Stone & Davey, 2011).

Tech-supported comparative judgement

Tech-supported comparative judgement uses technology to create measurement scales that can be compared and used to illustrate the relative quality of students' educational levels. This approach is based on enabling decision-makers to compare pieces of work to evaluate educational quality and progress. This approach can be used to measure learning losses by

1. Comparing results of learning assessments and presenting broader distributions of progress and achievement.
2. Standardising students' results by presenting how they compare with other students, including at a national level (↑Pollitt, 2012).

Organisations like No More Marking[5] in the United Kingdom have been developing comparative judgement tools using software that enables teachers or governments to compare students' learning losses, achievement, and overall assessment results. The main advantages and disadvantages of such tools for education are presented in Figure 7 below.

[4] See https://www.aleks.com/about_aleks Retrieved 8 December 2022
[5] See https://www.nomoremarking.com/ Retrieved 8 December 2022

Figure 7. *Advantages and disadvantages of tech-supported comparative judgement tools*

Advantages	Disadvantages
Comparative judgement can be used with open-ended tasks and questions, which can be well suited for learning assessment in certain contexts (↑Lesterhuis et al., 2017).	To score performance assessment the use of 'rubrics' is often needed. They consist of a series of criteria or categories that can be used to measure competence or progress. Problems with validity often emerge, as it can be difficult to formulate all relevant criteria before analysing or exploring preliminary results (↑Lesterhuis et al., 2017; ↑Sadler, 2009).

Importantly, these tech-supported approaches for measuring learning losses tend to be based on using standardised assessment and learner profiles, with recent emerging practices based on using technology to digitalise such approaches. These approaches have been developed and implemented mostly in high-income countries. Choosing a relevant approach for a given educational need, question, or challenge often depends on objectives (e.g., providing understandings of learning losses at regional, national, or international levels on a given topic, etc.).

Contextualising these tech-supported approaches for the LAC region requires a careful analysis of and inquiry about existing initiatives and how alternative tools can be adapted. More detailed guidance on how an analysis of contextual relevance can be undertaken is outlined in Annex 2.

3. Mitigating Covid-19-related learning losses

There are a number of methods emerging from around the world for mitigating Covid-19-related learning losses. UNICEF Mexico's implementation of the Learning Passport initiative offers a robust example of a data-driven EdTech approach to address learning losses at a national level.

Case Study: The Learning Passport in Mexico

The Learning Passport in Mexico exemplifies the potential of using data on learning losses to improve an EdTech intervention in the LAC region. It also illustrates how data on learning losses could be used in practice. Initially launched by UNICEF and Microsoft to support children who have been displaced, the Learning Passport[6] is a global programme that has been adapted in response to the Covid-19 pandemic to ensure continuity of learning during pandemic-related school closures. In the LAC region, Honduras, Mexico, and Costa Rica have officially launched the Learning Passport, while plans are in place for roll-out in Brazil and Jamaica in 2022/23.

In Mexico, the Learning Passport is supported by Microsoft, Cinvestav[7] and the Ministry of Education. It is presented as a national initiative that intends to facilitate free remedial courses to mitigate learning losses experienced by upper-secondary students during the Covid-19 pandemic. The Learning Passport in Mexico is based on a platform where children and teachers can access online modules and videos that are facilitated together with questionnaires, interactive features, and certificates of completion. During the first phase of the programme, from October 2021 to January 2022, 24,660 students and 1,397 teachers used the platform. The second phase of the programme, from February 2022 to June 2022, supported 35,552 students and 2,249 teachers, with 34% of all the students completing the courses that were initiated.

In Mexico, the Learning Passport is presented as a key example of a programme that has used measurements of learning losses at a system level to inform the implementation of a national EdTech programme. As soon as schools reopened in Mexico, the Ministry of Education launched a

[6] See https://www.learningpassport.org/about-learning-passport Retrieved 8 December 2022
[7] Cinvestav is the 'Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional' (In English: *Center for Research and Advanced Studies of the National Polytechnic Institute*)— https://www.cinvestav.mx/ Retrieved 8 December 2022

standardised test to capture and evaluate learning losses at a national level. The Learning Passport team then used this data to identify the schools most affected by the pandemic and subsequent learning losses (i.e., schools with the most students with low scores in numeracy, literacy, and science-related topics). The Learning Passport programme then invited teachers from these schools to customise the modules to best support their students. This included considering individual levels of learning losses, for instance, by choosing the difficulty levels of the courses.

Beyond approaches that are currently in action, there is also a range of guidance on how to mitigate learning losses by helping students recover knowledge and skills that have diminished in the time away from the classroom — to realign with the desired level of academic performance eventually. Notably, teaching and learning practice-based guidance stresses the importance of the following approaches, each of which has the potential to incorporate EdTech:

- Personalised learning
- Remedial education
- Accelerated learning
- Teaching at the right level (TaRL)

3.1 Personalised digital learning and LAC-specific EdTech tools

Personalised digital learning aims to use EdTech approaches to adapt learning to individual needs (↑UNICEF, 2022). A meta-analysis conducted by ↑Major et al., 2021 revealed that personalised digital learning approaches in low- and middle-income countries led to significantly greater learning outcomes compared to interventions that did not adapt or adjust to learner levels. In addition, ↑Jordan & Myers (2022) have compared the relative efficacy of different types of EdTech interventions for girls and illustrated that personalised digital learning has positive effects on learning outcomes for girls. The tools listed in Table 1 below are examples of personalised digital learning approaches. For example, the platform IXL[8] uses continuous diagnostics and data collection to inform instruction, highlight student needs, and provide individualised support for improved learning outcomes and

[8] See https://www.ixl.com/analytics Retrieved 8 December 2022

teaching practice. Importantly, however, personalised digital learning often requires the use of a device, which can lead to significant software costs (↑UNICEF, 2022).

Personalised digital learning can be used to mitigate learning losses by facilitating learning opportunities that define and target individual learning needs and gaps. Personalised digital learning can also support students in school by complementing in-school learning and reducing teachers' workloads. As such, personalised digital learning is often presented as having significant potential for remediating learning gaps in the post-pandemic context (↑UNICEF, 2022).

UNICEF conducted a study based on selecting and analysing 40 personalised learning products in multiple LMICs across different regions and found that China, India, and Brazil have the most active personalised learning markets. The report also illustrated that 35 of the 40 products had been used for supplemental learning, compared to core learning (↑UNICEF, 2022). This, again, points to the potential and relevance of personalised digital learning to mitigate learning losses in the LAC region.

Notably, several personalised EdTech learning tools are contextually relevant to the LAC region. Some of these tools are included in Table 1 below.

Table 1. *Examples of personalised digital learning approaches*

Tool Name	Information
Tempo de Aprender[9]	**Country(ies):** Brazil **Education Level(s):** Primary, secondary **Devices Used:** Computer, smartphone **Description:** Tempo de Aprender is a comprehensive literacy programme whose purpose is to improve the quality of literacy in all public schools in Brazil. The programme aims to improve the pedagogical and managerial training for teachers and managers; make materials and resources based on scientific evidence available to students, teachers, and educational managers; improve monitoring of student learning through individualised attention; improve the profile of literacy teachers and managers.
IXL Personalized Learning[10]	**Country(ies):** Global, and throughout Latin America (including Brazil, Spain, France) **Education Level(s)**: Pre-primary, primary **Devices Used:** Computer, smartphone **Description:** The IXL platform is a global personalised digital learning space that covers K–12 curricula and offers learning material for students based on age, subject, and topic. This tool also provides educators with learning analytics and recommendations to support teaching and learning.
Wumbox[11]	**Country(ies):** Latin America, based in Argentina **Education Level(s)**: Pre-primary, primary **Devices Used:** Computer, smartphone **Description:** An adaptive learning platform that provides teachers, education professionals and students educational resources. It compiles interactive, story-driven resources for teacher use. It measures student interactions and adapts to student needs and includes a sandbox that enables users to create educational content.

[9] http://alfabetizacao.mec.gov.br/tempo-de-aprender Retrieved 8 December 2022
[10] https://www.ixl.com/ Retrieved 8 December 2022
[11] https://www.wumbox.com/ Retrieved 8 December 2022

Blended[12]	**Country(ies):** Brazil and throughout Latin America **Education Level(s):** NA **Devices Used:** Smartphone **Description:** Blended is an app-based communication platform for teachers, students, and parents / caregivers aimed at promoting parental involvement in their children's education and sharing student information with teachers and parents. It also aims to improve administrative and school management strategies by proposing communication, attendance, grading, and reporting solutions.
Talk2U[13]	**Country(ies):** Argentina and Brazil, Ukraine, South Africa **Education Level(s)**: Secondary **Devices Used:** Computer, smartphone **Description:** An artificial intelligence chatbot that engages adolescents in conversations to impart strategies for child online safety, as well as training to raise awareness on different types of online abuse
Afinidata[14]	**Country(ies):** Global, based in Guatemala **Education Level(s)**: Pre-primary **Devices Used:** Computer, smartphone **Description:** An artificial intelligence chatbot that helps parents create educational activities for their children, and provides access to quality early childhood education resources directly into messaging apps they already use and without requiring further downloads. Afinidata connects parents to a virtual assistant similar to Siri that will suggest educational activities to play, sing, talk, and / or engage with their children in their household.

[12] https://blended.com.ar/ Retrieved 8 December 2022
[13] https://talk2u.co/ Retrieved 8 December 2022
[14] https://afinidata.com/ Retrieved 8 December 2022

Sistema Audioclase[15]	**Country(ies):** Colombia **Education Level(s):** Secondary **Devices Used**: Smartphone, tablet, radio, basic mobile phone **Description:** This platform shares educational audio and media content with students through multiple modalities. Teachers can create lesson plans using pre-developed content, and students can access interactive educational materials and tools. Audioclase tracks students' progress, establishes reward systems, and analyses / assesses students' learning.
Plataforma A+[16]	**Country(ies):** Brazil **Education Level(s):** NA **Devices Used**: Computer **Description**: Plataforma A+ is a Brazilian EdTech tool for managing in-classroom learning and school enrollment processes.
IQ.EDU.DO[17]	**Country(ies)**: Dominican Republic **Education Level(s)**: Primary, secondary **Devices Used:** Computer, smartphone **Description**: Online portal with educational materials (educational games and activities, parent portals, and virtual meeting spaces for teachers and students). It is aimed at delivering national curriculum standards and preparing students for examinations.

[15] https://www.sistema-audioclase.com/ Retrieved 8 December 2022
[16] https://www.plataformaamais.com.br/ Retrieved 8 December 2022
[17] http://iq.edu.do/ Retrieved 8 December 2022

Geekie[18]	**Country(ies):** Brazil **Education Level(s):** Secondary **Devices Used:** Computer, smartphone **Description**: Geekie is a platform that provides personalised educational content using adaptive learning technology, delivering Brazil's high-school syllabus with the aim of equipping students for the national 'ENEM exams' (national exams) via digital lessons incorporating text, images, videos, and exercises. The tool also evaluates student performance and provides real-time data to teachers and schools.
Colombia aprende[19]	**Country(ies)**: Colombia **Education Level(s):** Pre-primary, primary, secondary **Devices Used**: Computer **Description**: An educational website that offers the national and international community a support tool for educational improvement.
Conta pra Mim[20]	**Country(ies)**: Brazil **Education Level(s)**: Pre-primary, primary **Devices Used**: Computer, smartphone **Description**: Conta pra mim is a platform launched by the Brazilian Ministry of Education to promote family activities to improve literacy. The platform aims to provide tools that promote learning of spoken language, reading, and writing at home and improve parental engagement and involvement in their children's education.
Árvore[21]	**Country(ies):** Brazil **Education Level(s)**: Primary, secondary **Devices Used:** Computer, smartphone, tablet **Description:** Árvore Educação is a digital eBook lending platform aimed primarily at primary and high school students from public and private education networks.

[18] https://www.geekie.com.br/ Retrieved 8 December 2022
[19] https://colombiaaprende.edu.co/ Retrieved 8 December 2022
[20] http://alfabetizacao.mec.gov.br/contapramim Retrieved 8 December 2022
[21] https://www.arvore.com.br/sobre Retrieved 8 December 2022

Mundo de Libros[22]	**Country(ies):** Mexico **Education Level(s)**: Primary **Devices Used**: Computer, tablet **Description**: Mundo de libros is a web-based platform that matches students with grade-level-appropriate Spanish reading materials that align with their abilities and interests. The programme seeks to promote the development of reading skills among children from Grades 1–3 through free access to children's books and the tech platform.
Oppia[23]	**Country(ies)**: Brazil and global **Education Level(s)**: Secondary **Devices Used**: Smartphone **Description**: Oppia is a multilingual and personalised e-learning platform providing no-cost education to under-resourced and underprivileged learners around the world.

[22] http://www.mundodelibros.mx/ Retrieved 8 December 2022
[23] https://www.oppia.org/ Retrieved 8 December 2022

The tools listed in Table 1 and others like them can be used to implement personalised learning as an approach for tackling learning losses. For more in-depth information about these tools and other EdTech tools that are relevant to the LAC context, see the report on *Mapping and Analysing EdTech Programmes in Latin America and the Caribbean* (↑Myers et al., 2022).

3.2 Remedial education and computer-based learning

Remedial education programmes typically refer to "educational interventions aimed at addressing learning needs of a targeted group of children who are lagging behind academically or not mastering specific competencies" (↑Schwartz, 2012, p. 6). Remedial programmes can include interventions such as remedial education during school hours (curricular) or after school hours (co-curricular and extra-curricular), non-formal equivalency programmes, or focused instruction on specific topics like maths or reading (↑Upadhyay et al., 2020).

There is also ample evidence that remedial programming can significantly bolster learning outcomes, especially for students whose education has been interrupted, for example, by pandemic-related school closures (↑Schwartz, 2012). Importantly, these programmes tend to assume that students have had at least some introduction to the subjects covered and therefore serve to revisit or reinforce previous learning.

A range of digital tools can be used to support EdTech remedial education initiatives. One example comes from El Salvador, where a computer-assisted intervention called the CAL-Impact Program by Consciente[24] provided students with two additional 90-minute lessons each week, nearly doubling their maths instruction. This programme allowed students to access additional instruction on school computers and progress through basic maths concepts at their own pace. As a result, students who could complement their classroom-based learning with additional computer-based instruction significantly outperformed their peers who did not (↑Buchel et al., 2019). What is more, computer-assisted instruction was also found to fill gaps in instruction or teacher practice and support policy goals to expand school days (↑Buchel et al., 2019).

[24] An initiative aimed at promoting equitable access to education and improving education quality in El Salvador. https://www.consciente.ch/en/homepage/ Retrieved 8 December 2022

3.3 Accelerated learning and the potential for using EdTech

Accelerated learning is another promising approach to mitigating learning losses that is often related to, or contrasted with, remedial education programming. While remedial education seeks to help students catch up on missed learning, accelerated education speeds up learning, whether education was missed or not. Accelerated programming aims to provide established formal curricula at a faster pace and with just-in-time support for students (↑Damani, 2020; ↑New Classrooms, 2020).

There are several approaches education systems can take to design and implement accelerated learning initiatives. These approaches can include complementary education programming, more rigorous or intensive pedagogical approaches and lesson planning, and extending school days / hours (↑Damani, 2020). In terms of Covid-19-specific acceleration strategies, evidence suggests that tailored approaches to accelerated learning offer the most potential for meaningfully supporting learning recovery or mitigating learning losses. In contrast to traditional approaches to accelerated learning, tailored acceleration programmes strive to leverage data from formative assessments to provide more customised learning (↑New Classrooms, 2020).

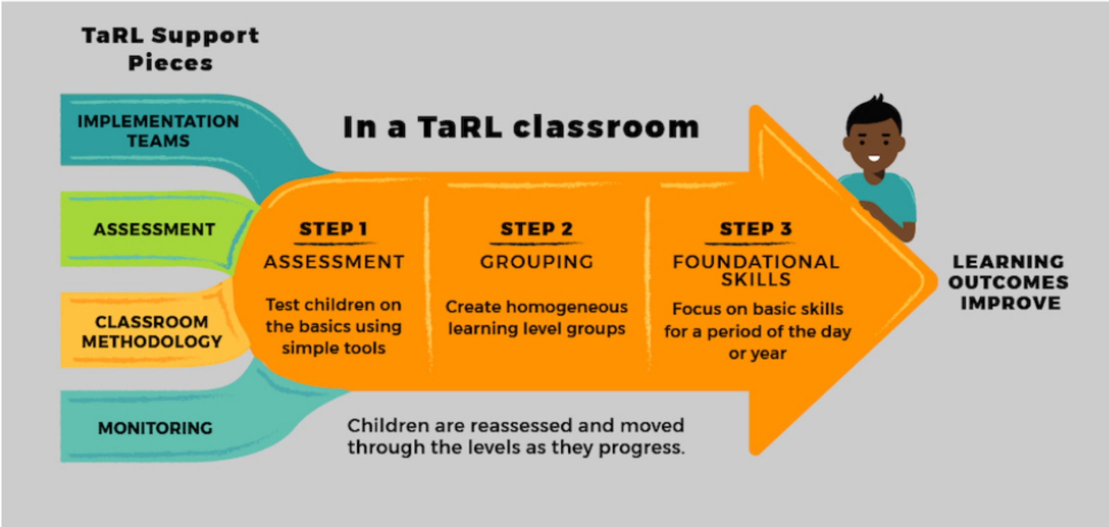
3.4 Teaching at the right level and tech-based adaptations

Teaching at the Right Level (TaRL) is a model that was developed by the Indian NGO Pratham[25] and intends to improve students' numeracy and literacy learning outcomes. As illustrated in Figure 8, key components of this approach include grouping students based on their learning levels (rather than age or grade level), using a range of pedagogical techniques, and monitoring student progress over time.

This model has been subjected to a series of rigorous evaluations by external research institutes and independent researchers and has been showing promising results in raising learning levels (↑Teaching at the Right Level, 2018). TaRL has been adopted in several countries, mainly in South Asia and sub-Saharan Africa (↑Global Education Monitoring Report Team & Pratham Resource Centre (India), 2020).

[25] See http://www.pratham.org/ Retrieved 8 December 2022

Figure 8: *Overview of the TaRL model as presented by the 'Teaching at the Right Level' NGO*. Source: ↑Teaching at the Right Level Africa, no date)



While the TaRL model has been implemented globally, it appears to have been particularly effective in the LAC region. A remedial education programme in Mexico called México Enseñar al Nivel Adecuado / Medición Independiente de Aprendizajes (MIA) has proven to be successful using TarL to improve the development of basic maths, language, and transferable skills (i.e., self-care, civics, and social-emotional learning) (↑International Bank for Reconstruction and Development & World Bank., 2022). Importantly, this intervention demonstrates the potential for implementing the TaRL model and the relevance of preliminary assessments in informing remedial education programming in the LAC region.

A study in Botswana has built on the TaRL model to use SMS text messages and direct phone calls to substitute learning during Covid-19-related school closures. The study has pointed to results illustrating that low-tech SMS text messages and phone calls can be used as part of TaRL interventions and were evaluated as having significant and cost-effective effects on household engagement in education and children's learning (↑Angrist et al., 2021).

TaRL has also been implemented using computer-assisted interventions by Pratham in India. In this intervention, students accessed educational materials which adapted to their performance level via extra instruction provided on a computer twice a week (↑Schwartz, 2012). Students shared computers to play games that worked on mathematics skills and responded to the students' ability to solve equations. This intervention equally increased maths scores in both the first and second year of implementation for all students (↑Banerjee et al., 2006; ↑Schwartz, 2012). Notably, the increased performance was maintained by participating students one year after the programme was implemented, demonstrating the long-term potential EdTech TaRL programming can have on learning trajectories.

4. Recommendations for decision-makers to mitigate learning losses in the LAC region

Along with the approaches and tools outlined above, current guidance also suggests several higher-level approaches for mitigating learning losses that have relevance for the various contexts in the LAC region. First, guidance often emphasises the importance of increasing and re-allocating funding to support efforts to mitigate learning losses in education systems. This includes providing direct funding and resources to high-need schools and providing remote learning via EdTech (↑Donnelly & Patrinos, 2020). Importantly, this kind of policy re-prioritisation for EdTech funding has been shown to support more equitable, accessible, and sustainable education systems (↑Zubairi et al., 2021). Second, guidance suggests the importance of policy adaptations that emphasise the use of pedagogical approaches that have been proven to be effective. These pedagogical approaches, including those discussed above, prioritise more personalised approaches to teaching and learning (↑Angrist et al., 2021). An EdTech Hub course that includes case studies[26] offers further information about how EdTech can be used to support structured pedagogy in particular. In addition, descriptions of the alignment between EdTech and structured pedagogy's core components are listed in Annex 3.

Guidance on effective and sustainable approaches to mitigating learning losses also emphasises the importance of supporting robust teacher professional development (TPD) at the policy level. Teacher practice significantly impacts the use and effectiveness of EdTech, making educator support and preparation imperative for the successful implementation of EdTech approaches to mitigate learning losses (↑Upadhyay et al., 2020). For example, while 70% of teachers in Latin America report using EdTech regularly in their classes, looking at a more granular level, we can see that in Brazil, one in five teachers never use ICT for class work (↑OECD, 2020). Understanding these differentiations is critical for ensuring all teachers receive the training and support they need to successfully use EdTech tools to help mitigate learning losses for their students. Policymakers and leaders should prioritise robust, evidence-based, and sustainable TPD when creating strategies to mitigate learning losses, especially when incorporating EdTech tools.

Finally, policy leaders should also prioritise outreach efforts to students, parents, caregivers, and teachers to encourage smooth and robust classroom returns (↑Evans et al., 2021). These actors can benefit from outreach campaigns encouraging returns to school and continued engagement with education

[26] See https://edtechhub.org/tool/structured-pedagogy/#/lessons/h6ZMIIaMAzKycwYIBAzitT0l_IU3uByv Retrieved 8 December 2022

systems and resources. Notably, EdTech has been shown to be an effective way of supporting these kinds of outreach efforts. For instance, mobile-based communication efforts have increased student and teacher attendance and caregiver engagement in education in low-resource settings (↑Nedungadi et al., 2018; ↑Aurino et al., 2022; ↑Angrist et al., 2020). These examples demonstrate how EdTech can be leveraged in broader education systems to promote returns to school and educational engagement and, by proxy, help mitigate learning losses. Policymakers should carefully consider how EdTech can be used to facilitate and promote returns to school in their contexts.

Education leaders need to be mindful of how they approach measuring, analysing, addressing, and mitigating learning losses. Education stakeholders must consider that the onus for these comparative delays and their correction should not be placed solely on teachers, caregivers, and, most importantly, students. It is the collective responsibility of education leaders and systems to understand and mitigate learning losses incurred throughout the Covid-19 pandemic. If used well, EdTech holds great potential for facilitating the success of those efforts.

Annex 1

Modelling vs measuring learning losses related to Covid-19 school closures

The benefits of using modelling to understand Covid-19 learning losses include:

- Enabling the use of pre-existing data without necessitating new data collection and the inherent resource allocation those efforts entail
- Informing planning for remediation programmes, strategising for mitigation of learning losses, and supporting allocation efforts
- Giving educators, school leaders, policymakers, and caregivers insight into the predicted learning outcomes of school closures / education interruptions
- Highlighting where the greatest needs for support may develop (schools in low-resource settings, among students with limited access to distance learning tools, younger students, etc.)
- Providing insights on learning losses in places where reliable education data (pre- or post-Covid-19 school closures) is unavailable
- Offering insight into the potential of recovery initiatives for learning losses, including programmes and policies

Approaches to modelling learning losses vary as widely as those to measurement and can include simulations of learning profiles (↑Kaffenberger & Pritchett, 2021), predicted learning regressions against projected academic progressions (↑Cummiskey et al., 2020; ↑Cummiskey, 2021), and using pre-Covid-19 evidence on learning losses to anticipate and compare linear and compounded education impacts (↑Angrist et al., 2021). The "pedagogical production function" is a common example of such a model, which simulates how much, on average, a student learns over time (usually one academic year) in a certain grade (↑Belafi, 2020; ↑Kaffenberger, 2019).

Notably, modelling provides predictive or projected estimates of learning losses or the impact of mitigation strategies. While these assessments offer valuable insights into the potential of learning losses, this kind of approach is limited by offering estimates rather than concrete measurements. Relatedly, because modelling relies on predictive assessments, this kind of approach is typically relied on in more academic or theoretical work rather than applied policy or programmatic efforts.

Annex 2

Framework to adapt existing EdTech approaches to measure learning losses to the LAC region

Consulting existing EdTech processes can help facilitate selecting an approach to measuring learning losses that is the best contextual fit. A team intending to measure learning losses in the LAC region could follow the steps presented below:

1. Define intended **objectives**, for example measuring learning losses at regional, national, or international levels, measuring learning losses on a given topic (e.g., numeracy, literacy, etc);
2. **Review** existing EdTech approaches (see Sections 2 and 3), and **identify** an existing approach or approaches that could be used and adapted to reach these objectives;
3. **Adapt** and **contextualise** an existing EdTech approach or approaches for the LAC region, reflecting on the questions presented in the framework and introduced below.

Analysis of context

Existing approach(es)	Adaptation to a LAC region
▪ Where were these approaches to measuring learning losses developed and previously implemented? ▪ What characteristics need to be considered to understand this context, and how were these approaches implemented in practice?[27]	▪ Where are these approaches intended to be used? ▪ What are some of the similarities and differences of this context (i.e., where these approaches were first developed) with the LAC region where these approaches are intended to be used? ▪ What contextual adaptations are needed to implement these approaches in a LAC region?

[27] For example, considering socio-economic indicators, number of schools / regions, experiences of teachers / school administrators conducting assessments / surveys, access to funding for learning assessment, challenges to access for schools / students, local levels of literacy and digital literacy, etc.

ICT infrastructure / use of technology

Existing approach(es)	Adaptation to a LAC region
▪ Was technology used to measure learning losses? ▪ If yes, how? And what ICT infrastructure, devices, or training are needed to use such technology?	▪ Could the same technologies be used in the context where learning losses are to be measured? ▪ Would another technology be more relevant in the context where learning losses are to be measured? Is technology needed at all? Why?

Identification of data needed

Existing approach(es)	Adaptation to a LAC region
▪ What type of data needs to be collected to measure learning losses using these approaches? ▪ How is this data intended to be collected and analysed, and by whom?	▪ Is this data available in a given LAC region? If not, what measures and data collection methods are needed? ▪ What is needed to implement these data collection and analysis methods in a given LAC context (e.g., access to local researchers, capacity-building opportunities for local researchers / teachers, funding, etc)?

Tailoring and adaptation of approaches

Existing approach(es)	Adaptation to a LAC region
▪ Do these approaches include potential for adapting or tailoring their design? ▪ If yes, to what extent and what aspects of these approaches can be modified? Do they provide guidelines for adaptation (i.e., without losing rigour / accuracy in results)?	▪ What aspects of these approaches need to be adapted to be relevant in a given context? ▪ How could these approaches be adapted and tailored to be relevant in a LAC region? What is needed to implement such changes?

Budget

Existing approach(es)	Adaptation to a LAC region
▪ What was the overall budget to implement these approaches to measure learning losses? ▪ What is the overall cost breakdown? ▪ What was the overall timeline to implement these approaches? Furthermore, what were the tasks that took the most time and / or the biggest part of the budget?	▪ What would be the overall budget to implement these approaches in a LAC region? ▪ How could the cost breakdown be adapted to the LAC region where the approaches are to be implemented? ▪ How could the budget be optimised by considering cost-effectiveness?

Integration with approaches to mitigate learning losses

Existing approach(es)	Adaptation to a LAC region
▪ Were these approaches integrated with plans or approaches to mitigate learning losses? ▪ If yes, what do these plans look like? In particular, what approaches to mitigate learning losses were chosen in a given context, and why?	▪ Could these plans be adapted or used in a LAC region? ▪ If yes, why? Are there other approaches to mitigate learning losses that could be more relevant for a LAC context?

Policy implications

Existing approach(es)	Adaptation to a LAC region
▪ Were these approaches used to impact policy? ▪ If yes, how? What were the steps to achieve policy change? ▪ Who are the stakeholders that were involved in achieving policy change? And why?	▪ How do these approaches need to be adapted to achieve policy impact in a LAC region? ▪ Who are the stakeholders that would need to be involved? And Why?

Annex 3

Descriptions of the alignment between EdTech and structured pedagogy's core components and corresponding resources

1. Teacher professional development (TPD)

Description: EdTech approaches can and are used to support technical and pedagogical professional development for teachers and educators in both pre-service and in-service environments. Importantly, tech-enabled TPD has been shown to support robust teacher training and help:

- Encourage teachers to focus on student learning;
- Share effective practices using modelling;
- Acknowledge and build on teachers' existing knowledge, views, and experiences;
- Encourage focus on developing practical subject pedagogy rather than theoretical general pedagogy;
- Empower teachers to become reflective practitioners and structure teacher education around practice-based cycles of trial and refinement;
- Incorporate peer support among educators;
- Ensure teacher education programmes motivate education practitioners;
- Prioritise school-based teacher education;
- Facilitate regular, ongoing teacher education;
- Provide educators with supportive teaching and learning materials;
- Garner support of TPD from school leaders (↑Allier-Gagneur et al., 2020)

EdTech-enabled TPD may cover how technology is used in teaching and learning activities, and also facilitate teacher continuous professional development itself. This kind of training can therefore support teachers' ability to integrate technology into their pedagogical practices and their capacity to use technology in the classroom more generally.

Resources: There is a growing body of evidence and guidance on how EdTech can support and enable impactful TPD and ultimately improve learning outcomes as a result. Some of these resources are listed below as they relate to

TPD as an enabling core component of structured pedagogy.

- Teachers' Skills and Skills Frameworks for Remote and Blended Learning Knowledge Pack (English), World Bank[28]
- Teacher Continuous Professional Development (TCPD), EdTech Hub[29]
- Curated Tools for Teacher Continuous Professional Development, EdTech Hub[30]
- Guidance Note 10 Prioritising effective and appropriate teacher training From the Report: *Education for the most marginalised post-Covid-19: Guidance for governments on the use of digital technologies in education,* ↑Unwin et al. (2020)
- Teacher professional development and coaching in low-income countries: *Overarching considerations for the use of technology, EdTech Hub* (↑Low-income countries: Haßler, 2020n)

2. Teaching and learning materials

Description: Digital learning resources may include open educational resources, which can take the form of any medium (text, image, audio, etc.) and are legally, technologically, and socially free (↑Haßler & Mays, 2014; ↑Koomar & Jull, 2020). Many countries developed or adapted digital learning platforms and tools in response to the need to provide educational continuity during Covid-19 school closures (↑Adam et al., 2020). These resources, in particular, have great potential to support mitigation initiatives to tackle learning losses as the educational pressures of Covid-19 wane. Educators and students have both been acclimatised to these systems and are, therefore, well positioned to continue using them.

Resources: Digital teaching and learning approaches and tools are diverse, and their effectiveness is highly dependent on contextual needs, challenges, and opportunities. Below is a concise list of resources that speak to more generalised national-level considerations that go into developing, adapting, deploying, and maintaining digital education resources.

- OER may be free, but you still need to invest to use them: Part I, World

[28] https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099118004132238882/p1742520615db3006094220dcbb0af52257 Retrieved 9 December 2022
[29] https://edtechhub.org/our-topic-areas/teacher-professional-development/ Retrieved 9 December 2022
[30] https://edtechhub.org/edtech-tools/curated-tools-tcpd/ Retrieved 9 Decemver 2022

Bank, 2021[31]

- Mapping Open Educational Resources Around The World, World Bank, 2012[32]
- *Regional Learning Hub for Eastern and Southern Africa — Part 3: Skills taxonomy* (↑Groeneveld, 2022a); Part 4: Content curation, (↑Groeneveld, 2022b)
- *Rolling Out a National Virtual Learning Environment*, EdTech Hub, 2020 (↑Adam et al., 2020)
- *Deploying an e-learning environment in Zanzibar: Digital content curation, EdTech Hub, 2020* (↑Groeneveld et al., 2020)
- *The use of 'building blocks' to develop digital platforms for education in sub-Saharan Africa*, EdTech Hub, 2021 (↑Adam et al., 2021)

3. Formative assessment

Description: As discussed above, there is growing evidence and understanding about the potential of using EdTech approaches to develop and deliver assessment and examination processes for students. This aligns with structured pedagogy's core components and objectives related to assessing and responding to student learning needs.

Resources: In addition to the resources included in the sections above, the following guidance offers insight into higher-level thinking about approaches to formative assessment and other forms of assessment that can aid effective teaching and learning practices.

- Assessment for improved learning outcomes, UNESCO[33]
- *Guidance on Pre-Assessment for Establishing E-Learning Centres*, EdTech Hub, 2022 (↑AlSheikh Theeb et al., 2022a)
- Resource Pack to Support Remote Learning: Formative Assessment (English), World Bank, UNICEF[34]
- *The effectiveness of tech-supported personalised learning*, (↑Major et al., 2021)

---

[31] https://blogs.worldbank.org/education/oer-may-be-free-you-still-need-invest-use-them-part-i Retrieved 9 December 2022

[32] https://blogs.worldbank.org/edutech/mapping-oer Retrieved 9 December 2022

[33] https://en.unesco.org/themes/learning-assessments Retrieved 9 December 2022

[34] https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099846303292215364/p174252093e0500400a42800c0560e18742 Retrieved December 2022

4. Primary caregiver engagement

Description: Caregivers and parents have always been central stakeholders in the education progression of students — guiding if and how young people can engage with education systems (↑Brossard et al., 2020; ↑Muigai, 2018). This role was amplified during Covid-19-related school closures and they were required to step into supporting students with at-home or distanced learning (↑Brossard et al., 2020; ↑Mishra et al., 2020). This influence is equally as important to the potential of mitigation strategies to tackle learning losses. Importantly, EdTech approaches have demonstrated good potential for engaging caregivers to improve learning outcomes (↑Aurino et al., 2022). Engaging parents, via tech-supported avenues or otherwise, is also key to enabling student access to and engagement with EdTech tools and resources — which is an especially meaningful component of education access for marginalised learners, including girls and students with SEND (↑Aurino et al., 2022; ↑Dias et al., 2016; ↑Tembey et al., 2021).

Resources: EdTech approaches and tools offer great potential for 1) engaging parents and caregivers in education systems; 2) facilitating their role in education processes; and 3) supporting the uptake and effectiveness of education initiatives including EdTech and mitigation efforts to tackle learning losses. The resources below describe some of the ways caregivers can be involved in EdTech approaches and improving learning outcomes.

- Parental Engagement in Children's Learning: Insights for remote learning response during Covid-19 (↑Brossard et al., 2020)
- Nudges to Improve Learning and Gender Parity: Preliminary findings on supporting parent-child educational engagement during Covid-19 using mobile phones, EdTech Hub (↑Aurino et al., 2022)
- Keep Kenya Learning: Helping Caregivers Support Learning at Home Sprint 1., EdTech Hub, 2021 (↑Mbatha et al., 2021)
- Raising Readers: Using technology to improve parent and caregiver engagement in literacy learning in Kenya, EdTech Hub, 2021 (↑EdTech Hub, 2021)

Bibliography

This bibliography is available digitally in our evidence library at https://docs.edtechhub.org/lib/FUBDMTM8

ASER Centre. (2018). *Annual Status of Education Report (rural) 2018*. Assessment Survey Evaluation Research (India). https://learningportal.iiep.unesco.org/en/library/annual-status-of-education-report-rural-2018. (details)

Adam, T., Chuang, R., & Haßler, B. (2021). *Structured Pedagogy and EdTech*. EdTech Hub. https://doi.org/10.5281/zenodo.4460344. Available from https://docs.edtechhub.org/lib/2QM825CH. (details)

Adam, T., El-Serafy, Y., Podea, M., & Haßler, B. (2021). *The use of "building blocks" to develop digital platforms for education in sub-Saharan Africa*. EdTech Hub. https://doi.org/10.53832/edtechhub.0049. Available from https://docs.google.com/presentation/d/1kbsum_aPxdwhuGNzAEzHnr_Wx_psKAUVldt1M2Wz34I/edit#slide=id.gdedd2e55e3_3_285. Available under Creative Commons Attribution 4.0 International. (details)

Adam, T., McBurnie, C., & Haßler, B. (2020). *Rolling Out a National Virtual Learning Environment* (EdTech Hub Helpdesk Request No. 22). EdTech Hub. https://doi.org/10.53832/edtechhub.0010. Available from https://docs.edtechhub.org/lib/KWJRW62J. (details)

Akmal, M., & Pritchett, L. (2019). *Learning Equity Requires More than Equality: Learning Goals and Achievement Gaps between the Rich and the Poor in Five Developing Countries – Working Paper 504*. RISE Programme Working Paper. https://www.cgdev.org/publication/learning-equity-requires-more-equality-learning-goals-and-achievement-gaps. (details)

AlSheikh Theeb, T., McGinty, S., & Obaid, R. (2022a). *Guidance on Pre-Assessment for Establishing E-Learning Centres* (Helpdesk Response No. 38). EdTech Hub. https://doi.org/10.53832/edtechhub.0084. Available from https://docs.edtechhub.org/lib/DPWSAA9Z. Available under Creative Commons Attribution 4.0 International. (details)

AlSheikhTheeb, T., Sahin, A., Abdelrahman, S., & Chuang, R. (2022b). *Online Examinations in Emergency Contexts: Can Proctoring and Other Technologies Be Feasible Alternatives for Facilitating Inclusive School Exams for All in Emergency Contexts?* EdTech Hub. (details)

Allier-Gagneur, Z., McBurnie, C., Chuang, R., & Haßler, B. (2020). *Characteristics of effective teacher education in low- and middle-income countries: What are they and what role can EdTech play?* EdTech Hub. (details)

Andrabi, T., Daniels, B., & Das, J. (2020). *Human Capital Accumulation and Disasters: Evidence from the Pakistan Earthquake of 2005*. RISE Programme. https://riseprogramme.org/publications/human-capital-accumulation-and-disasters-evidence-pakistan-earthquake-2005. (details)

Andrabi, T., Das, J., Khwaja, A. I., Vishwanath, T., & Zajonc, T. (2008). *Pakistan - Learning and Educational Achievements in Punjab Schools (LEAPS) : insights to inform the education policy debate* [Text/HTML]. The World Bank. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/997531468090281061/Pakistan-Learning-and-Educational-Achievements-in-Punjab-Schools-LEAPS-insights-to-inform-the-education-policy-debate. (details)

Angrist, N., Bergman, P., Brewster, C., & Matsheng, M. (2020). Stemming Learning Loss During the Pandemic: A Rapid Randomized Trial of a Low-Tech Intervention in Botswana. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3663098. Available from https://www.ssrn.com/abstract=3663098. (details)

Angrist, N., de Barros, A., Bhula, R., Chakera, S., Cummiskey, C., DeStefano, J., Floretta, J., Kaffenberger, M., Piper, B., & Stern, J. (2021). Building back better to avert a learning catastrophe: Estimating learning loss from COVID-19 school shutdowns in Africa and facilitating short-term and long-term learning recovery. *International Journal of Educational Development*, *84*, 102397. https://doi.org/10.1016/j.ijedudev.2021.102397. Available from https://www.sciencedirect.com/science/article/pii/S073805932100050X. (details)

Aurino, E., Tsinigo, E., & Wolf, S. (2022). *Nudges to Improve Learning and Gender Parity: Preliminary findings on supporting parent-child educational engagement during Covid-19 using mobile phones* [Technical Report]. EdTech Hub. https://doi.org/10.53832/edtechhub.0083. Available from https://docs.edtechhub.org/lib/PWU63GQS. Available under Creative Commons Attribution 4.0 International. (details)

Azevedo, J. P., Rogers, H., Ahlgren, E., Akmal, M., Cloutier, M.-H., Ding, E., Raza, A., Ning Wong, Y., Montoya, S., Chakroun, B., Chang, G.-C., Guerriero, S., Dewan, P., Mizunoya, S., Reuge, N., Russell, K., Yao, H., Bronwin, R., Cohen-Mitchell, J., … Boggild-Jones, I. (2022). *The State of Global Learning*

Poverty: 2022 Update. The World Bank. https://thedocs.worldbank.org/en/doc/e52f55322528903b27f1b7e61238e416-0200022022/original/Learning-poverty-report-2022-06-21-final-V7-0-conferenceEdition.pdf. (details)

Banerjee, A. V., Cole, S., Duflo, E., & Linden, L. (2006). Remedying education: Evidence from two randomized experiments in India. *Quarterly Journal of Economics*, *122*(3), 1235–1264. https://doi.org/10.1162/qjec.122.3.1235. Available from https://economics.mit.edu/files/804. (details)

Beatty, A., Berkhout, E., Bima, L., Coen, T., Pradhan, M., & Suryadarma, D. (2018). *Indonesia got schooled: 15 years of rising enrolment and flat learning profiles*. Research on Improving Systems of Education. https://learningportal.iiep.unesco.org/en/library/indonesia-got-schooled-15-years-of-rising-enrolment-and-flat-learning-profiles. (details)

Belafi, C. (2020). Modelling the learning process #1: What is a pedagogical production function—and how does it help us understand student learning? *RISE Programme*. https://riseprogramme.org/blog/modelling-the-learning-process-1. (details)

Brossard, M., Cardoso, M., Kamei, A., Mishra, S., Mizunoya, S., & Reuge, N. (2020). *Parental Engagement in Children's Learning: Insights for remote learning response during COVID-19* [Innocenti Research Brief]. https://www.unicef-irc.org/publications/1091-parental-engagement-in-childrens-learning.html. (details)

Buchel, K., Jakob, M., Kuhnhanss, C., Steffen, D., & Brunetti, A. (2019). *Expanding School Time and the Value of Computer-Assisted Learning: Evidence from a Randomized Controlled Trial in El Salvador*. 44. https://boris.unibe.ch/142255/1/201904_CALImpact_Evaluation_Report_April19.pdf. (details)

Buffie, E., Adam, C., Kpodar, K., & Zanna, L.-F. (2022). Loss-of-Learning and the Post-Covid Recovery in Low-Income Countries. *IMF Working Papers*, *2022*(025), 1. https://doi.org/10.5089/9798400200755.001. Available from https://elibrary.imf.org/openurl?genre=journal&issn=1018-5941&volume=2022&issue=025. (details)

Christodoulou, D. (2020, October 30). *Baseline Secondary Writing: have Year 7 pupils gone backwards?* Medium. https://blog.nomoremarking.com/baseline-secondary-writing-have-year-7-pupils-gone-backwards-5497ac10b894. (details)

Cresswell, J. (2016). *System-level assessment and educational policy | Unesco IIEP Learning Portal*. Australian Council for Educational Research.

https://learningportal.iiep.unesco.org/en/library/system-level-assessment-and-educational-policy. (details)

Crouch, L., Kaffenberger, M., & Savage, L. (2021). Using learning profiles to inform education priorities: An editors' overview of the Special Issue. *International Journal of Educational Development*, *86*, 102477. https://doi.org/10.1016/j.ijedudev.2021.102477. Available from https://www.sciencedirect.com/science/article/pii/S0738059321001309. (details)

Cummiskey, C. (2020, May 13). *Calculating the Educational Impact of COVID-19 (Part II): Using Data from Successive Grades to Estimate Learning Loss | SharEd*. https://shared.rti.org/content/calculating-educational-impact-covid-19-part-ii-using-data-successive-grades-estimate. (details)

Cummiskey, C. (2021). *Calculating the Educational Impact of COVID-19 (Part III): Where will students be when schools reopen? | SharEd*. RTI. https://shared.rti.org/content/calculating-educational-impact-covid-19-part-iii-where-will-students-be-when-schools-reopen. (details)

Cummiskey, C., Stern, J., DeStefano, J., & Piper, B. (2020, May 27). Calculating the Educational Impact of COVID-19 (Part II): Using Data from Successive Grades to Estimate Learning Loss. *The Education and Development Forum (UKFIET)*. https://www.ukfiet.org/2020/calculating-the-educational-impact-of-covid-19-part-ii-using-data-from-successive-grades-to-estimate-learning-loss/. (details)

Damani, K. (2020). *Accelerated Learning and EdTech: A Rapid Evidence Review*. EdTech Hub. https://doi.org/10.5281/ZENODO.4556941. Available from https://zenodo.org/record/4556941. Available under Creative Commons Attribution 4.0 International, Open Access. (details)

Dias, P., Brito, R., Ribbens, W., Daniela, L., Rubene, Z., Dreier, M., Gemo, M., Gioia, R. D., & Chaudron, S. (2016). The role of parents in the engagement of young children with digital technologies: Exploring tensions between rights of access and protection, from 'Gatekeepers' to 'Scaffolders.' *Global Studies of Childhood*, *6*(4), 414–427. https://doi.org/10.1177/2043610616676024. (details)

Donnelly, R., & Patrinos, H. A. (2020). Is the COVID-19 slide in education real? *World Bank Blogs*. https://blogs.worldbank.org/education/covid-19-slide-education-real. (details)

ECLAC. (2021). *Challenges and opportunities for secondary education in Latin America and the Caribbean during and after the pandemic* [Text]. https://www.cepal.org/en/insights/challenges-and-opportunities-secondary-education-latin-america-and-caribbean-during-and. (details)

EdTech Hub. (2021). *Raising Readers: Using technology to improve parent and caregiver engagement in literacy learning in Kenya* [Technical Report]. EdTech Hub. https://doi.org/10.53832/edtechhub.0057. Available from https://docs.edtechhub.org/lib/47KMRR48. Available under Creative Commons Attribution 4.0 International. (details)

Education Endowment Foundation. (2022). *Best evidence on impact of Covid-19 on pupil attainment*. EEF. https://educationendowmentfoundation.org.uk/guidance-for-teachers/covid-19-resources/best-evidence-on-impact-of-covid-19-on-pupil-attainment. (details)

Engzell, P., Frey, A., & Verhagen, M. D. (2021). Learning loss due to school closures during the COVID-19 pandemic. *Proceedings of the National Academy of Sciences of the United States of America*, *118*(17), e2022376118. https://doi.org/10.1073/pnas.2022376118. (details)

Evans, D., Hares, S., Mendez Acosta, A., & Saintis, C. (2021). It's Been a Year Since Schools Started to Close Due to COVID-19. *Center for Global Development | Ideas to Action*. https://www.cgdev.org/blog/its-been-year-schools-started-close-due-covid-19. (details)

Gabriela Alvarado, M. (2022, March 7). *Time for a safe back to school in Latin America and the Caribbean*. Save the Children International. https://www.savethechildren.net/blog/time-safe-back-school-latin-america-and-caribbean. (details)

Global Education Monitoring Report Team & Pratham Resource Centre (India). (2020). *Teaching at the right level: from concern with exclusion to challenges of implementation*. https://unesdoc.unesco.org/ark:/48223/pf0000373668. (details)

Groeneveld, C. (2022a). *Developing a Proof of Concept for a Regional Learning Hub for Eastern and Southern Africa Part 3: Skills taxonomy* (Technical Report No. 3). EdTech Hub. https://doi.org/10.53832/edtechhub.0077. Available from https://docs.edtechhub.org/lib/VFV5SG9H. Available under Creative Commons Attribution 4.0 International. (details)

Groeneveld, C. (2022b). *Developing a Proof of Concept for a Regional Learning Hub for Eastern and Southern Africa Part 4: Content curation* (Technical Report No. 4). EdTech Hub. https://doi.org/10.53832/edtechhub.0078.

Available from https://docs.edtechhub.org/lib/9VKXVKGI. Available under Creative Commons Attribution 4.0 International. (details)

Groeneveld, C., Kibga, E., & Kaye, T. (2020). *Deploying an e-learning Environment in Zanzibar: Digital Content Curation*. EdTech Hub. https://doi.org/10.5281/zenodo.3966976. Available from https://docs.edtechhub.org/lib/T2W7MU3K. (details)

Haßler, B. (2020n). *Teacher professional development and coaching in low-income countries: Overarching considerations for the use of technology* (EdTech Hub Helpdesk Response No. 2). EdTech Hub. https://doi.org/10.53832/edtechhub.0012. Available from http://docs.edtechhub.org/lib/H9W2X3KM. Available under Creative Commons Attribution 4.0 International. (details)

Haßler, B., & Mays, T. (2014). Open Content. In *The International Encyclopedia of Digital Communication and Society* (pp. 1–11). Wiley-Blackwell. (details)

Hanushek, E. A., & Woessmann, L. (2020). *The economic impacts of learning losses*. OECD. https://doi.org/10.1787/21908d74-en. Available from https://www.oecd-ilibrary.org/education/the-economic-impacts-of-learning-losses_21908d74-en. (details)

Hevia, F. J., Vergara-Lope, S., Velásquez-Durán, A., & Calderón, D. (2022). Estimation of the fundamental learning loss and learning poverty related to COVID-19 pandemic in Mexico. *International Journal of Educational Development*, *88*, 102515. https://doi.org/10.1016/j.ijedudev.2021.102515. Available from https://www.sciencedirect.com/science/article/pii/S0738059321001681. (details)

Himelfarb, I. (2019). A primer on standardized testing: History, measurement, classical test theory, item response theory, and equating. *Journal of Chiropractic Education*, *33*(2), 151–163. https://doi.org/10.7899/JCE-18-22. (details)

International Bank for Reconstruction and Development & World Bank. (2022). *Dos anos despues salvando a una generacion*. https://www.unicef.org/lac/media/35631/file/Dos-anos-despues-salvando-a-una-generacion.pdf (details)

Ironsi, C. (2021). Perceived Efficacy of e-Proctoring Software for Emergency Remote Online Based Assessment: Perceptions of Proctored Examinations. *EDEN Conference Proceedings*, *1*, 265–282. https://doi.org/10.38069/edenconf-2021-ac0026. Available from https://www.eden-online.org/proc-2485/index.php/PROC/article/view/1879. (details)

Jordan, K., & Myers, C. (2022). *EdTech and girls education in low- and middle-income countries: which intervention types have the greatest impact on learning outcomes for girls?* [Working Paper]. EdTech Hub. https://doi.org/10.5281/zenodo.5874080. Available from https://docs.edtechhub.org/lib/9RGDIIHD. Available under Creative Commons Attribution 4.0 International. (details)

Kaffenberger, M. (2019). *A Typology of Learning Profiles: Tools for Analysing the Dynamics of Learning*. https://riseprogramme.org/publications/typology-learning-profiles-tools-analysing-dynamics-learning. (details)

Kaffenberger, M., & Pritchett, L. (2021). A structured model of the dynamics of student learning in developing countries, with applications to policy. *International Journal of Educational Development*, *82*, 102371. https://doi.org/10.1016/j.ijedudev.2021.102371. Available from https://www.sciencedirect.com/science/article/pii/S0738059321000249. (details)

Koomar, S., & Jull, S. (2020). *Open Educational Resources in Africa: A Curated Resource List*. (details)

Lesterhuis, M., Verhavert, S., Coertjens, L., Donche, V., & Maeyer, S. D. (2017). *Comparative Judgement as a Promising Alternative to Score Competences* [Chapter]. Innovative Practices for Higher Education Assessment and Measurement. https://www.igi-global.com/chapter/comparative-judgement-as-a-promising-alternative-to-score-competences/www.igi-global.com/chapter/comparative-judgement-as-a-promising-alternative-to-score-competences/159970. (details)

Lichand, G., Doria, C. A., Leal-Neto, O., & Fernandes, J. P. C. (2022). The impacts of remote learning in secondary education during the pandemic in Brazil. *Nature Human Behaviour*, *6*(8), 1079–1086. https://doi.org/10.1038/s41562-022-01350-6. Available from https://www.nature.com/articles/s41562-022-01350-6. (details)

Linacre, J. M. (2000). *Computer-Adaptive Testing: A Methodology Whose Time Has Come*. (details)

Luna-Bazaldua, D., LIBERMAN, J., & LEVIN, V. (2020). Moving high-stakes exams online: Five points to consider. *World Bank Blogs*. https://blogs.worldbank.org/education/moving-high-stakes-exams-online-five-points-consider. (details)

Major, L., Francis, G. A., & Tsapali, M. (2021). The effectiveness of technology-supported personalised learning in low- and middle-income countries: A meta-analysis. *British Journal of Educational Technology*, *n/a*(n/a). https://doi.org/10.1111/bjet.13116. Available from https://bera-journals.onlinelibrary.wiley.com/doi/abs/10.1111/bjet.13116. (details)

Maldonado, J. E., & De Witte, K. (2021). The effect of school closures on standardised student test outcomes. *British Educational Research Journal*. https://bera-journals.onlinelibrary.wiley.com/doi/abs/10.1002/berj.3754 (details)

Mbatha, F., Crook, R., & Plaut, D. (2021). *Keep Kenya Learning: Helping Caregivers Support Learning at Home Sprint 1.* [Sprint Review]. EdTech Hub. https://doi.org/10.5281/zenodo.4928926. Available from https://docs.edtechhub.org/lib/A2D9FVTA. Available under Creative Commons Attribution 4.0 International. (details)

Mendez Acosta, A., & Evans, D. (2020). *COVID-19 and Girls' Education: What We Know So Far and What We Expect*. Center for Global Development | Ideas to Action. https://www.cgdev.org/blog/covid-19-and-girls-education-what-we-know-so-far-and-what-we-expect-happen. (details)

Mishra, S., Brossard, M., Reuge, N., & Mizunoya, S. (2020, April 20). How involved are parents in their children's learning? MICS6 data reveal critical insights. *Evidence for Action*. https://blogs.unicef.org/evidence-for-action/parental-involvement-childrens-learning/. (details)

Muigai, J. W. (2018). Parental Involvement in Primary Schools in Kenya as a Major Strategy for Academic Success. *European Journal of Education Studies*, *5*(3). https://oapub.org/edu/index.php/ejes/article/view/2011/4648 (details)

Munyan-Penney, N., & Barone, C. (2020). *Covid-19 Response: Diagnostic Assessment.* http://edreformnow.org/wp-content/uploads/2020/05/COVID-19-Response-Diagnostic-Assessment.pdf. (details)

Myers, C., Wyss, N., Villavicencio Peralta, X., & Coflan, C. (2022). *Mapping and Analysing EdTech Programmes in Latin America and the Caribbean* (Helpdesk Response No. 47). EdTech Hub. https://doi.org/10.53832/edtechhub.0111. Available from https://docs.edtechhub.org/lib/VINQBTJ5. Available under Creative Commons Attribution 4.0 International. (details)

Nedungadi, P., Mulki, K., & Raman, R. (2018). Improving educational outcomes & reducing absenteeism at remote villages with mobile technology and WhatsApp: findings from rural India. *Education and Information Technologies*, *23*(1), 113–127. https://doi.org/10.1007/s10639-017-9588-z. (details)

Neidhöfer, G., Lustig, N., & Tommasi, M. (2021). Intergenerational transmission of lockdown consequences: prognosis of the longer-run persistence of COVID-19 in Latin America. *The Journal of Economic Inequality*, *19*(3), 571–598. https://doi.org/10.1007/s10888-021-09501-x. (details)

New Classrooms. (2020). *Solving the Iceberg Problem: Addressing Learning Loss in Middle School Math through Tailored Acceleration*. New Classrooms. https://newclassrooms.org/solving-the-iceberg-problem. (details)

OECD. (2020). Teachers' use of new technologies in Latin America. In *Making the Most of Technology for Learning and Training in Latin America*. OECD. https://doi.org/10.1787/ce2b1a62-en. Available from https://www.oecd-ilibrary.org/education/making-the-most-of-technology-for-learning-and-training-in-latin-america_ce2b1a62-en. (details)

Pollitt, A. (2012). The method of Adaptive Comparative Judgement. *Assessment in Education: Principles, Policy & Practice*, *19*(3), 281–300. https://doi.org/10.1080/0969594X.2012.665354. (details)

SURF. (2020). *White paper Online proctoring. Questions and answers about remote proctoring. | SURF.nl*. SURF. https://www.surf.nl/en/white-paper-online-proctoring-questions-and-answers-about-remote-proctoring. (details)

Sadler, R. (2009). *The futility of attempting to codify academic achievement standards | SpringerLink*. https://link.springer.com/article/10.1007/s10734-013-9649-1. (details)

Schwartz, A. C. (2012). *Remedial Education Programs to Accelerate Learning for All*. World Bank. https://doi.org/10.1596/26824. Available from https://elibrary.worldbank.org/doi/abs/10.1596/26824. (details)

Stone, E., & Davey, T. (2011). Computer-Adaptive Testing for Students with Disabilities: A Review of the Literature. *ETS Research Report Series*, *2011*(2), i–24. https://doi.org/10.1002/j.2333-8504.2011.tb02268.x. Available from https://onlinelibrary.wiley.com/doi/10.1002/j.2333-8504.2011.tb02268.x. (details)

T4 Education, & EdTech Hub. (2022). Effective Assessment and Progress Monitoring in an Online Environment: A Study in Six Countries. *EdTech*

Hub. https://edtechhub.org/2022/06/10/effective-assessment-and-progress-monitoring-in-an-online-environment-a-study-in-six-countries/. (details)

Teaching at the Right Level Africa. (n.d.). *Teaching at the Right Level – strengthening foundational skills*. Teaching at the Right Level. Retrieved July 23, 2021, from https://www.teachingattherightlevel.org/. (details)

Teaching at the Right Level. (2018). *Implementation Models: Evidence and lessons from randomised evaluations*. Teaching at the Right Level. https://www.teachingattherightlevel.org/wp-content/uploads/2018/09/Implementation-Models.pdf. (details)

Tembey, L., Baier, J., Ogolla, C., & Mohan, P. (2021). *Understanding Barriers to Girls' Access and Use of EdTech in Kenya During Covid-19*. EdTech Hub. (details)

Tomasik, M. J., Helbling, L. A., & Moser, U. (2021). Educational gains of in-person vs. distance learning in primary and secondary schools: A natural experiment during the COVID-19 pandemic school closures in Switzerland. *International Journal of Psychology*, *56*(4), 566–576. https://doi.org/10.1002/ijop.12728. Available from https://onlinelibrary.wiley.com/doi/abs/10.1002/ijop.12728. (details)

UNDP. (2020). *The Socio-Economic Implications of the COVID-19 Pandemic: Ideas for Policy Action* (p. 291). UNDP Latin America and the Caribbean. https://www.sdg16hub.org/system/files/2021-02/undp-rblac-Socio-Economic-Implication-Volumen1-EN.pdf#page=167 (details)

UNESCO. (2022). *High Stakes Assessment*. UNESCO Institute for Statistics Glossary. https://learningportal.iiep.unesco.org/es/node/73371. (details)

UNICEF. (2020). *COVID-19: Más del 95 por ciento de niños y niñas está fuera de las escuelas de América Latina y el Caribe*. https://www.unicef.org/mexico/comunicados-prensa/covid-19-m%C3%A1s-del-95-por-ciento-de-ni%C3%B1os-y-ni%C3%B1as-est%C3%A1-fuera-de-las-escuelas-de. (details)

UNICEF. (2022). *LACRO Covid-19 Education Response: Update 34 Status of School's Reopening & Learning*. https://www.unicef.org/lac/en/media/34976/file. (details)

UNICEF. (2022). *Trends in Digital Personalized Learning: Taking stock of personalized learning solutions in low- and middle-income countries* [Landscape Review]. Office of Global Insight and Policy United Nations Children's Fund.

https://www.unicef.org/globalinsight/reports/trends-digital-personalized-learning. (details)

Unwin, T., Naseem, A., Pawluczuk, A., Shareef, M., Spiesberger, P., West, P., & Yoo, C. (2020). *Guidance Note 10 Prioritising effective and appropriate teacher training. From the Report: Education for the most marginalised post-COVID-19: Guidance for governments on the use of digital technologies in education* (ACT THREE (OF THREE): GUIDANCE NOTES; p. 8). UNESCO, UniTwin, EdTech Hub. https://doi.org/10.5281/zenodo.5652081. Available from https://docs.edtechhub.org/lib/7E62A3FM. (details)

Upadhyay, A., Shoobridge, J., & Coflan, C. M. (2020). *Effective Use of EdTech for Remedial Learning Programmes: Considerations for Mongolia*. EdTech Hub. (details)

Vegas, E. (2022). *COVID-19's impact on learning losses and learning inequality in Colombia*. Brookings. https://www.brookings.edu/research/covid-19s-impact-on-learning-losses-and-learning-inequality-in-colombia/. (details)

Weiss, D. J. (2004). Computerized Adaptive Testing for Effective and Efficient Measurement in Counseling and Education. *Measurement and Evaluation in Counseling and Development*, *37*(2), 70–84. https://doi.org/10.1080/07481756.2004.11909751. Available from https://www.tandfonline.com/doi/full/10.1080/07481756.2004.11909751. (details)

Weiss, D. J., & Kingsbury, G. G. (1984). Application of Computerized Adaptive Testing to Educational Problems. *Journal of Educational Measurement*, *21*(4), 361–375. https://doi.org/10.1111/j.1745-3984.1984.tb01040.x. Available from https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1745-3984.1984.tb01040.x. (details)

World Bank. (2019). *Learning poverty*. https://www.worldbank.org/en/topic/education/brief/learning-poverty. (details)

World Bank. (2021). *Report on Education Crisis in Latin America and the Caribbean: Urgent Action is Needed to Address the Enormous Education Crisis in Latin America and the Caribbean*. The World Bank. https://www.worldbank.org/en/news/press-release/2021/03/17/hacer-frente-a-la-crisis-educativa-en-america-latina-y-el-caribe. (details)

World Bank. (2022). *Guide for Learning Recovery and Acceleration: Using the RAPID Framework to Address COVID-19 Learning Losses and Build Forward Better*. The World Bank, Bill and Melinda Gates Foundation, FCDO, UNICEF, USAID, UNESCO. https://thedocs.worldbank.org/en/doc/e52f55322528903b27f1b7e61238e416-0200022022/related/Guide-for-Learning-Recovery-and-Acceleration-06-23.pdf. (details)

World Bank, UNESCO, & UNICEF. (2021). *The State of Global Learning Poverty: 2022 Update*. https://documents1.worldbank.org/curated/en/416991638768297704/pdf/The-State-of-the-Global-Education-Crisis-A-Path-to-Recovery.pdf. (details)

World Bank, UNICEF. (2022). *Two Years After: Saving a Generation*. World Bank. https://doi.org/10.1596/37586. Available from http://elibrary.worldbank.org/doi/book/10.1596/37586. (details)

Zubairi, A., Kreimeia, A., Jefferies, K., & Nicolai, S. (2021). *EdTech to Reach the Most Marginalised: A Call to Action*. EdTech Hub. (details)