



Operational Guide

for Monitoring Hybrid Learning
Delivery Toward Long-term
System Strengthening and
Resilient Education Systems

unicef 
for every child

About this document

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Foreword



This Operational Guide aims to provide a comprehensive overview of data collection methods, management and dissemination strategies and techniques. Importantly, the guide outlines ways in which hybrid learning can be integrated into national Education Management Information Systems (EMISs). Learning by example is a key component of this document; monitoring case studies from various countries around the world are integrated throughout the Operational Guide.

The Operational Guide is meant to be generic so it can support ministries of education and education authorities and its key stakeholders around the world to contextualize the framework for any given emergency and context, such as future epidemics and pandemics, hurricanes, and earthquakes where hybrid learning may take place. It is accompanied by two documents:

1. [Short Guide](#)¹ The Short Guide summarizes key points and lessons learnt on monitoring hybrid learning across the Conceptual Framework and Operational Guide.
2. [Conceptual Framework](#)² The Conceptual Framework contains a comprehensive list of 163 indicators linked to hybrid learning priority areas. It is a globally oriented framework that can be used by ministries of education to monitor the needs of learners, staff, administrators, and other key education stakeholders engaged in hybrid learning.

This guide outlines UNICEF's commitment and contribution to ensuring ministries of education are equipped with the resources to effectively monitor the status and implementation of education delivery and learning in emergency situations. It also aims to contribute to the growing guidance on hybrid learning and encourages national and international partners to collaborate effectively and efficiently to strengthen monitoring processes, utilize systems that streamline data collection and dissemination and work to decrease the growing education data deficits that have resulted from the Covid-19 pandemic. Every child has the right to receive equitable education and this requires commitments from all stakeholders and partners to provide education delivery methods that meet the needs of all learners.

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1 UNICEF, and EdTech Hub, *Monitoring Hybrid Learning: A Short Guide*, 2022.

2 UNICEF, and EdTech Hub, *Conceptual Framework for Monitoring Hybrid Learning Delivery Toward Long-Term System Strengthening and Resilient Education Systems*, 2022.

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Definitions

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Hybrid learning

Hybrid learning attempts to make use of the most effective resources possible for any given learning objective, whether they sit online or offline.

In-person learning

Monitoring in-person learning, as suggested in its title, is a traditional approach in which teachers and school administrators monitor education delivery and learning in designated learning centers. This includes blended learning, which is defined here as the use of technology within teaching in the classroom (tablets with teachers etc).³

Remote learning

Remote learning is a method of learning where the teacher and learner are not physically present together in an academic institution for reasons related to accommodation and / or in response to emergency situations, such as the Covid-19 pandemic. A term now being used frequently is 'emergency remote teaching' (ERT).⁴ This is a rapid approach to remote teaching and learning where online learning tools are used but not to their fullest potential, because of the rapid and "temporary shift of instructional delivery" present in crisis situations.⁵

Learning loss

Learning loss refers to the stagnation or decrease in learner achievement relative to expected performance attributed to the disruption of in-person schooling either due to seasonal factors (e.g., summer breaks)⁶ or emergencies (e.g., the Covid-19 pandemic).⁷

Summative assessment

This type of graded assessment happens periodically throughout the semester and checks learners' learning achievement. Summative assessments are often associated with exams and midterms, but can also include other kinds of assessment tasks. This guide provides a variety of alternative summative assessment options.

Formative assessment

This type of assessment is ongoing throughout the semester, and often involves low-stakes, ungraded assessment tasks in and outside of the classroom. Timely feedback of these assessments assists in learners' reflection of their learning and provides opportunities for improvement in learning.⁸

Education Management Information System (EMIS)

A system for the collection, integration, processing, maintenance, and dissemination of data and information to support decision-making, policy analysis and formulation, planning, monitoring, and management at all levels of an education system. More than just a technology, an EMIS is a system of people, technology, models, methods, processes, procedures, rules and regulations that function together to provide education leaders, decision-makers and managers at all levels with a comprehensive, integrated set of relevant, reliable, unambiguous and timely data and information to support them in completion of their responsibilities. (UNESCO 2019). Traditionally, an EMIS has been designed around annual or biannual data collection campaigns, where schools reported aggregated information on students, staff, and institutions. More modern versions of EMIS leverage technology to provide school-based management information systems, allowing for the recording and reporting of individual records for staff and students.⁹

3 Commonwealth of Learning, *Open and distance learning: key terms and definitions*, 2015.
4 Australian Council of Education Research, *Remote Learning: Rapid Literature Review*, 2020, p. 2.
5 Hodges et al., 'The difference between emergency remote teaching and online learning', 2020.
6 Harris Cooper et al., 'The Effects of Summer Vacation on Achievement Test Scores: A Narrative and Meta-Analytic Review', *Review of Educational Research* 66, no. 3 (1996): 227–68.
7 Diego Luna Bazaldua, Victoria Levin, and Julia Liberman, *Guidance Note on Using Learning Assessment in the Process of School Reopening*, 2020, p. 1.
8 Boston University, *Faculty Guide to Assessment Options in Remote & Hybrid Classes*, 2020.
9 UNESCO, 'Education Management Information System', 2019. <https://learningportal.iiep.unesco.org/en/glossary/educational-management-information-system-emis>



Acronyms and abbreviations

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ADB	Asian Development Bank	MENARO	UNICEF Middle East and North Africa Regional Office
API	Application Programming Interface	MICS	Multiple Indicator Cluster Surveys
CDC	Centers for Disease Control and Prevention	MICS-EAGLE	Multiple Indicator Cluster Surveys-Education Analysis and Global Learning for Equity
CLA	Collaborating, Learning, and Adapting	MIS	Management Information System
DAP	Data Analysis Plan	MNO	Mobile Network Operator
DEC	Development Assistance Committee (of OECD)	NGO	Non-governmental organization
DHS	Demographic and Health Surveys	NWEA	Northwest Evaluation Association
DQA	Data Quality Assessment	OECD	Organisation for Economic Co-operation and Development
ECD	Evaluation Capacity Development	OOsc	Out-of-school children
Ed-DQAF	Ed-Data Quality Assessment Framework	RCCE	Risk Communication and Community Engagement
EiE	Education in Emergencies	RDD	Random Digit Dialling
EMIS	Education Management Information System	ROSA	UNICEF Regional Office for South Asia
ERT	Emergency remote teaching	SABER	Systems Approach for Better Education Results
ESARO	UNICEF Eastern and Southern Africa Regional Office	SDG	Sustainable Development Goals
FAO	Food and Agriculture Organization of the United Nations	SIS	Student Information System
GPE	Global Partnership for Education	SMIS	School Management Information System
IEA	Institute of Educational Analytics	SMS	Short Message Service
IIEP-UNESCO	UNESCO International Institute for Educational Planning	SOP	Standard Operating Procedure
ILO	International Labour Organisation	SSRC	Social Science Research Council
INEE	Inter-agency Network for Education in Emergencies	TCF	The Citizens Foundation
IPEC	International Program on the Elimination of Child Labor	TVET	Technical and Vocational Education and Training
IVR	Interactive Voice Response	UNESCO	United Nations Educational, Scientific, and Cultural Organization
J-PAL	Abdul Latif Jameel Poverty Action Lab	UNICEF	United Nations Children's Fund
KPI	Key Performance Indicator	UIS	UNESCO Institute for Statistics
LACRO	UNICEF Latin America and Caribbean Regional Office	USAID	United States Agency for International Development
LeaRA	Learning Readiness Rapid Assessment	WCARO	UNICEF West and Central African Regional Office
LMS	Learning Management System	WASH	Water, sanitation and hygiene
MEL	Monitoring, evaluation and learning		
MENA	Middle East and North Africa		



1. Introduction



1. Introduction



1.1. Background

In the past year, over 1.6 billion learners globally have been affected by school closures due to the Covid-19 pandemic. With the sudden halt of basic service delivery — education, health, nutrition, water, sanitation and hygiene (WASH), and social protection — the immediate, medium and long-term impacts of Covid-19 are unprecedented, especially for vulnerable and disadvantaged populations and communities. The joint UNESCO / UNICEF / World Bank *Overview of findings from a survey of ministries of education on national responses to COVID-19* highlights that, on average, 77 days of instruction were missed in low-income countries and 23 days were missed in high-income countries for the 2020 school year.¹⁰

However, many schools have reopened and / or adopted a hybrid model that combines in-person and remote learning. In parallel with the rise of hybrid learning, decision-makers must

ensure that they have the systems and capacities in place to monitor education delivery, learning, and skills development across a range of contexts. According to the 2021 UNESCO-UNICEF-World Bank-OECD survey, only one out of three countries have a regular monitoring system in place for hybrid learning. Among low- and lower-middle-income countries, this estimate decreases to one out of four countries.¹¹ However, against the backdrop of Covid-19 and school closures, monitoring hybrid learning is even more relevant as education providers grapple with the challenges of evolving circumstances and seek to build back better, more resilient education systems. Specifically, further information on how to monitor hybrid learning, compared to traditional monitoring approaches, is needed.

1.2. Objective

The objective of this project is to generate the information needed to answer five main categories of questions pertaining to hybrid learning. The questions below can be used to develop monitoring goals and guide an overarching monitoring approach:

1. **Who** are the children reached and not reached or at risk of not being reached by any one of a particular form of hybrid learning? What are the key variables (e.g., age, sex, wealth quintile, ethnic group, religion, category of vulnerability) determining the educational status of a given child being left out of hybrid learning?
2. **Where** are the children not accessing any form of hybrid learning? In which settings (schools, homes, community resources centers, etc.) and / or residence area (urban vs rural) is the most effective learning taking place? What are their geographic locations (which may change from one year to another) considering lockdown and or pandemic / health emergency contexts?
3. **Why** are children not reached by any form of hybrid learning delivery modes (high- / low- / no-tech)? If they are reached,

¹⁰ UNESCO, UNICEF, and World Bank. What have we learnt?: Overview of findings from a survey of ministries, 2020, p. 15.

¹¹ These numbers were calculated from the answers to question 4 of module 10 in the Joint Survey on National Education Responses to COVID-19 (Round 3). The question focuses on monitoring digital learning; we assume that governments that did not monitor digital learning regularly also did not monitor hybrid learning.

why are they not engaging? If they are engaging, why are they not learning?¹² Why might learners have a preference for a particular learning modality if they have more than one choice?

4. **What** is the interplay of barriers (socio-cultural / economic, demand-side, supply-side) that determine a child's participation in hybrid learning? Which barriers prevent a child's access to hybrid learning platforms and capacity to effectively achieve learning objectives? What leads to a child not being reached despite national efforts to reach all children? What are the changes in a child's learning gain or loss due to emergencies such as Covid-19 in general? More importantly, how much are children accessing and participating effectively in any one of the delivery modes of hybrid learning made available by the Ministry of Education or any education service provider? What is the preferred modality and frequency of usage by children and how are they using it? What content are learners receiving remotely? Is it relevant, age-appropriate? Is it helping children to progress in their learning?
5. **How** are children engaging with hybrid learning to ensure that effective learning is taking place? How are they being supported by teachers if there is teacher engagement — i.e. continued engagement, feedback mechanisms? To what extent can monitoring data be used to make necessary adjustments to ongoing education programs and / or learning processes with the design of specific interventions targeted towards children with learning gaps (i.e., remedial measures and / or classes, community-based learning support mechanisms)? How do we ensure online / remote learning is equitable and of good quality? How can we nurture local eco-systems to enhance quality, contextualization, and sustainability of remote learning?¹³ How do we ensure online / remote learning is safe for children? How can the privacy and safety of participants be protected during monitoring?

This Operational Guide, along with the [Conceptual Framework](#),¹⁴ offers practical solutions to generate the up-to-date evidence needed at country level to gauge the effectiveness and appropriateness of multiple pathways to

hybrid learning. The package will guide the generation of the required data on the overall reach of hybrid learning and the access and effectiveness of learning options made available by the education system. In addition, a benchmarking mechanism building on the work done by the UNICEF Data & Analytics Section on the potential reach of hybrid learning policies will serve as a validity range for data verification and triangulation, on the understanding that the number of learners who potentially could be reached by hybrid learning may have been overestimated.¹⁵

1.3. Approach

In the spirit of cooperation in the face of enormous development challenges related to the Covid-19 pandemic, UNICEF aims to develop a conceptual framework and toolkit for monitoring hybrid learning delivery as a regional and global public good. The work aims to build on a growing body of research and real-world practical experience to make a contribution to the literature in an area of critical importance.

The conceptual framework and operational guide are informed by an extensive literature review and guided by ad hoc contributions, from and consultations with, a Reference Group of experts to ensure the content, scope, and impact of the framework is wide-reaching and aligned with global perspectives and best practice in the field of monitoring education and learning (MEL).

1.4. Audience

The operational guide aims to support national policy planners and education actors¹⁶ in monitoring and improving their policy / program responses. In addition, the guide can inform strategies for education systems to become more flexible by providing options for expanding multiple pathways, reaching children who may not be reached by formal face-to-face schooling and addressing individual learning needs.

The information in this guide can be adapted by countries from all regions of the world to fit their unique education contexts.

12 Tom Kaye, Caspar Groeneveld, and Amreen Bashir, *Monitoring Distance Education: A Brief to Support Decision-Making in Bangladesh and Other Low- and Lower-Middle Income Countries*, 2020.

13 Alassane Ouedraogo, 'Quality assurance and monitoring of online/remote learning platforms', 2021.

14 UNICEF, and EdTech Hub, *Conceptual Framework for Monitoring Hybrid Learning Delivery Toward Long-Term System Strengthening and Resilient Education Systems*, 2022.

15 UNICEF, *COVID-19: are children able to continue learning during school closures?*, 2020c.

16 Education actors include school administrators and staff, national and international non-governmental organizations (NGOs), the donor community and private sector supporting the direct or indirect delivery of education.

2. Ensuring continuity of learning during and after school closures

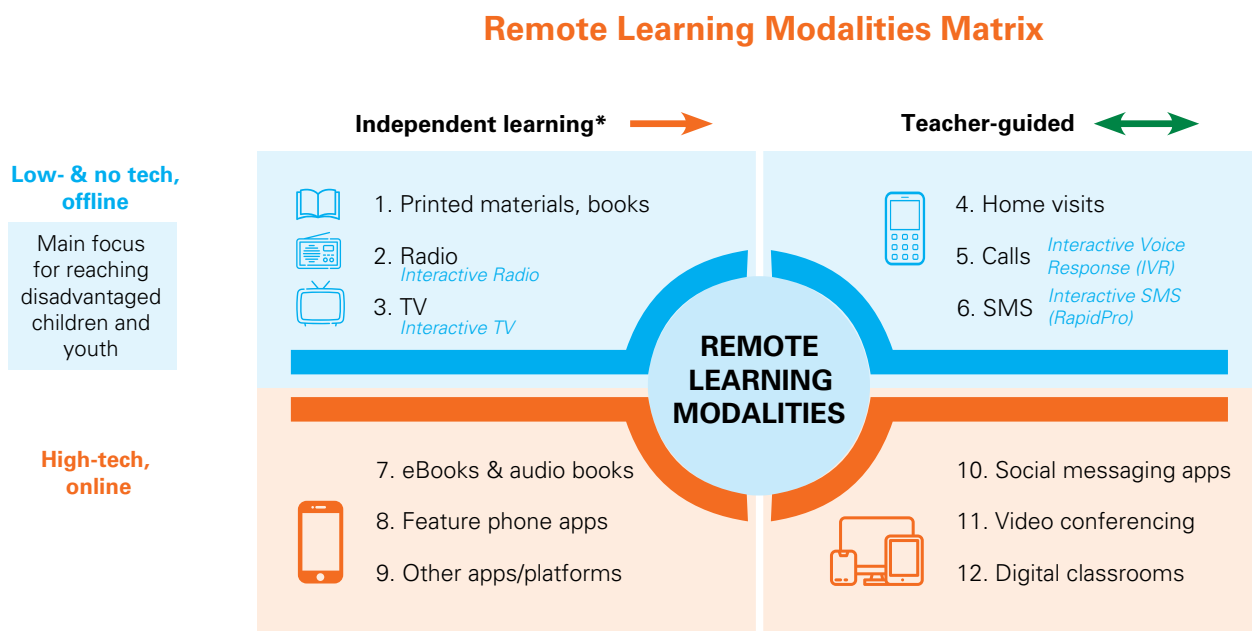


2. Ensuring continuity of learning during and after school closures

In 2020, 1.6 billion students (including 110 million children and young people in the Middle East and Northern Africa¹⁷ and 430 million learners in the South Asian Region¹⁸) were affected by school closures around the world.¹⁹ This prompted school administrators and educators to think innovatively and adapt traditional in-person learning approaches and techniques to meet the demands and needs of learners learning from home

(i.e., using virtual meeting platforms to deliver educational content). Many countries implemented multimodal approaches to ensure that all learners could be reached through no-tech, low-tech, and high-tech options. These modalities included printed materials, radio, television, SMS messaging, digital classrooms, social media, and other apps and platforms.²⁰

Figure 1. Home learning modalities²¹



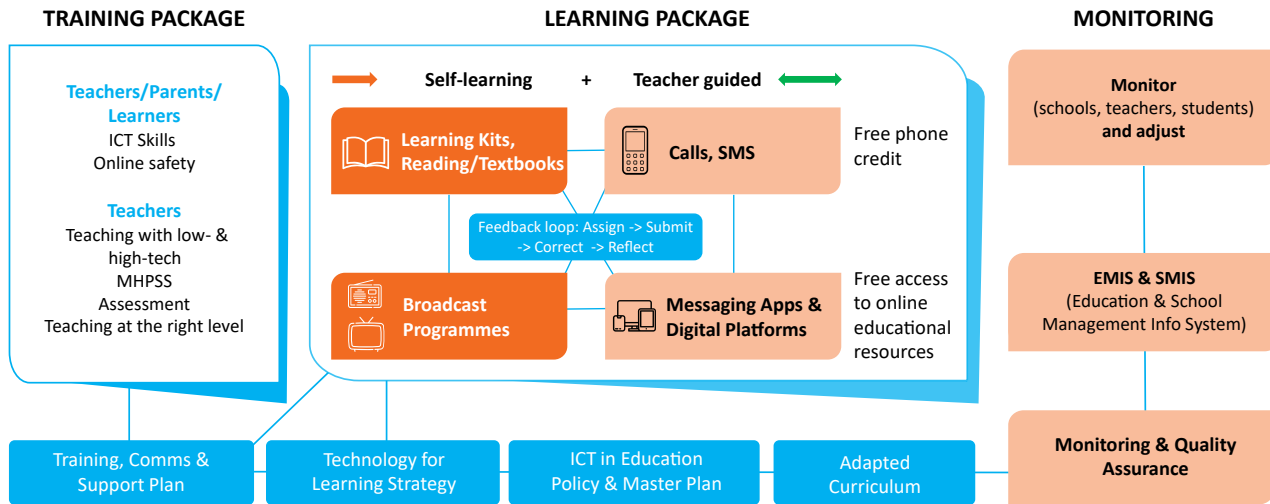
* Ideally supported by parents/caregivers

During this unprecedented time, decision-makers not only recognized the need for quality training and learning packages to support learning continuity, but also the importance of monitoring schools, teachers and students, integrating this information within the EMIS and School Management Information System

(SMIS) and conducting quality assurance (see Figure 2 below²²). Along with challenges presented when delivering education in remote or hybrid environments, monitoring the implementation of these delivery modes can often be challenging and requires adaptation of existing methodologies.

17 UNICEF, 'COVID-19, an opportunity to bridge the digital gap and reform education systems in the region,' 2021a. <https://www.unicef.org/mena/stories/covid-19-opportunity-bridge-digital-gap-and-reform-education-systems-region>
 18 UNICEF, 'Urgent need to secure learning for children across South Asia,' 2020g. <https://www.unicef.org/press-releases/urgent-need-secure-learning-children-across-south-asia>
 19 Thomas Dreesen et al., *Promising Practices for Equitable Remote Learning. Emerging Lessons from COVID-19 Education Responses in 127 Countries*, 2020.
 20 UNICEF ROSA, *Guidance on distance learning modalities to reach all children and youth during school closures*, 2020b.
 21 Ibid.
 22 UNICEF ROSA, and ADB. 'Distance Learning Reach & Effectiveness in South Asia,' 2021.

Figure 2. Ensuring continuity of learning through training and learning packages, and monitoring.²³



Between November 2020 and October 2021, the number of country-wide school closures had decreased significantly from 148 to 14.²⁴ Many schools had started to reopen and / or adopt a hybrid model that combines in-person and remote learning. Recognizing the importance of building back better and more resilient education systems, the transition to hybrid learning can position countries to respond more effectively and efficiently to other disruptions to schooling in the future. However, the question of how to monitor hybrid learning (and how this approach may differ from traditional education monitoring) remains.

Before adapting an approach to monitor hybrid learning, it is important to ground future action in established systems and processes in place today. In its *Guide for Adopting Remote Monitoring Approaches During COVID-19*,²⁵ USAID presents clear, reflection questions for careful consideration. These questions and associated next steps for monitoring hybrid learning have been adapted for the purposes of this guide as below:

²³ Ibid.
²⁴ UNESCO, 'Education: From Disruption to Recovery,' 2020b. <https://en.unesco.org/covid19/educationresponse>.
²⁵ USAID, *Guide for Adopting Remote Monitoring Approaches During COVID-19*, 2020a.



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Question

Next step

1. How was data collected before the change in education delivery?

Review MEL plans and take inventory of what data was collected and how, as well as how it was reported.

2. What were the known gaps in the MEL plan?

Review the updated MEL plan and discuss gaps in performance and context monitoring. For example, some routine data collection methods such as school ledgers for attendance may no longer be possible.

3. How can the existing MEL plan be adapted to address those gaps and any new requirements of hybrid learning?

Depending on the focus of the MEL plan and indicators therein, new approaches may be required to supplement traditional data collection methods.

4. How can we backstop and monitor the new MEL approach?

As new processes are deployed to monitor hybrid learning, continued guidance, coaching, and monitoring of activities will be required. This will help the education actors fulfil new or changing responsibilities in real time.

Where possible, action points should also be identified when developing remote monitoring approaches. During these action points, decision-makers can assess:

- *Are there problems that need to be addressed?*
- *Are there tweaks that can be tried to make the intervention more effective?*

Prior to starting a new monitoring cycle, the intervention can be adjusted based on the data collected.

Across the four questions listed above, decision-makers may need to adapt their existing data collection and analysis methods to effectively monitor hybrid learning. Based on the identified gaps and proposed adaptations, a decision-maker

can use this guide to supplement their existing knowledge of monitoring and make the necessary adjustments to their approach for a hybrid learning model.

The table below maps key monitoring questions with a corresponding section in the Operational Guide.

Gaps or questions to address	Operational Guide Section
Who should be surveyed and sampled within the population when monitoring hybrid learning?	<i>Sampling design</i>
What data collection methods and instruments should I use, especially when in-person data collection is not possible?	<i>Data collection</i>
How can formative and summative assessments be administered within a hybrid learning model? What about digital forms of assessment?	<i>Integrating formative and summative assessments into hybrid learning</i>
How do I create a data analysis plan? How do I manage, analyze, and present data in a compelling manner?	<i>Data analysis</i>
How do I set up a data quality assurance approach for data collection to monitor hybrid learning?	<i>Data quality assurance</i>
How can hybrid learning be integrated into existing monitoring measures within EMISs?	<i>Integrating hybrid learning in Education Management Information Systems</i>
What ethics considerations should I be aware of when conducting monitoring and data collection remotely (e.g., online data confidentiality)?	<i>Ethics considerations</i>

Monitoring the implementation of hybrid learning will lend itself to data-driven decision-making across all levels of the education system both now and in a post-Covid world. It provides insights into the reach and effectiveness of the hybrid learning program, and how decision-makers might improve both of these program aspects. Monitoring can also

empower decision-makers to take an equity-focused lens to their work and identify the student segments and areas that hybrid learning is not reaching. Based on this information, policies, strategies, and programs can be developed to reach marginalized learners.²⁶

26 UNICEF ROSA, *Guidance on distance learning modalities to reach all children and youth during school closures*, 2020b.

3. Sampling design



3. Sampling design

Sampling design is the process of defining the framework and the criteria leading to the selection of survey samples. Sampling design for remote and hybrid learning data collection can include the following activities:

1. Defining the survey focus population and their demographic characteristics (including their geographical distribution).
2. Determining who will be sampled within a population (sample frame).
3. Determining the sample size based on key indicators and the number of reporting domains.
4. Selecting the data collection method (to be discussed in the following section).²⁷

Sampling design is all the more relevant in light of the recent and ongoing shift to hybrid learning around the world. Overall, a good sample design is critical for collecting informative and representative data.



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²⁷ WFP, *Sample design for remote data collection*, 2017, pp. 2–3.

²⁸ UNICEF ROSA, *Monitoring Distance Learning During School Closures*, 2020c.

3.1. Defining demographics

In UNICEF ROSA’s monitoring distance education guidance document,²⁸ the authors identify ways that questionnaires / surveys can be designed to include perspectives of children / youth, teachers and parents / caregivers. Because of the immediacy of emergency situations like the Covid-19 pandemic, there may be other target populations from whom it is necessary to collect information. For this reason, surveyors should consider *who they want to collect data from* before proceeding with the design of the survey itself.

To inform the most meaningful interventions, data collection can take place across five targeted areas:

1. **Learners** Collecting data on learners will support ministries of education in better understanding key factors like chronic absenteeism, the connectivity levels of learners in remote areas and the best modality for delivering education during emergency situations. However, as UNICEF ROSA notes, collecting data on younger learners may pose a challenge because they may have difficulties in responding to detailed surveys. For this reason, it is recommended that ministries of education target older learners, or older siblings, that may have a stronger grasp on technology and learning experiences that would be incorporated into the survey sampling process. There may be additional difficulties associated with reaching and identifying the needs of out-of-school children (OOSC), and others who are not engaged in traditional forms of learning.
2. **Teachers** Just as emergency situations pose new challenges to learners, teachers are also a critical population to collect data about and from. With the Covid-19 pandemic, teachers across the world had to make a quick transition from in-person learning to either hybrid or fully remote learning. This unprecedented shift took planning and coordination between school administrators and teachers,

and at the same time placed high volumes of stress on both of these groups. Considering the essential role that teachers play in education delivery, emotional support, and learning outcomes, collecting data on teachers' experiences and key characteristics related to specific skills gaps during emergency situations can help to understand ways of safely and effectively reopening schools, as well as methods to better address new and emerging educational challenges.

3. **Parents / caregivers** Parents / caregivers are an important resource for understanding the at-home learning environments of learners, as well as a pathway to understanding the successes and challenges of different learning modalities (i.e., computer, radio, TV) that are present during hybrid or remote learning. Surveying this demographic can also highlight which learners have a parent / caregiver who can support home-based learning.
4. **Institutions** Institutional level data can help with understanding the delivery and quality of education during in-person and remote learning sessions. This data could be collected from the administration or staff such as the school director, school principal, or head teacher from a particular school and could help governments better understand the general characteristics of schools, and the enabling factors being put in place to promote effective delivery of hybrid and remote learning, such as: which schools are equipped to deliver remote learning, have learning management systems in place, have electricity lines to power the school, have reliable internet connectivity, access to handwashing facilities and clean and functional bathroom facilities, among other variables. Understanding the ability of schools to deliver quality and safe education during emergency situations will best facilitate the transition back into full-time, in-person learning.
5. **Ministry of education / programs** Programmatic data helps to identify achievements and gaps in systematic approaches to hybrid learning. It is particularly important in informing an initiative at the design and planning stages. Data collected for hybrid learning programmes can help to understand enabling factors such as legislation and policies that are in place to support hybrid learning, allocations of budget to facilitate distribution of resources to learners and

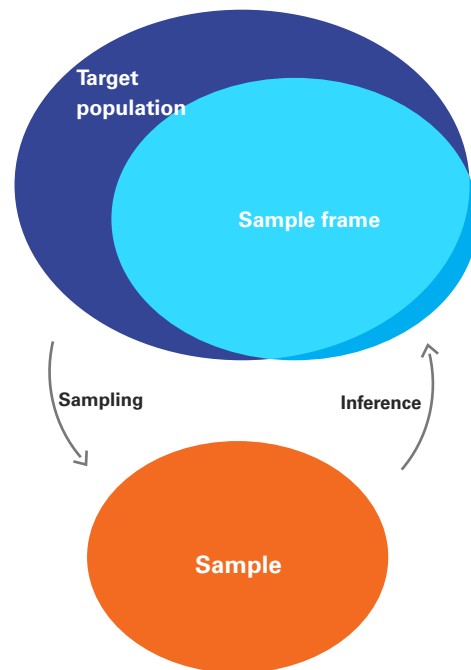
schools, as well as the preferred support modality, high-tech vs low-tech solution vs low-cost solutions (such as radio, MP3, or computer) across a country or region.

To ensure that the data collected is inclusive, it should consider sex, age-group and diversity, to ensure that future investments are data-driven, informed by equitable participation and targeted to the most vulnerable and marginalised children and families.

3.2. Determining the sampling frame

A sampling frame is the set of source materials from which the sample is selected. For household surveys, samples can be drawn from the census, which includes information about the distribution of the population in geographical area frames.²⁹ A sampling frame is ideally complete, accurate, and up-to-date (e.g., an updated register of schools with information on the number of teachers and students by level). It has significant implications for the cost and the quality of any survey. Conversely, faulty sampling frames can cause errors during the data collection process.

Figure 3. Relationship between the sampling frame and sample.³⁰

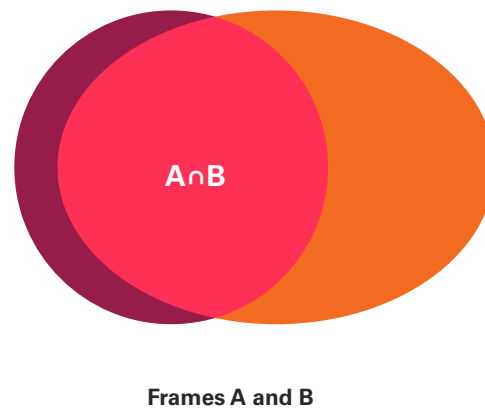


29 UN, *Designing Household Survey Samples: Practical Guidelines*, 2008, p. 1.

30 Tom Pellens, 'Undertaking Rapid Assessments and RealTime Monitoring in the COVID-19 Context: Lessons from UNICEF South Asia,' 2021.

The sampling frame should capture the target population; a “perfect” sampling frame would encompass the direct mapping of elements in the frame to the target population. However, the sampling frame can suffer from *undercoverage*, when the sampling frame only includes part of the target population, and/or *overcoverage*, when the sampling frame contains elements that are not included in the target population. There are also risks associated with a frame becoming outdated in a dynamic environment and representing inaccurate information. In light of these challenges, FAO (2021) recommends novel sampling approaches that “allow for some of the abovementioned problems to be overcome without excessively increasing survey costs. They also enable sampling of rare or hard-to-reach populations.” For example, when the target population can be covered by the union of two or more frames, multisource sampling could be used to remedy the imperfect frames (see Figure 4).³¹

Figure 4. Example of multisource sampling.³²

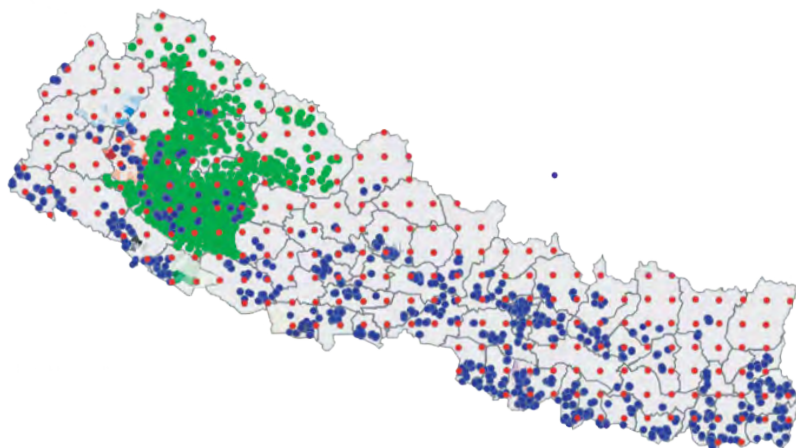


Box 1. Example sampling frames used for surveys in Bangladesh.

In Bangladesh, several major surveys were conducted during school closures, including a World Bank survey of Grade 9 students and an Asian Development Bank (ADB) survey of primary level students. The World Bank survey sampled students eligible to receive poverty-targeted stipends in the Dhaka and Mymensingh divisions, while the sampling frame for the ADB survey included 32 districts (out of 64) with a higher share of out-of-school students.³³

Figure 5. Map of Nepal with sampled wards, overlaid with existing household databases.³⁴

In 2020, UNICEF Nepal set up the Child and Family Tracker (CFT), a longitudinal survey used to rapidly capture data on the socio-economic impacts of Covid-19. The team utilized grid-based random sampling to randomly select 250 wards (out of 6,744) from within each grid on the map of Nepal. Households located in these wards and containing contact information in existing databases were then sampled.³⁵



³¹ FAO, *Guidelines on Data Disaggregation for SDG Indicators Using Survey Data*, 2021.

³² Ibid.

³³ UNICEF ROSA, and ADB, ‘Distance Learning Reach & Effectiveness in South Asia’, 2021.

³⁴ Ibid.

³⁵ Ibid.

Trade-offs exist between investing in a sampling strategy that ensures accurate and applicable findings while engaging in the rapid generation of evidence. Difficulties associated with this balancing act were especially evident during the height of Covid-19-related school closures in 2020 when it was necessary for governments to pivot and subsequently monitor their approach quickly. In many cases, the use of existing databases containing the contact details of potential respondents enabled rapid generation of evidence. However, this approach was limited by reduced sample size, coverage errors and possible selection bias. To address these gaps, a decision-maker might consider applying strategies such as:

- **ex-post reweighting:** assigning corrective values to sample responses of a survey to ensure that the data is more representative of the target survey population. When assigning weights, respondents from under-represented groups will receive a weight larger than 1 and respondents from over-represented groups will receive a weight smaller than 1.³⁶
- **grid-based sampling:** dividing the population based on geographical grids, and taking random samples from each grid (see example below).
- **stratification:** dividing the population into smaller groups (i.e., strata) based on shared characteristics, and taking random samples from each strata.³⁷

When there is no sampling frame, an alternative approach that could be implemented is Random Digit Dialing (RDD). RDD randomly generates phone numbers using the prefixes of Mobile Network Operators (MNOs). While this sampling technique can help avoid coverage bias, there are a few limitations that must be acknowledged. For instance, RDD can be inefficient, as many of the generated numbers may be invalid and / or have low response rates. Further, this technique has limited effectiveness when targeting specific population groups, as there is no additional information that can be used for stratification.³⁸

It can be challenging to generate data estimates that are representative at the district / provincial / national levels, especially when data collection relies on online, SMS, and

phone-based surveys. For example, SMS and phone-based surveys might generate estimates that are biased towards men, as phone ownership is often skewed toward males. Likewise, partnerships with telecommunication companies to gather a list of contact numbers will mean that the sample is restricted to users who have subscribed to that particular network. In light of these complexities, the selection of sampling frames should influence which monitoring modality to use.³⁹

3.3. Determining the sample size

Sample size is a pivotal feature that governs the overall design of the sample, and is defined as the number of households or persons selected for the sample. Sample size must also address the urgent needs of users who desire data for domains, for example, subpopulations. Determination of the sample size is crucial to achieving accurate results with statistical significance, which refers to the likelihood that the result was observed due to chance or random factors. The larger the sample size is, the more likely the result will be statistically significant (i.e., less likely to be due to chance). Larger sample sizes can also lead to fewer sampling errors, which are created when the sample is not representative of the overall population.⁴⁰ However, while increasing the sample size leads to a reduction in sampling errors, it raises the frequency of non-sampling errors. These errors occur during data collection and can range widely, from non-response errors (when certain individuals choose not to participate in a survey and thus are not represented in the survey results) to interviewer errors (when a response is recorded incorrectly).⁴¹

In order to produce the desired sampling outcome, sample size must take competing needs into account so that costs and precision are optimally balanced. A sample size that is too small might skew the result and increase sampling errors, while a bigger sample size might complicate the study, raise the costs and lead to non-sampling errors.

For example, in a recent study assessing education, economic, and health-related outcomes during Covid-19 in Pakistan conducted by the Center for Global Development, The Citizens' Foundation (TCF) schools were selected to study the impacts

36 Thomaidou Fotini, Valavanioti Evangelia, and Vassileiadis Michail. *Weighting of Responses in the Consumer Survey: Alternative Approaches – Effects on Variance and Tracking Performance of the Consumer Confidence Indicator*, 2013.

37 UNICEF, *Undertaking Rapid Assessments in the COVID-19 Context: Learning from UNICEF South Asia*, 2021c.

38 Ibid.

39 UNICEF ROSA, *Guidance on distance learning modalities to reach all children and youth during school closures*, 2020b.

40 FAO, *Guidelines on Data Disaggregation for SDG Indicators Using Survey Data*, 2021.

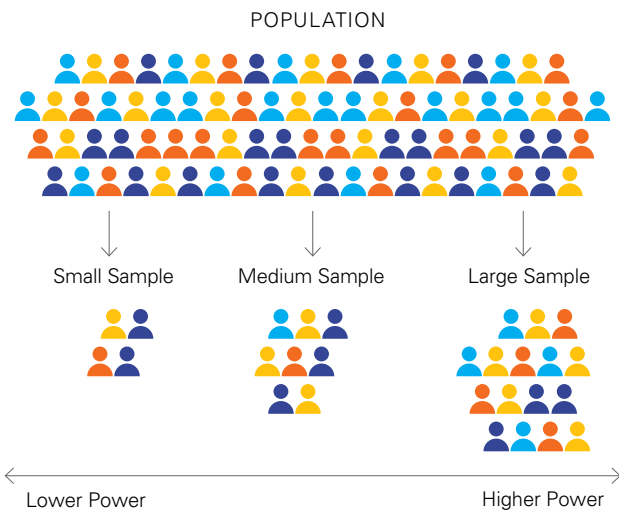
41 Corporate Finance Institute, 'Non-Sampling Error,' (no date). <https://corporatefinanceinstitute.com/resources/knowledge/other/non-sampling-error/>.

of the crisis on disadvantaged households. TCF operates 1,600 primary and secondary schools in urban slums and rural communities of Pakistan and serves a total of 240,458 students. A sample of 3,089 students was drawn randomly from the TCF schools; this sample mirrors the gender and district distribution of the overall student body.⁴²

The Poverty Action Lab (J-PAL) highlights several rules of thumb regarding sample size, including:⁴³

1. *A larger sample increases the statistical power (i.e., likelihood of detecting significant changes in outcomes) of the assessment.* As shown in Figure 6 below, larger samples are more likely to represent the original population and capture impacts that would occur in the target population. They can also increase the statistical power of the assessment and thus improve the precision of the estimates.

Figure 6. Sample size and statistical power.



2. *If the effect size of a program is small, the assessment needs a larger sample to achieve a given level of power.* Effect size is the magnitude of impact on a particular outcome of the intervention. For a given level of power, smaller effects can be precisely detected with a larger sample size, and vice versa.

3. *If the underlying population has high variation in outcomes, the evaluation needs a larger sample.* When the target population has high variation in key outcome measures, it could be challenging to distinguish between the program effect and the effect of the random variation. For a target population with high variance, larger samples make it easier to identify the causal impact of a program (see Figure 7 below).

Figure 7. Relationship between sample size and population variance.



Sample size should be enlarged based on the anticipated non-response rate. It is a common practice to increase the sample size by the number of non-responses, which ensures that the actual number of complete surveys could approximate the desired sample size. The degree of non-responses varies by survey type and situation. When choosing sample size for different countries, figures that reflect the most recent non-response rate in national surveys should be used.

42 Maryam Akmal, Lee Crawford, Susannah Hares, and Ana Luiza Minardi. 'COVID-19 in Pakistan: A Phone Survey to Assess Education, Economic, and Health-Related Outcomes,' 2020. <https://doi.org/10.7910/DVN/EGQ4XO>.

43 J-PAL, *Six Rules of Thumb for Determining Sample Size and Statistical Power*, 2018.

3.4. Further reading

Below are additional resources that a decision-maker can refer to on the subject of sampling design.

Title	Organization	Description
Compilation of tools / guidance of existing materials for data disaggregation⁴⁴	United Nations Statistics Division	<i>The Inter-Agency and Expert Group on SDG Indicators have released a compilation of material and resources highlighting various vulnerable populations and methods of survey collection.</i>
Eurostat sampling reference guidelines: Introduction to sample design and estimation techniques⁴⁵	Eurostat	<i>This reference provides an overview of fundamental elements of survey design and sampling to support governments in building their capacity around survey development and conduction.</i>
Guidelines on data disaggregation for SDG Indicators using survey data⁴⁶	Food and Agriculture Organization of the United Nations (FAO)	<i>These guidelines provide a comprehensive overview on ways that data can be disaggregated, how it can support in monitoring SDG indicators, and how information can be collected through various sampling strategies. Additionally, this resource can also support governments in better understanding terms related to survey sampling.</i>
ILO-IPEC interactive tools in sampling with household-based child labour surveys⁴⁷	International Labour Organization (ILO)	<i>With various modules, these tools can be utilized for comprehensive and specific purposes, such as understanding sample size and margins and determining sampling errors.</i>
Planning and Implementing Household Surveys Under Covid-19⁴⁸	Inter- Secretariat Working Group on Household Surveys	<i>This document outlines guidance on how to ensure the continued availability of high-quality and timely and well-documented data for policymaking at the national and local level.</i>
Mobile Phone Surveys for Understanding COVID-19 Impacts: Part I Sampling and Mode⁴⁹	World Bank	<i>This source provides a summary of reasons that may drive sampling design during Covid-19, such as following up on existing baseline surveys, new impact evaluation, or need for a rapid monitoring survey. It also demonstrates how sample frames can be completed on a mobile phone, as well as how to make sampling more representative.</i>
Undertaking rapid assessments in the COVID-19 context: Learning from UNICEF South Asia⁵⁰	UNICEF ROSA	<i>This source synthesizes the findings and lessons learnt in designing and implementing rapid assessments in the South Asia region in a pandemic context. It provides insights on how to implement a rapid assessment in emergency situations, focusing on the technical and managerial dimensions of the cases rather than the actual findings of the studies</i>
MICS6 Tools⁵¹	UNICEF MICS	<i>This source provides a set of MICS tools that guide survey teams through each step of the MICS process, which include planning the survey, sampling, constructing questionnaires and indicator lists, and preparing for fieldwork.</i>

44 For more information, please refer to: <https://unstats.un.org/sdgs/files/meetings/iaeg-sdgs-meeting-11/Compilation%20of%20tools.guidance%20of%20existing%20materials%20for%20data%20disaggregation-%20DRAFT.pdf>

45 For more information, please refer to: <https://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/KS-RA-08-003>

46 For more information, please refer to: <https://www.fao.org/3/cb3253en/CB3253EN.pdf>

47 For more information, please refer to: https://www.ilo.org/ipecc/ChildlabourstatisticsSIMPOC/Manuals/WCMS_304559/lang-en/index.htm

48 For more information, please refer to: https://unstats.un.org/iswghs/news/docs/COVID-19_TechnicalGNote_final.pdf

49 For more information, please refer to: <https://blogs.worldbank.org/impacfevaluations/mobile-phone-surveys-understanding-covid-19-impacts-part-i-sampling-and-mode>

50 For more information, please refer to: <https://www.unicef.org/rosa/reports/undertaking-rapid-assessments-covid-19-context>

51 For more information, please refer to: <https://mics.unicef.org/tools>

4. Data collection



4. Data collection

Data collection during the Covid-19 pandemic and beyond requires careful consideration to ensure that the right data is collected to fit decision-maker needs and the local context. Key steps include:

1. Clarify data needs and available data.
2. Determine the data collection approach.
3. Train surveyors.
4. Utilize inclusive and participatory data collection processes when possible.

It is important to note that before data collection begins, a clear data analysis plan is integral. This topic will be discussed further in *Section 6 on data analysis* in the Operational Guide.

4.1. Clarify data needs and available data

Before beginning data collection for the monitoring of hybrid learning, a decision-maker should first identify what data they need, what data they already have, and then work to match the two categories. This action prevents duplication of work and ensures that extraneous time is not spent collecting data that is more detailed than what is required.

UNICEF has identified the following questions to ask:⁵²

- **What are the most important data needs and what is the required level of frequency?** Consider the specific use cases of the data and who it will be utilized by.
- **What existing data do we have? And is it ‘good enough’ for the purpose as is?** Examine what population groups are covered in the existing data. Is the available data sufficient for effective decision-making?
- If gaps remain in data, **what are the opportunities and challenges in existing or emerging data processes / systems that could be improved or pivoted to respond to data needs, shifting scale, focus or frequency — in the short and longer term?** Pinpoint how to leverage and pivot existing data systems to meet these gaps. What investments are required, and by whom?

- If new data collection is needed, and cannot be addressed by strengthening and pivoting existing systems, **what kind of data collection will most fit data needs (including ‘good enough’ quality considerations), type of data requirements, resources, and capacities?** Section 4.2 below on determining the data collection approach expands on this question.
- **How can data investments be developed so that they strengthen more responsive and resilient national data systems and capacities and address responsible data collection on children?** In the wake of the Covid-19 pandemic and other disruptions to education, new risks may arise due to novel data needs and collection approaches.

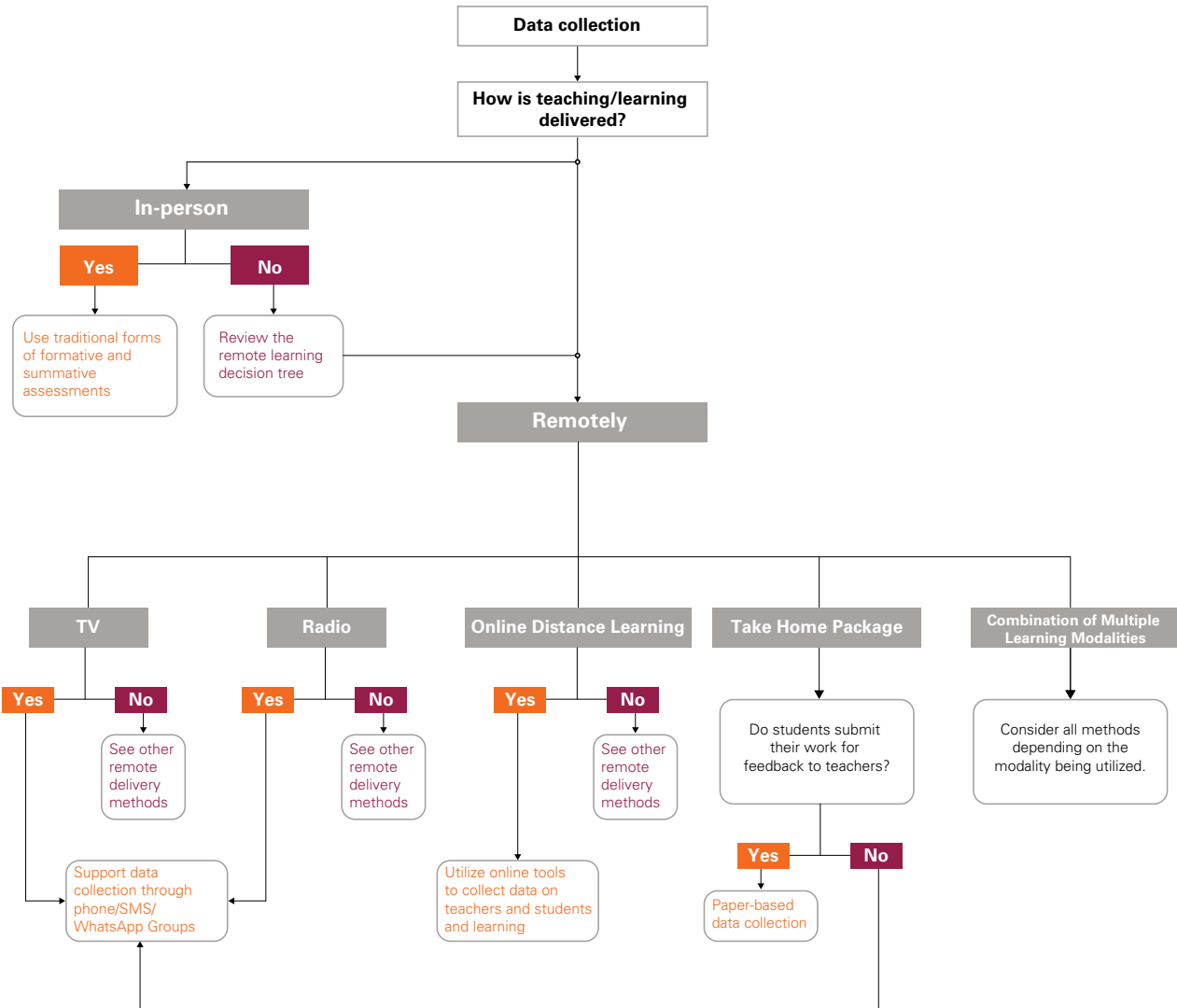
4.2. Determine the data collection approach

After identifying data needs, it is critical to determine whether in-person data collection, remote data collection or a combination of both should be utilized. In some cases, it simply may not be feasible or safe to conduct in-person data collection. To determine the appropriate data collection approach, UNICEF’s decision tree (Figure 8) for data collection can be used.

The decision tree first asks: “how is teaching / learning delivered?” If in-person, a traditional approach to formative and summative assessments can be applied. However, when teaching and learning are occurring remotely or in a hybrid manner, other data collection methods must be considered. To encourage the collection of data from students, teachers, parents and caregivers in these situations, it is useful to align the data collection method with the learning modality. For example, a take-home package of materials may also include a short survey at the end of the student exercises that the student can fill out and drop off at the school, or return to the teacher when they return to in-person classes. For educational television and radio, data collection may instead be administered through phone calls, SMS surveys and / or WhatsApp groups.

52 UNICEF, *Data Collection for COVID-19 Planning and Monitoring for Children*, 2020d.

Figure 8. UNICEF decision tree for data collection modalities.



In cases of emergencies, in-person data collection may not be possible. For example, in October 2020, almost three out of every four National Statistical Offices across all regions were fully or partially halting their face-to-face data collection operations.⁵³ Due to this, ministries of education and NGOs had to move away from face-to-face interviews to remote sources of data collection, including SMS-based surveys, telephone- and web-based data collection.⁵⁴

4.3. Remote data collection instruments

With 3.8 billion people having access to the internet via their mobile devices,⁵⁵ and at the same time 1.3 billion learners aged 3 to 17 not having access to an internet connection in their homes,⁵⁶ a variety of data collection instruments must be considered to address the specific contexts of countries and the needs of the learners, caregivers, and school staff. As noted by USAID, where and when populations do not have

53 UN DESA, *Policy Brief #96: COVID-19: How the data and statistical community stepped up to the new challenges*, 2021.

54 Ibid.

55 GSMA, *The State of Mobile Internet Connectivity 2020*, 2020, p. 5.

56 UNICEF, 'Two thirds of the world's school-age children have no internet access at home, new UNICEF-ITU report says,' 2020f. <https://www.unicef.org/press-releases/two-thirds-worlds-school-age-children-have-no-internet-access-home-new-unicef-itu>



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access to mobile internet, gender, age, and literacy levels should be taken into account when choosing a data collection instrument.⁵⁷ This is because, for example, collecting data from younger learners (aged 10 and below) may pose a challenge because they are still developing vocabulary and comprehension skills.⁵⁸

Considering the virtual nature of remote data collection, the procurement of specific equipment, such as computers, phones, and internet connection may be necessary. Importantly, it is necessary to think about costing and budgeting for these items to ensure the equipment is reliable and can support the collection of information related to hybrid learning.

Below is an annotated list of remote data collection instruments that are phone-based or can be accessed through online web platforms.

1. **Phone Surveys** are an effective method of collecting data without reliance on the internet. There are challenges with the length of phone surveys and scaling them. For rapid information collection, as would be necessary in emergency

situations, this can support school administrators in understanding learning outcomes in learners and learning environments at home during hybrid learning scenarios. Cell phones, dedicated SIM cards, and headsets with microphones would be required for phone interviews.

Box 2. Phone surveys conducted in Ethiopia.

In Ethiopia, USAID conducted remote monitoring through existing phone surveys to gain an enhanced understanding of the socio-economic impacts of Covid-19. They added new questions to existing surveys that other NGO and development partners were able to use to interview their beneficiaries within a relatively short time frame. Through the phone survey, partners were able to adapt their activities to meet evolving needs of beneficiaries.⁵⁹

2. **Interactive Voice Response (IVR)** supports voice responsive data collection through mobile phone surveys. This survey method is good for short surveys and can be used in low-literacy contexts.

57 USAID, *Guide for Adopting Remote Monitoring Approaches During COVID-19*, 2020a, p. 4.

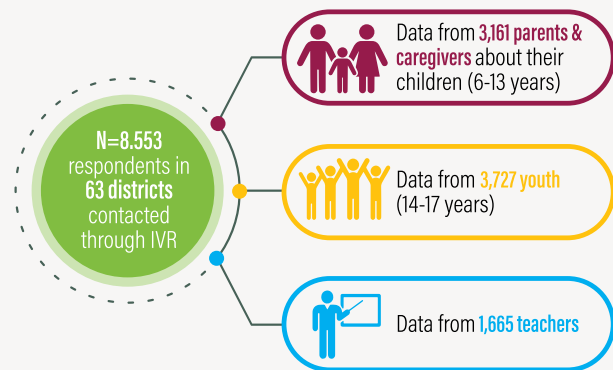
58 N. Borgers, E.D. de Leeuw, and J.J. Hox, 'Children as respondents in survey research: Cognitive development and response quality', *Bulletin de Méthodologie Sociologique*, vol. 66, 2000, pp. 60–75.

59 USAID, *Guide for Adopting Remote Monitoring Approaches During COVID-19*, 2020a, p. 2.

Box 3. Use of IVR in Pakistan.

During school closures in Pakistan, radio, TV, print, and mobile applications were used to maintain learning continuity for students. UNICEF then led a rapid assessment on the access and effectiveness of remote learning. IVR calls were used to survey students, teachers and parents / caregivers.

The assessment identified several barriers to learning, including lack of access to technology, lack of motivation, household chores, and working outside the home.⁶⁰



3. **SMS-based surveys** are remotely administered mobile surveys to collect concise data from general and specific segments of the population (e.g., women, youth, etc.).⁶¹ This method of remote data collection works best when

a substantial proportion of the intended population owns or has access to a mobile phone. That said, a limitation of SMS-based surveys is that it is dependent on access to mobile phones.⁶²

Box 4. SMS-based survey in Botswana.

Young 1ove, a non-governmental organization, and the Ministry of Basic Education in Botswana partnered together to collect over 10,000 parent / caregiver and student phone numbers from schools. During school closures, parents, caregivers, and students were invited to join remote learning pilots through various modalities. Feedback from participants on the remote learning content was then gathered through the use of SMS and IVR.⁶³

4. **RapidPRO**⁶⁴ can support the design, pilot, and scale of SMS-based phone surveys without the use of a software developer. It has been utilized by UNICEF and other UN agencies to rapidly collect information in emergency and non-emergency situations. RapidPRO is the underlying technology behind **UNICEF U-Report**,⁶⁵ which has encouraged youth to engage in data collection.

5. **Mobile Applications** can be used to collect information that is structured and unstructured. For target populations with mobile devices connected to the internet by WiFi or cellular data, mobile applications can be an efficient and effective way to collect data. Utilizing existing mobile applications and ones that require little to no training for surveyors and survey-takers to use is recommended. There are many applications that have been designed for, or repurposed as, data collection tools (e.g., **OpenEMIS Survey**⁶⁶).

⁶⁰ UNICEF, *Brief on Learning Continuity amidst Covid-19 School Closures in Pakistan*, 2020b.

⁶¹ USAID, *Using SMS- and IVR-based Surveys During COVID-19*, 2020b, pp. 1–3.

⁶² Subha Mani, and Bidisha Barooah. 'Phone Surveys in Developing Countries Need an Abundance of Caution,' 2020. <https://www.3ieimpact.org/blogs/phone-surveys-developing-countries-need-abundance-caution>.

⁶³ Noam Angrist et al., 'Practical Lessons for Phone-Based Assessments of Learning,' *BMJ Global Health* vol. 5, no. 7, 2020.

⁶⁴ For more information, please refer to: <https://community.rapidpro.io/>

⁶⁵ For more information, please refer to: <https://www.unicef.org/innovation/U-Report>

⁶⁶ For more information, please refer to: <https://www.openemis.org/products/survey>



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Box 5. Tangerine, a mobile data collection platform.

Tangerine⁶⁷ is a mobile data collection platform that can be used on tablets and smartphones. It records student performance in literacy and numeracy and can be used to support classroom observations and student assessments. It is a key element of a Kenyan initiative, Tusome, which aims to improve primary literacy outcomes for children in grades 1–3.⁶⁸

6. **Web Surveys** are online surveys that can be administered anywhere in the world and can be used to collect information on computers or mobile devices. Common web survey platforms include [Google Forms](https://www.google.com/forms/about/)⁶⁹ and [SurveyMonkey](https://www.surveymonkey.com/).⁷⁰ For web-based surveys (or interviews over virtual meeting platforms), reliable internet, a 4G adapter or a hotspot data plan that can transmit data will be necessary. This would also require at-home electricity to charge devices, whether a phone, tablet, or computer.

4.4. Comparison of data collection modalities and instruments

Across data collection modalities, the cost, ease of administration and whether the sample is representative can vary greatly. For example, face-to-face interviews are often much more costly and difficult to administer due to the logistics required for travel, coordination and, during the Covid-19 pandemic, adequate safety measures. Alternatively, online surveys can be a low-cost and simple way to collect data; however, the sample is often not representative of the population. In other words, only individuals with regular access to the internet in their households, schools and / or communities will be able to participate. Table 1 below outlines additional advantages and disadvantages of remote and in-person data collection instruments that should be considered by decision-makers prior to finalizing a data collection approach. Overall, leveraging existing devices for monitoring and using open-source monitoring resources are integral components of a long-term approach to using data to strengthen systems.⁷¹

67 For more information, please refer to: <https://www.tangerinecentral.org/>

68 RTI, 'Tangerine – Mobile Learning Assessments Made Easy', 2016. <https://www.rti.org/impact/tangerine-mobile-learning-assessments-made-easy>.

69 For more information, please refer to: <https://www.google.com/forms/about/>

70 For more information, please refer to: <https://www.surveymonkey.com/>

71 Saalim Koomar, and Harriet Blest. *Using EdTech to Support Effective Data Monitoring: A Curated Resource List*, 2020.

Table 1. Comparing advantages and disadvantages of data collection modalities.

Modality	Instrument ^{72, 73}	Advantages	Disadvantages	Remote or in-person?
Phone-based	<p>Phone Surveys</p> <p><i>*Note that phone surveys work best when respondents understand the questions and when responses can be compared</i></p>	<p>Works well in low-literacy contexts</p> <p>Not reliant on internet connectivity</p> <p>In most countries, the vast majority of households have access to phones and thus this can lead to a much more representative sample compared to an online or social media run survey</p>	<p>Prone to teacher bias if teachers are collecting data, for example, for questions related to their support and engagement with learners</p> <p>Phones are often not answered on first attempts, and vulnerable people, especially children, are more likely to respond when the enumerator is familiar⁷⁴</p> <p>Requires household number database</p> <p>Call may drop frequently in areas with poor network and will require repeat calls and follow-ups</p> <p>Response dependent on who in the household has maximum access to the phone</p> <p>Surveyors who make the telephone calls will have to be trained to strictly follow the questionnaire</p>	Remote
Phone-based	<p>Interactive Voice Response (IVR)</p>	<p>Works well in low-literacy contexts</p> <p>Can be longer than SMS-based surveys (though shorter than face-to-face ones)</p> <p>In most countries, the vast majority of households have access to phones and thus this can lead to a much more representative sample compared to an online or social-media-run survey</p>	<p>Expensive (depending on desired sample size)</p> <p>Requires household number database</p> <p>Call may drop frequently in areas with poor network and will require repeat calls and follow-ups</p> <p>Response dependent on who in the household has maximum access to the phone</p> <p>Surveyors who make the telephone calls will have to be trained to strictly follow the questionnaire</p>	Remote
Phone-based	<p>SMS-based survey (through RapidPRO)</p>	<p>Similar to phone-based surveys, can lead to a much more representative sample compared to an online or social media survey, especially during emergency situations, lockdowns, and pandemics</p> <p>Data collection can be automated</p>	<p>SMS assumes basic literacy</p> <p>Non-responses from households, particularly if it costs them money to reply to the SMS</p> <p>Restricted survey length and character length of questions and responses, as well as number of responses</p> <p>Multiple answers to a question may not be possible</p> <p>Requires some database of household numbers</p> <p>Access to demographics data might be challenging or restrictive</p> <p>Cost depends on in-house capacity to support the use of RapidPRO</p>	Remote

72 UNICEF ROSA, *Monitoring Distance Learning During School Closures*, 2020c, p. 15 -17

73 For additional information, please refer to: https://www.youtube.com/watch?v=pKE_wESXGdg

74 Tom Kaye, Caspar Groeneveld, and Amreen Bashir, *Monitoring Distance Education: A Brief to Support Decision-Making in Bangladesh and Other Low- and Lower-Middle Income Countries*, 2020.

Phone-based / Online	Web Surveys / Mobile Application / Social Media	<p>Can use social media advertisements to reach households</p> <p>If in-house expertise exists, can avoid having to contract to a survey company (and associated costs)</p> <p>Can be quick to deploy and collect data</p> <p>Data collection can be automated</p>	<p>Leads to under-representation of disadvantaged groups in the population (e.g., low-income households, girls and women, because they are less likely to have access to internet)</p> <p>May be biased towards populations using a specific social media platform or platforms, where the survey is deployed / advertised</p>	Remote
Face-to-face	Visits by teachers	<p>Works well in low-literacy contexts</p> <p>Can be more expensive than other forms of data collection</p> <p>Parents and learners may be likely to be more open to a survey given a past relationship with the teacher</p>	<p>Prone to teacher bias if teachers are collecting data, for example, for questions related to their support and engagement with learners</p> <p>Home visits may not be possible if there are risks (contamination risk during a pandemic or other risks) and / or if teachers have moved away and returned to their home communities</p> <p>Desirability bias tends to be higher in face-to-face surveys</p> <p>Surveyors / teachers will have to be trained on strictly following the questionnaire</p>	In-person

4.5. Training surveyors

To the extent possible, the training of surveyors should be carried out through remote sessions during emergency situations like the Covid-19 pandemic. The training can include sessions on utilizing online meeting platforms like Zoom, Skype, and Google Meet, practicing interview skills and skills to engage hesitant participants. If in-person training is conducted, the following should be considered:

- **Resource availability** — the cost of providing protective measures and conducting socially distanced training is substantially higher than normal training because of the need to reduce the number of participants per room.
- **Protocols** for how the training should be conducted — what rules participants should observe and what to follow if someone is tested positive for the virus during or after training.
- **Venue** — the layout and configuration of which should limit the risk of transmission.
- **Supplies** — the type and quantity of which should help participants protect themselves throughout the training.⁷⁵

4.6. Utilize inclusive and participatory data collection processes when possible

To ensure the needs and gaps of children are addressed and met, inclusive and participatory planning and data collection processes could be undertaken when possible. UNICEF and Save the Children define child participation in decision-making as: “an ongoing process of children’s expression and active involvement in decision-making at different levels in matters that concern them. It requires information-sharing and dialogue between children and adults based on mutual respect, and requires that full consideration of their views be given, taking into account the child’s age and maturity.”⁷⁶ This can be viewed as a form of community-sourced data collection, which incorporates active participation from the audience. It can generate data in a timely and cost-effective manner.

Enabling children (and communities) to lead data collection efforts generates evidence on the everyday lives and needs of children and also showcases how children’s contributions can enhance and extend the research process. Given the disruption in education and learning, including learners in data collection

⁷⁵ Intersecretariat Working Group on Household Surveys, *Planning and Implementing Household Surveys Under COVID-19*, 2020, pp. 12–15.

⁷⁶ Office of the Special Representative of the Secretary-General on Violence against Children, *When children take the lead: 10 child participation approaches to tackle violence*, 2007, p. vii.



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processes can ensure that their experience of how the Covid-19 Pandemic has affected them and their families is taken into account when decision-makers are designing response plans.⁷⁷

Responsible Data for Children (RD4C) covers materials and tools to support responsible data handling for and about children. It covers the following 'P' principles: participatory, professionally accountable, people-centric, prevention of harms across the data life cycle, proportional, protective of children's rights and purpose-driven.⁷⁸

Box 6. Community-sourced data through U-Report in Uzbekistan.⁷⁹

In 2018, UNICEF launched U-Report, a digital platform for youth in Uzbekistan. Through this community-sourced platform, young people can give input on various issues related to education, health, and employment through polls (via SMS, Facebook, and Telegram). The data from U-Report can be used to inform decision-making at the government level.

4.7. Household surveys and hybrid learning

One of the most effective methods of collecting nationally-representative information is to use household surveys, like the Multiple Indicator Cluster Survey (MICS) and the Demographic and Health Survey (DHS). The authors of this Operational Guide note that the integration of hybrid learning into MICS and DHS is an area of further investigation. Household surveys can also be applied to school-level monitoring; for example, school leaders and teachers could conduct a survey with parents on access to devices and infrastructure prior to implementing a hybrid learning initiative. In the Maldives, teachers monitored attendance to online classes using MEMIS (Maldives Education Management Information System). Based on this information, teachers followed up with students who had low attendance rates.⁸⁰

In light of the Covid-19 pandemic, some countries continue to face capacity challenges around remote data collection. This had led the United Nations Statistics Division (UNSTAT) to call for investment in data and innovation to respond to the Covid-19 pandemic and to support the revitalization and acceleration of the Sustainable Development Goals (SDGs).⁸¹ This includes recommendations to fully digitize data collection, instead of using traditional paper-based methods, and to invest in geospatial and statistical information systems to better respond to local contexts.

77 Save the Children, Protect a Generation: *The Impact of COVID-19 on Children's Lives*, 2020, p. 77.

78 UNICEF, and TheGovLab, 'Responsible Data for Children,' (no date). <https://rd4c.org>.

79 UNICEF Innovation, 'Youth Engagement for Positive Social Change,' 2018.

80 UNICEF ROSA, *COVID-19 Situation Report No. 6*, 2020a, p. 8.

81 UNSTAT, *The need for data innovations in the time of COVID-19*, 2021.

4.8. Further reading

Below are additional resources that a decision-maker can refer to on the subject of data collection.

Title	Organization	Description
Planning and Implementing Household Surveys Under COVID-19⁸²	Intersecretariat Working Group on Household Surveys	<i>This note compiles national survey protocol guidance for face-to-face interviews during the Covid-19 pandemic, as well as other guidance from international organizations.</i>
Planning Survey Research⁸³	Oxfam	<i>This toolkit can support decision-makers with sampling design, questionnaire design, primary data collection, and data analysis.</i>
Preparing for Field Data Collection⁸⁴	World Bank	<i>This guidance informs a reader of how to address each component of primary data collection using field surveys. It can be utilized by Ministries of Education to understand the following: how to develop a questionnaire, pilot a questionnaire, recruit a research team, create a budget, develop a data quality plan, obtain ethics approvals, and contract a survey firm.</i>
Preparing for Remote Data Collection⁸⁵	World Bank	<i>Similar to the above resource, this guidance examines the main components of remote data collection (e.g., timelines, approvals, instrument design).</i>
Guide for Adopting Remote Monitoring Approaches During COVID-19⁸⁶	USAID	<i>This guide can be used to understand the requirements of remote data collection, as well as ways to set expectations, guidelines, and protocols to ensure successful collection of information.</i>
Data Collection during COVID-19⁸⁷	Mathematica	<i>These slides contain tools and tips pertaining to equipment, instruments, training, ensuring data quality, etc.</i>
Best practices for conducting phone surveys⁸⁸	J-PAL	<i>This living document is a crowdsourced resource on best practices for conducting surveys online or via phone. It contains strategies for ensuring participants answer the phone as well as ways to keep information and data secure.</i>
Children and Participation: Research, monitoring and evaluation with children and young people⁸⁹	Save the Children	<i>This report covers information on good practices when involving children in research and evaluation. It contains additional detail on carrying out participatory monitoring and evaluation with children and young people.</i>
When children take the lead: 10 child participation approaches to tackle violence⁹⁰	Office of the Special Representative of the Secretary-General on Violence against Children	<i>This document analyzes 10 child participation examples and serves as a resource for child rights practitioners.</i>
ENGAGED AND HEARD! Guidelines on Adolescent Participation and Civic Engagement⁹¹	UNICEF	<i>These guidelines answer the ‘why’, ‘what’ and ‘how’ questions of adolescent participation in data collection.</i>
Promoting children’s participation in democratic decision-making⁹²	UNICEF	<i>This practical guidance summarizes lessons learnt from working with children as partners.</i>
SOPs for Data Collection during COVID-19⁹³	REACH	<i>This guidance outlines Standard Operating Procedures (SOPs) to guide research teams on how to undertake data collection during the Covid-19 pandemic.</i>

82 For more information, please refer to: https://unstats.un.org/iswghs/news/docs/COVID-19_TechnicalGNote_final.pdf

83 For more information, please refer to: <https://policy-practice.oxfam.org/resources/planning-survey-research-578973/>

84 For more information, please refer to: https://dimewiki.worldbank.org/Preparing_for_Remote_Data_Collection

85 For more information, please refer to: https://dimewiki.worldbank.org/Preparing_for_Remote_Data_Collection

86 For more information, please refer to: https://www.usaid.gov/sites/default/files/documents/15396/USAID_Remote_Monitoring_Guide_-_May_2020.pdf

87 For more information, please refer to: https://www.alnap.org/system/files/content/resource/files/annex/Mathematica%20-%20Data%20collection%20during%20COVID-19_tools%20and%20tips.pdf

88 For more information, please refer to: <https://www.povertyactionlab.org/blog/3-20-20/best-practices-conducting-phone-surveys>

89 For more information, please refer to: https://www.participatorymethods.org/sites/participatorymethods.org/files/children%20and%20participation_wilkinson.pdf

90 For more information, please refer to: https://violenceagainstchildren.un.org/sites/violenceagainstchildren.un.org/files/documents/publications/10_cases_of_child_participation_report.pdf

91 For more information, please refer to: <https://www.unicef.org/media/73296/file/ADAP-Guidelines-for-Participation.pdf>

92 For more information, please refer to: <https://www.unicef-irc.org/publications/pdf/insight6.pdf>

93 For more information, please refer to: <https://www.reachresourcecentre.info/wp-content/uploads/2020/05/DataCollectionSOPCOVID-19.pdf>

5. Integrating formative and summative assessments into hybrid learning



5. Integrating formative and summative assessments into hybrid learning

Beyond national monitoring of hybrid learning, monitoring is also necessary at the school and classroom levels. Formative assessments are carried out on a regular basis to gauge learners' progress through observation, quizzes, assignments, and feedback. The feedback allows teachers to evaluate their classroom practices, to ensure that curriculum learning goals are achieved, and to ideally target their instruction to learners' levels. In hybrid learning, both synchronous and asynchronous methods of formative assessment can be used.⁹⁴ Summative assessments are conducted at the end of the school term or year to establish whether learners have achieved the learning goals specified in the curriculum.⁹⁵ Further, summative assessments serve as a tool to analyze the overall effectiveness of an education initiative.

Other learning assessments that can feed into a monitoring approach for hybrid learning include the following.

1. **Large-scale assessments** aim to produce evidence-based information on the education systems' performance and are based on a specific set of standards or learning goals previously defined. Conducted at international, regional, and national levels covering either all students in the target grade or a representative proportion of them.
2. **Examinations** are standardized tests conducted nationally and administered to the entire student population. These results can also be used to assess the performance of schools and teachers in the delivery of quality education.⁹⁶

This section will focus on the use of formative and summative assessments. The approach to formative and summative assessments in hybrid learning contexts is largely dependent on context, platform for delivery of education content and assessments, and teacher / learner engagement.

5.1. Formative assessments in hybrid learning

Four main attributes of formative assessments include:

- **Clarify:** determine what students will learn and how they will know they have learnt it;
- **Elicit:** generate evidence of student learning, such as asking questions;
- **Interpret:** review evidence to determine students' progress towards the learning goal(s);
- **Act:** take instructional next steps to move students from where they are to where they need to be, such as re-teaching using a different mode.⁹⁷

Given the synchronous and asynchronous nature of hybrid learning, the use of formative assessment helps teachers identify the gaps between where students are and where they need to be in order to determine the next steps. There are diverse formative assessment strategies, techniques, and tools for teachers to use in instructional practice within and outside of their classrooms. In hybrid learning, the selection of digital tools to achieve a learning goal can be based on the following strategies:⁹⁸

94 Le Thu Huong, and Yee Ki Au, 'How Can Digital Formative Assessment Help Monitor Student Learning during and after the COVID-19 Era?', 2020. <http://learningportal.iiep.unesco.org/en/blog/how-can-digital-formative-assessment-help-monitor-student-learning-during-and-after-the-covid>.

95 Diego Luna Bazaldua, Victoria Levin, and Julia Liberman, *Guidance Note on Using Learning Assessment in the Process of School Reopening*, 2020.

96 UNESCO IIEP, 'Learning Assessments,' 2021. <https://learningportal.iiep.unesco.org/en/issue-briefs/monitor-learning/learning-assessments>.

97 Smarter Balanced, 'Remote Learning and the Formative Assessment Process,' 2020. <https://smarterbalanced.org/remote-learning-and-the-formative-assessment-process/>.

98 Kathy Dyer, '75 Digital Tools and Apps Teachers Can Use to Support Formative Assessment in the Classroom,' 2021. <https://www.nwea.org/blog/2021/75-digital-tools-apps-teachers-use-to-support-classroom-formative-assessment/>.

- Record audio and video (e.g., [Animoto](#)⁹⁹)
- Create quizzes, polls, and surveys (e.g., [Kahoot](#)¹⁰⁰)
- Brainstorm, mind map, and collaborate (e.g., [Miro](#)¹⁰¹)
- Present, engage, and inspire (e.g., [Typeform](#)¹⁰²)
- Generate word or tag clouds (e.g., [EdWordle](#)¹⁰³)
- Get real-time feedback (e.g., [Mentimeter](#)¹⁰⁴)
- Foster family communication (e.g., [Remind](#)¹⁰⁵)
- Strengthen teacher-to-student or student-to-student communication (e.g., [Biblionasium](#)¹⁰⁶)
- Keep the conversation going with live chats (e.g., [Backchannel Chat](#)¹⁰⁷)
- Create and store documents or assignments (e.g., [Google Forms](#)¹⁰⁸)

In general, appropriate use of digital formative assessments can enable real-time data collection that supports rapid and efficient decision-making. However, this requires access to technology and adequate digital capacities of teachers and learners to employ the tools. Without a robust infrastructure in place (including devices, internet access and digital competencies), the digital tools listed above will have limited usability. During hybrid / remote learning, options for formative assessments can be more limited, especially in contexts where the primary form of communication takes place through mobile devices (non-smartphones).¹⁰⁹ Despite these challenges, formative assessments continue to be a valuable channel for teachers to identify learning gaps and monitor and support their students.

In low-connectivity and low-resource contexts, decision-makers may wish to consider alternative forms of digital formative assessments, such as:¹¹⁰

- phone-based platforms that can be accessed offline (e.g., [Cell-Ed](#)¹¹¹)

- text messaging platforms (e.g., WhatsApp)
- other low-tech solutions (e.g., working with parents to administer assessments)

Box 7. Hybrid learning assessments in South Korea.

In South Korea, a hybrid learning model was implemented following school reopenings in 2020. To reflect this model, assessments were administered both in the classroom and online. Under this hybrid learning model implemented in South Korea, student assessments take place both in the classroom and online. Paper-based assessments are used in the classroom when students attend classes in person. When classes are online, formative assessments using online presentations, discussions, or student class participation are implemented.¹¹²

5.2. Summative assessments in hybrid learning

Summative assessments are typically administered at the end of a school year and can provide a high-level snapshot of how much students are learning through a hybrid learning program. These assessments can also be used by teachers to adjust their instructional methods. Decision-makers should carefully consider how equity may factor into the administration of summative assessments in a hybrid learning environment. For example, choosing to administer a summative assessment via a computer-based and online format may exclude certain students that do not have access to devices or the internet.

99 For more information, please refer to: <https://animoto.com/>

100 For more information, please refer to: <https://kahoot.com/>

101 For more information, please refer to: <https://miro.com/education-whiteboard/>

102 For more information, please refer to: <https://www.typeform.com/examples/polls/>

103 For more information, please refer to: <http://www.edwordle.net/>

104 For more information, please refer to: <https://www.mentimeter.com/>

105 For more information, please refer to: <https://www.remind.com/>

106 For more information, please refer to: <https://www.biblionasium.com/#tab/content-fall-picks>

107 For more information, please refer to: <https://backchannelchat.com/>

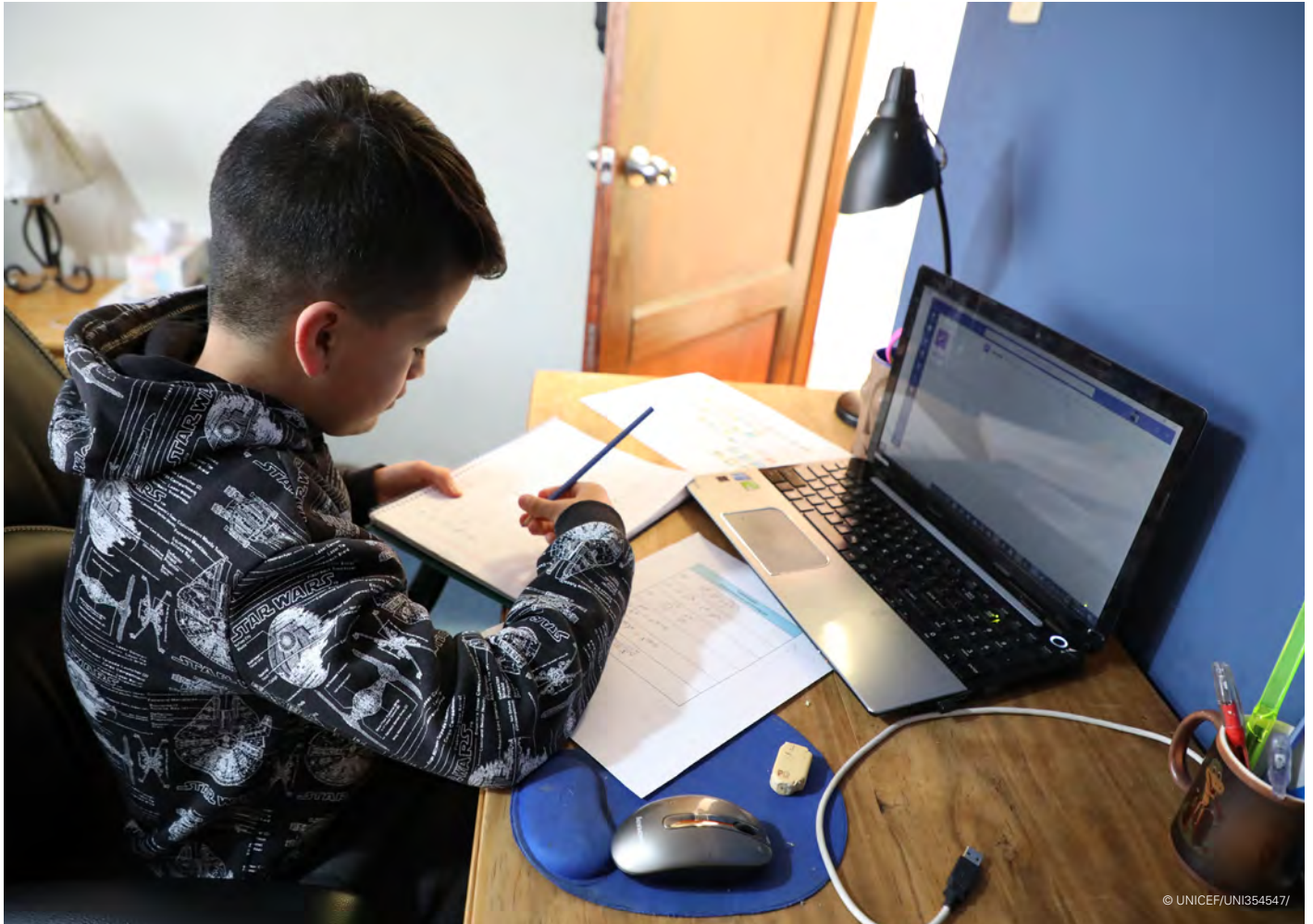
108 For more information, please refer to: <https://www.google.com/forms/about/>

109 UNICEF ROSA, *Guidance on distance learning modalities to reach all children and youth during school closures*, 2020b.

110 Le Thu Huong, and Yee Ki Au, 'How Can Digital Formative Assessment Help Monitor Student Learning during and after the COVID-19 Era?', 2020. <http://learningportal.iiep.unesco.org/en/blog/how-can-digital-formative-assessment-help-monitor-student-learning-during-and-after-the-covid>

111 For more information, please refer to: <https://www.cell-ed.com/>

112 Diego Luna Bazaldua, Victoria Levin, and Julia Liberman, *Guidance Note on Using Learning Assessment in the Process of School Reopening*, 2020.



As a result, decision-makers must carefully consider questions of availability, access, and usage through the hybrid learning indicators and relevant data collected (please see the [full list of indicators here](#)). Such data can support decisions on whether summative assessments should be postponed until students are able to return to school, or if other formative assessments would suffice instead.¹¹³ During hybrid learning scenarios, decision-makers may also wish to consider alternative forms of assessment. This might look like open book / open note exams and creative options, instead of major exams and traditional papers.¹¹⁴

Box 8. Summative assessments in São Paulo.

In light of school closures and reopenings during 2020, São Paulo's state Ministry of Education encouraged teachers and schools to adapt summative assessments to reflect the content that was actually taught during the school year. Summative assessments were implemented in person. In general, when disruptions to schooling occur, the administration of summative assessments may shift slightly to better reflect the content that was taught and avoid causing additional stress to students and parents / caregivers.¹¹⁵

113 UNICEF EAPRO, *Guidance: Assessing and Monitoring Learning During the Covid-19 Crisis*, 2020.

114 Center for Teaching Excellence, *Alternative Assessment Guide for Hybrid/Online Teaching*, 2020.

Diego Luna Bazaldua, Victoria Levin, and Julia Liberman, *Guidance Note on Using Learning Assessment in the Process of School Reopening*, 2020

5.3. Recommended next steps for ministries of education

The World Bank recommends the following steps for a ministry of education to carry out formative and summative assessment practices. Such practices can be integrated into a hybrid learning approach.¹¹⁶

Recommended step	Application to hybrid learning
1. Identify curriculum content for inclusion in formative and summative assessment guidelines, prioritizing core subjects.	<i>Ensure that the formative and summative assessments reflect the content tailored for all components of the hybrid learning program (e.g., in-person vs remote, asynchronous vs synchronous).</i>
2. Develop formative and summative classroom assessment guidelines and teacher training modules on effective classroom assessment practices.	<i>Teacher training modules may also be administered using a hybrid model (in-person vs remote), based on the local context.</i>
3. Provide formative and summative classroom assessment guidelines to teachers with various supporting materials and training opportunities.	<i>To provide teachers with ongoing support, consider setting up informal groups (e.g., WhatsApp) for teachers to connect and share insights.</i>
4. Support teachers to incorporate formative assessment activities to monitor students' ongoing progress towards the achievement of the curriculum-based learning goals.	<i>Provide information on approaches and tools for teachers to administer formative assessments both in-person and remotely.</i>
5. Once teachers and students reach certain curriculum-based learning goals, such as concluding a specific learning unit or reaching a school-year milestone, teachers should engage in summative classroom assessment that covers learning content in a cumulative manner.	<i>Ensure that summative assessments are administered in an equitable format, such that students are able to access and complete the assessment.</i>

5.4. Further reading

Below are additional resources that a decision-maker can refer to on the subject of formative and summative assessments.

Title	Organization	Description
Formative Assessment in Distance Learning¹¹⁷	Edutopia	<i>This article covers good practices for conducting formative assessment in distance learning. Good practices are linked to topics such as matching the purpose of assessments to the tools that are used and collecting data over time.</i>
Formative Assessment During Distance Learning: Recapturing "In-the-Moment" Observations that Inform Instruction¹¹⁸	Washington Office of Superintendent of Public Instruction	<i>This note responds to the following questions: "What does formative assessment look like during distance learning?" and "Without proximity, how can teachers gather and act on "in-the-moment" information?"</i>

¹¹⁶ Ibid.

¹¹⁷ For more information, please refer to: <https://www.k12.wa.us/sites/default/files/public/ela/assessment/pubdocs/Formative%20Assessment%20During%20Distance%20Learning.pdf>

¹¹⁸ For more information, please refer to: <https://www.k12.wa.us/sites/default/files/public/ela/assessment/pubdocs/Formative%20Assessment%20During%20Distance%20Learning.pdf>



6. Data analysis



6. Data analysis

Following data collection, data analysis should take place. A data analysis plan is critical at the onset of any monitoring exercise (i.e., during initial design phases). It provides information on how the collected data will be analyzed and by which individuals / organizations. Creating an analysis plan is an important way to ensure that you collect all the data you need and that you use all the data you collect.¹¹⁹ Researchers will then need to summarize the collected information for interpretation and presentation to others.¹²⁰

The main tasks of data analysis include:

1. Creating an analysis plan
2. Managing data
3. Analyzing and interpreting the data

These three steps should ultimately culminate in the transformation of data into action.

Box 9. Example DAP for hybrid learning scenario.

For example, let's say a researcher is looking to uncover the impact of a new hybrid learning program (in-person classes supplemented by educational television) on numeracy outcomes. A simple DAP may look like:

1. Background

- In the wake of Covid-19 and the implementation of remote and hybrid learning models, it is necessary to monitor programs to ensure that children are learning.
- Monitoring these programs can also help government officials, teachers, community organizations, and others iterate upon and improve the programs.

2. Aims

- To examine the impact of educational television on literacy outcomes for children aged 5–12. Data will be disaggregated by gender and age.
- Research hypothesis: children watching 30 minutes of educational television episodes on mathematics will exhibit significant gains in numeracy outcomes after 3 months compared to children who are not watching the episodes.

3. Methods

- Data source: classroom quizzes and assessments (school database)
- Study measures:
 - exposure variable: amount of time spent watching educational television
 - outcome variable: numeracy outcomes
 - how missing data will be dealt with: exclusion
 - Software: R version 4.1.1

4. Planned figure

Bar chart comparing numeracy outcomes between children who participated in the hybrid learning program and children who did not participate.

119 CDC, *Creating an Analysis Plan*, 2013.

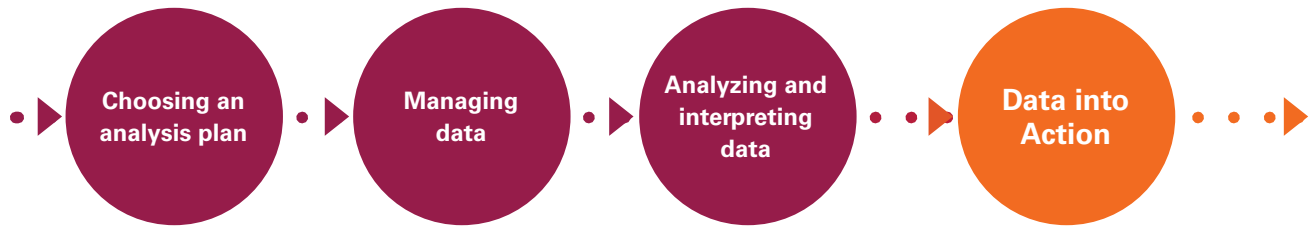
120 Scot Simpson, 'Creating a Data Analysis Plan: What to Consider When Choosing Statistics for a Study,' *The Canadian Journal of Hospital Pharmacy*, 2015.

6.1. Creating an analysis plan

A data analysis plan (DAP) contains the following components:

1. **Background** This section should identify the rationale for monitoring hybrid learning and research questions.
2. **Aims** This section includes research hypotheses.
3. **Methods** The methods section is the main part of the DAP. It covers information on the data sources, study measures, and inclusion / exclusion criteria (e.g., if only data for children will be used). The researcher should also outline the software and version number they plan to use for the analysis.
4. **Planned (dummy) tables and figures** Dummy tables, also referred to as table shells, outline a table that will be used to present results. The empty cells of the dummy table will be populated after the data analysis.¹²¹

Figure 9. Data analysis: three steps for transforming data into action.



After developing the DAP, Table 2 below (also known as a data dictionary) may serve as a supplement to map relevant indicators to the variables / data to be collected and analyzed. A data dictionary contains metadata about the data to be

collected (e.g., data unit, source of data) and is used to capture the structure and content of the data.¹²² Importantly, the format can be contextualized and configured based on the specific requirements and needs of the ministry of education.

Table 2. Example data dictionary.

	Name of Indicator	Unit	Disaggregations	Data Collection (Method/ Tool)	Sources/ Means of Verification	Periodicity of Data Collection	Data Reporter	Data Analyst
Ex	Children with access to internet connection	Number	Age, Gender, Level of Education, Location, Religion	RapidPro	UNICEF U-Report	Monthly	Person 1	Education Planner

¹²¹ Emily Banks, Ellie Paige, and Tanya Mather. *Developing a Quantitative Data Analysis Plan for Observational Studies*, 2013, pp. 3–4.

¹²² USGS, 'Data Dictionaries,' (no date). <https://www.usgs.gov/data-management/data-dictionaries>.

The table columns include:

- **Unit** — Demonstrates how an indicator will be measured (e.g., percentage, number, yes / no, etc.)
- **Disaggregations** — Highlights how the indicator will be broken down to understand the specific situation and context of subgroups within a larger population.
- **Data Collection (Method / Tool)** — Identifies specific methods and tools that have been utilized to collect information and supports verification of data if there are discrepancies.
- **Sources / Means of Verification** — To ensure accountability and transparency, information like ‘data sources,’ or ‘means of verification,’ are critically important to ensure that the data is valid and properly sourced.
- **Periodicity of Data Collection** — Supports an understanding of how often data will be collected, processed, cleaned, and potentially disseminated.
- **Data Reporter** — This helps to identify the person(s) responsible for uploading information into a particular system or file, and helps with validation and verification of data.
- **Data Analyst** — Identifies the person(s) responsible for supporting the translation of the data from raw information to make it usable for dissemination and decision-making purposes.

Data collected for hybrid learning indicators can be disaggregated by:

- gender (highly recommended)
- age (highly recommended)
- wealth status
- migration experiences
- disability
- school type
- other dimensions that can capture potential marginalization.¹²³

6.2. Managing the data

The first step to managing the data is to create a working copy of the dataset. This step enables the researcher to have a backup copy of the data, in case certain data points are accidentally erased or displaced. Following this step, it is necessary to clean the data in the working file.¹²⁴ Data cleaning

fixes or removes incorrect or duplicate data within a dataset. It is especially important when combining several data sources into one master file. Data entry errors may be caused by:

- lack of consistency between forms (e.g., different layouts),
- open-answer fields
- absence of data validation checks (e.g., checking for double data entry).¹²⁵

Though the data cleaning process varies based on the collected information, general steps may include:¹²⁶

1. Removing duplicate or irrelevant observations.
2. Fixing structural errors such as typos, incorrect capitalization, etc.
3. Filtering unwanted outliers.
4. Handling missing data.
5. Validating questions such as ‘does the data make sense?’ and ‘can you find trends in the data to help you form your next theory?’

By referencing common items across databases, the accuracy of the collected data can be verified. UNICEF And UIS provide the following example, “If a social security card number matches in another database, but the name does not, there is a data-entry error which could be further resolved by examining additional fields in common.” In general, forms that are scanned automatically are less likely to generate errors.¹²⁷ For phone or SMS surveys, responses are often compiled automatically, preparing a raw database that is ready for analysis.¹²⁸

6.3. Analyzing and interpreting the data

Once the DAP has been developed and the data collected and managed, the raw database can be analyzed and interpreted. Data analysis methodologies vary greatly, depending on the methods and planned tables and figures listed in the DAP. Using software such as R or SAS, the data analysis can examine various dimensions of the data to uncover new perspectives.

Following data analysis, a researcher should interpret the data in a way that is most useful for the intended audience. For example, when reporting on the results of a hybrid learning program to a government official, a researcher may wish to

¹²³ UNICEF ROSA, *Monitoring Distance Learning During School Closures*, 2020c, p. 10.

¹²⁴ CDC, *Creating an Analysis Plan*, 2013, p. 7.

¹²⁵ UNICEF, *Monitoring Education Participation*, 2016, p. 30.

¹²⁶ Tableau, ‘Guide To Data Cleaning: Definition, Benefits, Components, And How To Clean Your Data,’ (no date). <https://www.tableau.com/learn/articles/what-is-data-cleaning>.

¹²⁷ UNICEF, *Monitoring Education Participation*, 2016, p. 45.

¹²⁸ UNICEF ROSA, *Monitoring Distance Learning During School Closures*, 2020c, p. 25.

focus on messages related to equity and whether select groups are not being reached and / or benefiting from the program. Key findings can be conveyed visually; however, it is also necessary to ensure that there is minimal room for misinterpretation of the data. The following questions should be considered when reporting data:

- Why is the data included?
- What are the key messages that the data should convey?
- Which type of analysis needs to be applied to understand and interpret the data?

To ensure that the data is easy to interpret, a researcher may wish to prototype the design with a test audience. This action would help ensure that the audience interprets the data as intended. Various design elements, such as colors and graphs can be used to present the data in an engaging format. For example, UNICEF Innocenti displays household ownership of

radios across countries in seven regions around the world in Figure 10 below. The graph indicates the minimum, median and maximum levels of ownership across countries in a region; the use of colors and dots to indicate median values positions the graphic for easy interpretation.

Some common outputs of this step include:

- tabular reports
- tables, maps, and graphs supported with narrative analysis
- interactive data dashboards
- static administrative area profiles
- infographics
- data stories.

Each output has advantages and disadvantages. The selection of an output should be linked back to the intended audience and expected use of the data.

Figure 10. Household ownership of radios across countries.¹²⁹



n = number of countries

129 Thomas Dreesen et al., *Promising Practices for Equitable Remote Learning. Emerging Lessons from COVID-19 Education Responses in 127 Countries*, 2020, p. 4.

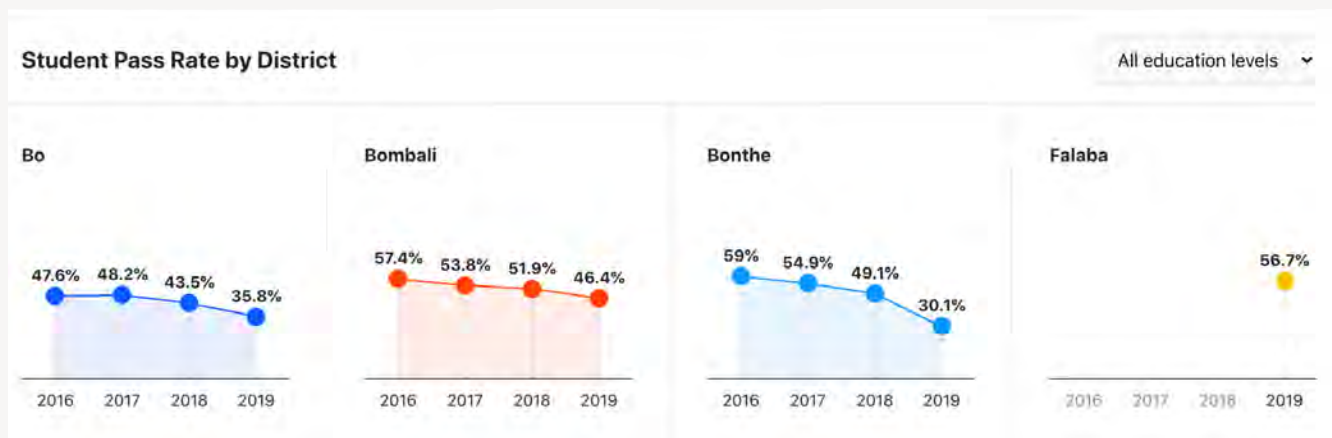


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Box 10. Data visualization through the Government of Sierra Leone Education Data Hub.¹³⁰

The Government of Sierra Leone Education Data Hub was launched in September 2019 by the Directorate of Science, Technology and Innovation (DSTI) and the Ministry of Basic and Senior Secondary Education (MBSSE). It connects data from the annual school census and national examination results to support education data monitoring and data use for decision-making. The Data Hub contains a school directory, key performance metrics and an indicator map that can be accessed and easily interpreted by government officials, teachers, parents, communities, students, NGOs, and others.

For example, the screenshot below from the Data Hub visualizes student pass rates by district, between 2016–2019.



¹³⁰ Government of Sierra Leone, 'DSTI Education Data Hub,' (no date). <https://educationdatahub.dsti.gov.sl/>.

6.4. Further reading

Below are additional resources that a decision-maker can refer to on the subject of data analysis.

Title	Organization	Description
Education sector analysis and data literacy ¹³¹	UNICEF	This UNICEF course includes nine modules covering key concepts on education sector analysis and data literacy.
MICS – Education Analysis for Global Learning and Equity ¹³²	UNICEF	MICS-EAGLE is designed to (1) build national capacity for education sector situation analysis and sector plan development and (2) conduct data analysis at the national, regional, and global levels.
Education Sector Analysis Methodological Guidelines (Vol. 1–3)	UNESCO	These guidelines provide methods for comprehensive education sector analyses to support the preparation and monitoring of education sector plans. The guidelines are split into three volumes: (1) sector-wide analysis , ¹³³ (2) sub-sector specific analysis , ¹³⁴ and (3) thematic analyses . ¹³⁵
Using Data to Guide School Improvement ¹³⁶	North Central Regional Educational Laboratory	This newsletter edition offers practical guidance on the use of data and data analysis planning to guide school improvement.
Data Exploration: A Journey to Better Teaching and Learning ¹³⁷	US Department of Education	This multimedia package contains a 20-minute video featuring two schools that have used data and data-based processes to build and maintain school cultures of continuous improvement. In the video, educators and administrators in each school clearly articulate the ways they use data to improve learner achievement.

¹³¹ For more information, please refer to: <https://agora.unicef.org/course/info.php?id=23561>

¹³² For more information, please refer to: <https://data.unicef.org/resources/mics-education-analysis-for-global-learning-and-equity/>

¹³³ For more information, please refer to: <http://www.iiep.unesco.org/en/publication/education-sector-analysis-methodological-guidelines-vol-1-sector-wide-analysis-emphasis>

¹³⁴ For more information, please refer to: <http://www.iiep.unesco.org/en/publication/education-sector-analysis-methodological-guidelines-vol-2-sub-sector-specific-analysis>

¹³⁵ For more information, please refer to: <http://www.iiep.unesco.org/en/publication/education-sector-analysis-methodological-guidelines-vol-3-thematic-analyses>

¹³⁶ For more information, please refer to: <https://files.eric.ed.gov/fulltext/ED518630.pdf>

¹³⁷ For more information, please refer to: https://archive.org/details/ERIC_ED476386

7. Data quality assurance



7. Data quality assurance

A data quality assurance approach needs to be established for any national EMIS and / or system for data collection to monitor hybrid learning. This approach may include various activities including:

- Standardizing the data collected in conformance with international guidelines;
- Customizing the data collected to meet national development priorities in education;
- Collating data from various sources for a holistic analysis of the education system (e.g., data from national ID registration, national education budgets, and data on institutions, staff, and learners);
- Capturing indicator metadata (e.g., method of calculation, limitations);
- Establishing naming conventions and unique IDs for administrative areas and institutions;
- Establishing policies, criteria, and methods for detecting and correcting data nonconformity.

The UNESCO Ed-Data Quality Assessment Framework (Ed-DQAF) provides a detailed account of how to evaluate administrative routine data systems.¹³⁸ In addition, the World Bank Systems Approach for Better Education Results (SABER) further elaborates on the systems approach for improved education results.¹³⁹

This section outlines the four domains that make up the data quality assurance framework:

1. Enabling environment
2. System soundness
3. Data quality
4. Utilisation and decision-making



7.1. Enabling environment

An enabling environment that supports data quality assurance includes the following:

- **Work procedures and policies**
A well-established work procedure explains the data flow across all levels of education and, if supported by policies and legislation, lends itself to an effective EMIS work environment.
- **Institutional processes and linkages**
Clarity in institutional processes and linkages within and across sectors improves efficiency in work processes.
- **Human resource capacity**
Equipping individuals working in data quality assurance with the necessary skills ensures that data can be easily standardized, captured, and customized.
- **Demand-driven data**
It is important that actors understand and appreciate the importance of the EMIS environment and its application.

¹³⁸ UNESCO Institute for Statistics, *Ed-Data Quality Assessment Framework (Ed-Dqaf) to Evaluate Administrative Routine Data Systems: Manual for the Conduct of an Evaluation by a National Technical Team*, 2015.

¹³⁹ World Bank, 'Systems Approach for Better Education Results (SABER)'; (no date). <https://www.worldbank.org/en/topic/education/brief/systems-approach-for-better-education-results-saber>

7.2. System soundness

Components of system soundness include the following:

- **IT solutions**

Diversity in IT solutions improves system soundness. For example, an education system may have IT solutions that are integrated into the overall government central database system.

- **Data automation and coverage**

The automation of EMIS systems vary across education subsectors. Many countries use manual procedures supported by partial automation.

- **Access to data and reports**

Understanding how end-users can access data and reports is important. Many countries report limited data access, in addition to limited knowledge on data extraction techniques and accessible reports.

Box 11. 2017 SABER Country Report for Ukraine.¹⁴⁰

In the 2017 SABER Country Report for Ukraine, the World Bank identified Ukraine's enabling environment as "established." The Institute of Educational Analytics (IEA) was established by the Ministry of Education and Science to collect and analyze education data. The work of the IEA follows the legal framework of ministerial orders, decrees and charters; these work procedures and institutional processes ensure that data from primary and secondary schools is captured and vetted. However, with regard to human resource capacity, challenges linked to recruitment and retention of qualified staff remain.

7.3. Data quality

For data quality, the following points (also discussed in the data collection and data analysis sections) are of utmost importance:

- **Data collection procedures**

Clear mechanisms should be in place to guide the data collection.

- **Data accuracy and reliability**

Confirming that data is reliable and robust may include (1) detection of data outliers by automatically scanning data falling outside of preset limits; (2) detection of missing data; and (3) analysis of latent data and the most recent data available for a given indicator.

- **Data frequency and timeliness**

A ministry of education should specify the frequency and / or periodicity of the data collection. This also helps to establish timelines and a set validation process to address the discrepancies.

7.4. Utilization and decision-making

The key elements of utilization and decision-making to be enforced by a ministry of education include:

- **Access rights to users**

The right users should be able to access EMIS databases, to undertake downstream operations and the planning and management of the different service provisions. However, in various contexts, the sharing of information across the practitioners can be weak.

- **Availability of reports in dashboard**

Incorporating reports within the dashboard provides a broad range of users with the opportunity to utilize the data.

- **Effective use of EMIS**

The lack of staff data extraction and analysis skills can hinder data utilization. Key personnel may be aware of planning tools and models but require further training.

Box 12. 2017 SABER Country Report for Tajikistan.¹⁴¹

In the 2017 SABER Country Report for Tajikistan, the World Bank identified Tajikistan's utilization and decision-making as "emerging." The main user of the EMIS data is the government, as other stakeholders cannot fully access the EMIS data. Most stakeholders outside of the central government are not able to access the EMIS due to limitations in training and Internet connectivity.

¹⁴⁰ World Bank, *Ukraine SABER Country Report*, 2017.

¹⁴¹ World Bank, *Republic of Tajikistan SABER Country Report*, 2017.



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7.5. Further reading

Below are additional resources that a decision-maker can refer to on the subject of data quality assurance.

Title	Organization	Description
Ed-Data Quality Assessment Framework (Ed-DQAF) to Evaluate Administrative Routine Data Systems ¹⁴²	UIS	This manual includes instructions and information on conducting Data Quality Assessment (DQA) for EMIS and other education data systems.
Systems Approach for Better Education Results (SABER) ¹⁴³	World Bank	SABER aims to produce comparative data on education systems and policies. SABER's EMIS policy domain includes the topic of data quality assurance.

¹⁴² For more information, please refer to: http://uis.unesco.org/sites/default/files/documents/training-workshop-manual-data-quality-assessment-framework-2017-en_0.pdf

¹⁴³ For more information, please refer to: <https://www.worldbank.org/en/topic/education/brief/systems-approach-for-better-education-results-saber>



8. Integrating hybrid learning in Education Management Information Systems



8. Integrating hybrid learning in Education Management Information Systems

The first part of this section provides the reader with a high-level overview of EMISs, covering topics including the national structure of EMISs, the EMIS information cycle, and the future of EMISs. The second part discusses the following steps in the integration of hybrid learning in EMISs:

1. Identification of information needs
2. Inventory of available sources and data collection
3. Data management
4. Data dissemination
5. Data quality and feedback loops.

Some of the content in this section has strong ties and / or overlaps to other sections in this Operational Guide. As needed, the reader is welcome to reference other sections to supplement the information included below.

8.1. Overview of Education Management Information Systems (EMISs)

An Education Management Information System (EMIS) is a framework for collection, integration, processing, maintenance, and dissemination of data and information to support policy formulation, planning, and management at all levels of an education system. More than just a technology, an EMIS is a system of people, technology, models, methods, processes, procedures, rules and regulations that function together to provide relevant, reliable, unambiguous, and timely data and information to decision-making.¹⁴⁴

UNESCO [...] notes that “Education Management Information Systems (EMISs) around the world are at different stages of maturity in design, deployment, and use of data. In many countries, EMIS is established for purely monitoring and

statistical roles through the collection and reporting of students and teachers’ profiles. In some countries, EMIS is evolving into a comprehensive, integrated and dynamic education management solution.”¹⁴⁵ There is increasing demand for the right education data, for data-driven decisions and for a system to manage education statistics. The complexity of education data calls for a comprehensive and structured solution (i.e., a system that collects, maintains, and disseminates timely and relevant information). In using a well-designed EMIS, data-driven planning has the potential to result in effective allocation of resources and may improve efficiency in an education system.

8.1.1. EMIS structure

The establishment of an EMIS is to provide national education authorities with a dedicated and effective system to compile education data and to process, report, and disseminate it for education diagnosis and planning.¹⁴⁶ An EMIS also provides data for monitoring and evaluation of the educational achievements in program implementation. For a comprehensive and holistic EMIS, usually, a needs assessment is conducted to inform the structure and flow of data and information including the IT requirements in networking and data management. A national EMIS consists of databases of a computerized statistical information system or an administrative function-specific database.

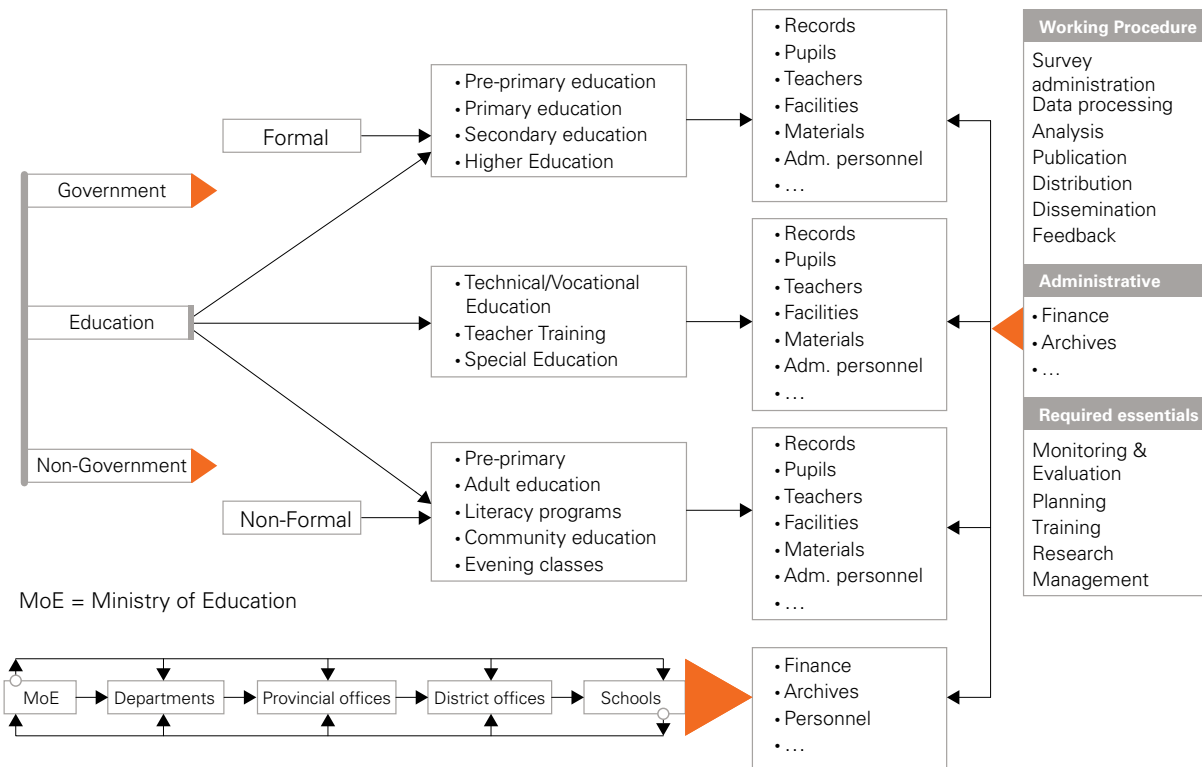
In a decentralized system, the EMIS building blocks cover diverse data sets that include: education institutions, learners, teachers, infrastructure, and finances, among others, at national, regional, local, and school levels. An effective EMIS requires information flow across different levels of education and stakeholders (see Figure 11 below).

144 UNESCO, ‘Education Management Information System’, 2019.

145 UNESCO, *International seminar on Re-imagining the future of Education Management Information Systems*, 2021a, p. 1.

146 UNESCO, *Module 3: Improving Education Management Information Systems (EMIS)*, (no date).

Figure 11. EMIS information flow across stakeholders.¹⁴⁷



8.1.2. Information management cycle

The EMIS information management cycle covers the following steps required to gather data, process it, and report results back to users. It is a cyclical process, as shown in Figure 12 below.

1. Data collection

The data collection stage of an EMIS management cycle covers review of instruments, pre-testing, printing, distribution, and follow-up. The review of the school census questionnaire is to allow for adjustment of new data needs to address the priorities in education planning. The instruments are then pre-tested and once approved, they are printed. Ideally, a circular is prepared and sent to the school managers, and the questionnaires distributed with a specified period for the data collection exercise. The ministry official(s) schedule a follow-up to ensure a high response rate or to attain a 100% response rate.

To ensure data quality, the following actions are required.

- Ascertaining the school census coverage by determining the number of both public and private schools for each education subsector for computing the questionnaire return rate.
- A strong quality-control mechanism involves sampling schools to conduct data reliability by head counting and triangulation, as well as conducting manual data validation and cleaning of the questionnaires.
- Ensuring effective education institutions record reference documents for completing the annual school census.
- Aligning school records management with the school census questionnaire.
- Using national standards that are applicable to all schools.
- Including a summary records template in the school questionnaire.

2. Data processing

The stage of data processing is informed by the data requirements, program design, program testing, implementation, and maintenance. A data capture system is developed with front-end user-friendly data entry templates.

147 Tegegn Nuresu Wako. *Education Management Information Systems (EMIS): An Overview*, 2003.

The system is used for data entry to capture data that has been collected and the processed data is stored in a database. A database is a collection of information that is interlinked and organized in a systematic manner in one or more files. For example, an educational database may include:

- A data file called 'schools', containing the identification of the regions and the schools, the number of pupils and teachers, the number of qualified teachers, the number of toilets, the number of classrooms, the surface area of the classrooms, etc.
- A file called 'teachers', containing identification details of teachers, their gender, age, general educational background, etc.

The personnel conducting data entry must be trained to ensure data quality. Data quality is enhanced by

- avoiding double-counting for shared facilities, teachers teaching in public and private schools
- checking for missing data and missing schools and providing for estimation of missing data.

3. Data analysis

Data analysis encompasses the data requirements, visualisation, compilation, and reporting. The focus of the data requirements is to compile education statistics and indicators useful in tracking the performance of the educational interventions. For example, tracking trends in enrolment, transition rates, retention rates, dropout rates, etc.

Data visualisation involves using a graphical presentation of the data, which can then be used in data interpretation. Tabulated and visual data presentation is used in report development.

4. Publication

Publication involves putting together, formatting, and publishing the data. This involves design of various formats of publication. The publications can be in the form of statistical booklets, brochures, and flyers.

5. Dissemination

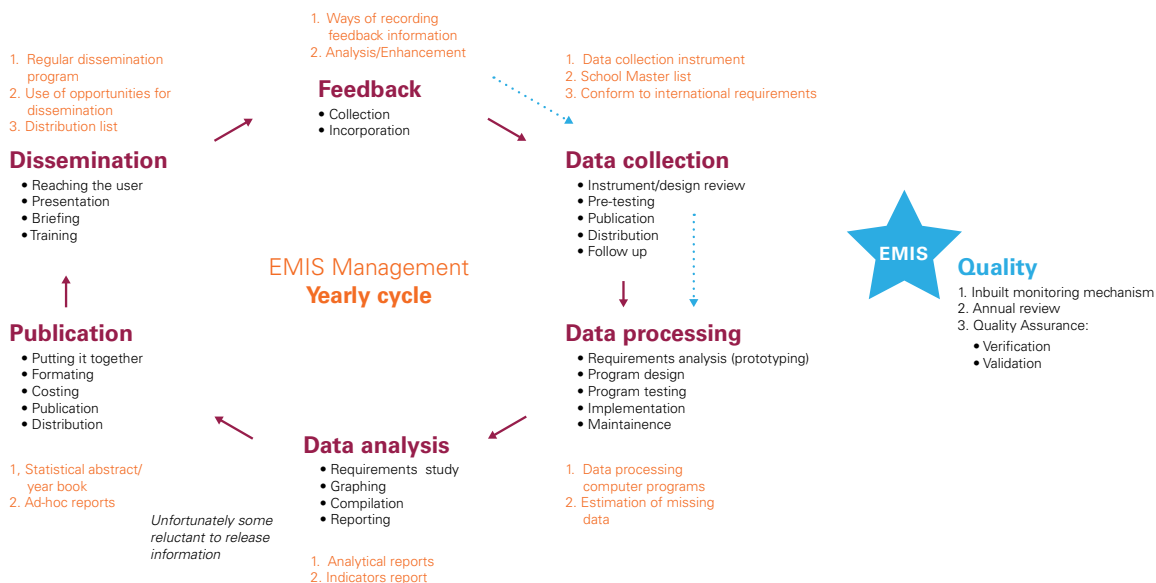
Dissemination includes contacting users, holding workshops, and distributing both print and online materials. Dissemination is used to inform the issues to be addressed in an education system, as well as the gaps in data for monitoring an education system. Such feedback contributes to:

- helping to improve measures of quality and efficiency in education management,
- planning for the improvement in education service delivery,
- creating an effective EMIS for reporting findings at all education levels,
- enhancing knowledge in the linkage of education outputs in the national economic development.

6. Feedback

Feedback allows for receiving input and incorporation of data needs in the next EMIS cycle.

Figure 12. EMIS Information cycle.¹⁴⁸



148 Ibid.

8.1.3. Future of an EMIS

The steps above cover a traditional EMIS information management life cycle. However, many countries are now upgrading from a traditional to a technology-driven EMIS. Modern EMIS technology can tap the vast amounts of education data collected through various applications and processes, day-by-day and minute-by-minute. It can allow for daily tracking of attendance, behavior, and assessment data.

In applying artificial intelligence, the information can be used to generate predictive models to guide policies for better education. For example, patterns in learner attendance can be used in the early identification and mitigation of the risk of school dropouts.¹⁴⁹ Typically, much more data is collected than analyzed to yield insights for education stakeholders.

In Figure 13, UNESCO identified the following factors contributing to the evolution of EMISs.

Figure 13. Factors contributing to the evolution of EMISs.¹⁵⁰



8.1.4. Building resilient monitoring systems

The call to ‘build back better’ and more resilient education systems during the Covid-19 pandemic led to reflections on the future of EMISs that might integrate real-time data within a dynamic education management system.¹⁵¹ The implications of the Covid-19 pandemic embolden the need for decision-makers to build on resilient education systems. Natural disasters, diseases, and political conflicts can all result in often protracted emergencies that impact education by endangering children’s well-being and magnifying disparities in learning outcomes.¹⁵² UNICEF emphasizes, “*Resilience in education delivery is all the more important due to climate change increasing the intensity and frequency of extreme weather events (such as cyclones, droughts and floods), likely*

*to result in more frequent and prolonged school closures and the movement of populations.”*¹⁵³

Resilient and responsive systems provide access to quality education in emergencies (EiE) data to facilitate robust evidence-based decision-making in crisis situations. Such systems enable decision-makers to continue to monitor reach, engagement, and effectiveness during and after school closures and other disruptions to education. Increased resilience can be made possible through improved coordination around EiE and data by partners, and the use of various technologies for data collection and compilation into EMISs. For example, as mobile phones are often widely available, they can be used to both deliver and monitor learning during EiE.¹⁵⁴

149 Community Systems Foundation, ‘Initiatives,’ (no date). <https://www.communitysystemsfoundation.org/initiatives.html>.

150 UNESCO, *Re-Imagining the Future of Education Management Information Systems*. Working Paper v.1. 2021b, p. 5.

151 Ibid.

152 Pina Tarricone, Kemran Mestan, and Ian Teo, *Building resilient education systems: A rapid review of the education in emergencies literature*, 2021a.

153 UNICEF, *Reopening with Resilience: Lessons from Remote Learning during COVID-19*, 2021b.

154 Ibid.

Box 13. Resilient monitoring systems in the Maldives.

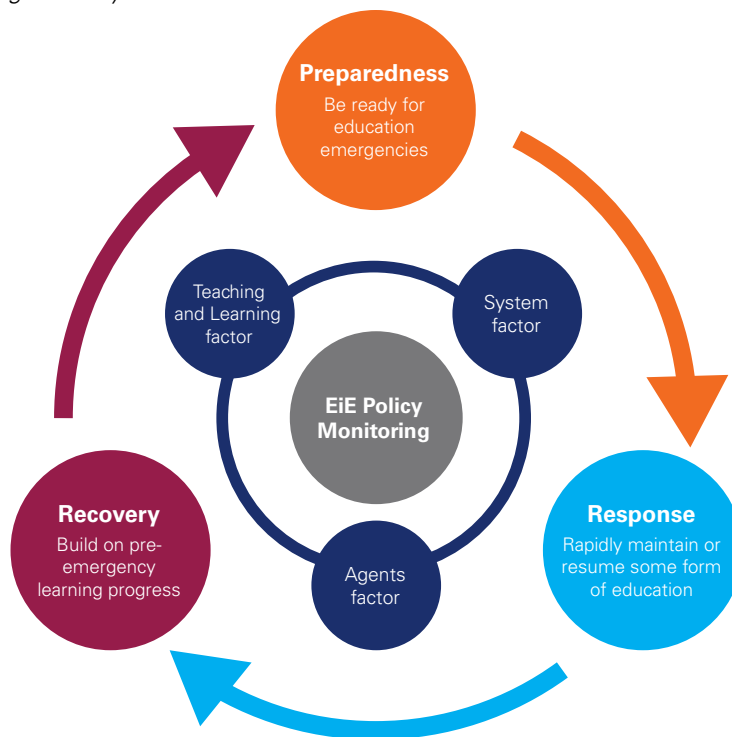
In the Maldives, the Ministry of Education monitored participation in online classes using QR codes when schools were closed due to Covid-19. During this time, teachers also monitored class attendance using MEMIS (Maldives Education Management Information System). This monitoring system supported government and school decision-makers to identify learners with low attendance that may require extra support and also can serve as a long-running tool to 'build back better' and more resilient monitoring systems. For example, following school reopenings, the system could pivot to monitor the return to schooling and to identify students who were not returning.¹⁵⁵ This approach facilitates systematic monitoring of the reach of hybrid learning. With the addition of other questions, the system could similarly be used to improve the reach and effectiveness of hybrid learning.

The EiE Policy Monitoring Framework, developed by the Global Education Monitoring (GEM) Centre, calls for three factors to establish a resilient monitoring and evaluation (M&E) system to improve learning:

1. systems
2. teaching and learning
3. agents.

These factors are integral to managing national, state, or local education systems and school-level planning. This framework is underpinned by an emergency management cycle that identifies the phases of Preparedness, Response and Recovery (see Figure 14 below).¹⁵⁶ These phases have been informed by the *Minimum Standards for Education*¹⁵⁷ developed by the Inter-agency Network for Education in Emergencies (INEE).

Figure 14. Emergency management cycle.¹⁵⁸



155 UNICEF ROSA, *COVID-19 Situation Report No. 6*, 2020a, p. 8.

156 Pina Tarricone, Kemran Mestan, and Ian Teo, 'A New Policy Tool to Help Build Resilient Education Systems,' 2021b.

157 INEE, 'Minimum Standards for Education: Preparedness, Response, Recovery,' 2010.

158 Pina Tarricone, Kemran Mestan, and Ian Teo, 'A New Policy Tool to Help Build Resilient Education Systems,' 2021b.

8.1.5 Learning Management Systems (LMSs) and EMISs

UNESCO highlights that future EMIS designs are now focusing on large pools of data that can be collected primarily from schools, teachers, and learners. Whereas previously data collection may have taken place on paper or using Excel, online applications are becoming more user-friendly, reliable, and efficient.¹⁵⁹ For example, a Learning Management System (LMS) supports online / offline teaching and learning through both synchronous and asynchronous interactions. LMS features can include discussions, chats, online quizzes, and assignment submissions and grading.¹⁶⁰ Since the LMS has a depository function, data on learner participation and performance can be integrated with existing Student Information Systems (SISs) and Education Information Management Systems (EMISs). Using school, district, or other IDs, automatic data collection from an LMS into an EMIS can take place.

8.2. Integration of hybrid learning in an EMIS^{161, 162}

While educational authorities routinely collect information on schools as a part of their regular operations, such data may be outdated and not relevant for integration with hybrid learning. When considering hybrid learning, further information on individual learners and the context in which they are learning at home or at school is needed. Data collected on schools may also not include sufficient data on school name, school ID, condition of facilities, number of grades taught, number of learners, number of teachers and other information vital to successful hybrid learning.

Additional considerations for a decision-maker designing a national data system are covered by the following questions:

- Why do you need a national data system and what will users do with this information?
- What actors have an interest in and influence over the development of a national data system?
- What existing infrastructure and programmes can support a national data system?

- What human capacity does the proposed data system require?
- How does the proposed data collection model reflect the day-to-day routines of users?
- What assumptions do you need to validate to ensure program success?¹⁶³

Monitoring hybrid learning in the EMIS can be carried out via the following steps.

Step 1: Identification of information needs

Key questions include:

- How can the education system's strategic objectives be met within the context of the needs for information on hybrid learning?
- What are the key indicators to be included in the system?
- Are any of these indicators currently available from an existing EMIS?
- What are the current difficulties related to education information?

Additional information needs for monitoring hybrid learning may encompass:

- Number and location of displaced school-aged children, and whether they are with their families or have become separated;
- The availability and conditions of institutional facilities;
- The availability and locations of teachers;
- The availability and type of learning materials and / or channels (online, TV, radio, classroom, blended);
- Effective access and coverage of hybrid distance learning by type of learning materials and / or channels;
- Teachers' skills and preparedness to support hybrid learning;
- The security situation for learners and teachers.

Table 3 below contains a sample set of questions for monitoring hybrid learning that can be included in the EMIS questionnaire.

¹⁵⁹ Chris van Wyk, and Luis Crouch, *Efficiency and Effectiveness in Choosing and Using an EMIS*, 2020.

¹⁶⁰ Mary Burns, 'Choosing An Online Learning Platform: Which Makes Sense?', 2014.

¹⁶¹ World Bank, *Educational Management Information Systems Ratings & Data*, 2021.

¹⁶² International Institute of Educational Planning, *Data Collection and Education Management Information Systems (EMIS)*, 2006.

¹⁶³ Chris McBurnie, *Navigating the 'Data Revolution': A Case Study on the One Tablet Per School Programme in Sierra Leone*, 2021, pp. 23–25.

Table 3. Suggested hybrid learning survey questions for integration in EMIS questionnaires.¹⁶⁴

Category	Survey questions
Access — Availability of service, functional capabilities	<p>1. Does the school use the national online learning platform? 1 Yes 2 No</p> <p>2. What are the specific modules of the school online learning platform? 1. Module for students 2. Module for teacher engagement 3. Module for school principals 4. Module for school Inspectors 5. Module for parents reporting and feedback 6. Module for MoE policy markers (statistics)</p> <p>3. Which modalities of distance learning are your students using to continue learning from home? 1. Provided by the government 2. Provided by the school 3. Provided by the private providers</p> <p>4. Do your students have access to the learning platform at home? 1 Yes, all 2 Yes, some 3 No</p>
Equity/ Inclusivity/ Partnership	<p>5. Is the access to the MoE online learning platform free of charge? 1 Yes 2 No</p> <p>6. Is the content of the school's online learning platform disability-sensitive? 1 Yes 2 No</p>
Quality	<p>7. Does the MoE online learning platform integrate formative assessment tools? 1 Yes 2 No</p> <p>8. Does the system send alerts and reports to the parents and students? 1 Yes 2 No</p> <p>9. Can the teacher engage directly with students? (feedback, discussion, two-way communication, responding to student's queries) 1 Yes 2 No</p>

164 UNICEF MENARO, *MENA Phone Survey on the Impact of COVID19 on Children*, 2020.

Step 2: Inventory of available data and data collection

A decision-maker should first conduct a quick scan of existing data and data sources to ensure alignment and avoid duplication of work across the government. They may investigate the following:

- Is there an existing EMIS data source that can provide any of the critical information for monitoring hybrid learning?
- Which government departments can contribute data?
- What formats are the data available in?

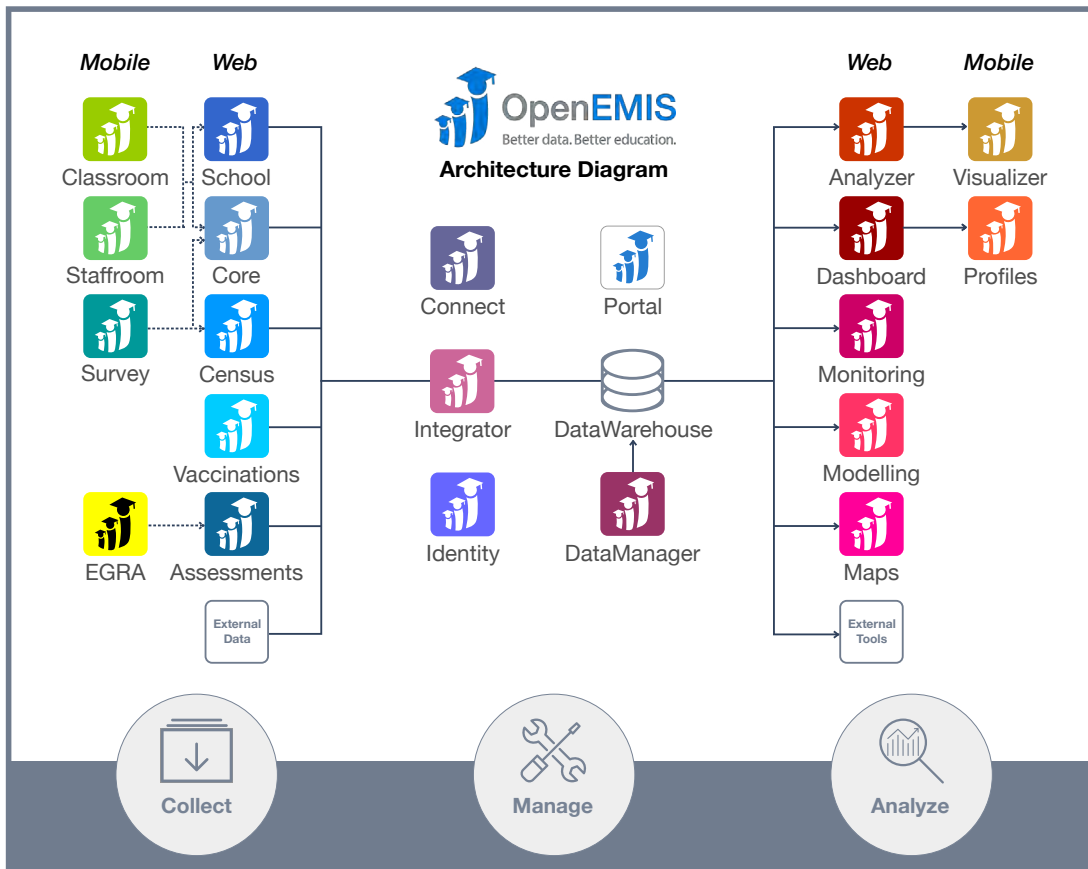
To supplement existing data, data collection may then need to take place (please refer to the above section on data collection). A decision-maker may also consider other sources of information, including the annual school census; education statistics surveys; household sample surveys; and

external information about the population, the socio-economic characteristics of geographic areas and communities coming to the ministry of education from other government sources.

Step 3: Data management

Depending on the maturity of the current EMIS system, decision-makers can build on existing data structures, while maintaining consistency with international standards for EMIS data management. For example, the free open-source [OpenEMIS application](#)¹⁶⁵ supports data management and processing that is customized to meet national priorities. As presented in Figure 15 below, OpenEMIS functionality supports national governments with managing student and staff data at national, regional, and school levels.

Figure 15. OpenEMIS architecture diagram.¹⁶⁶



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165 For more information, please refer to: <https://www.openemis.org/>
 166 OpenEMIS, 'OpenEMIS Software Architecture,' 2020.

Overarching features of data management are covered below.

- **Directory**

The system has a feature to manage a directory of institutions, staff, and learners.

- **Unique identifier**

The system allocates unique identifiers for institutions, students, and staff according to specific algorithms.

- **Questionnaire design**

The system enables education authorities to design custom questionnaire forms to be used at the institution level (the school census approach), with flexibility to edit / add / delete fields according to the use needs.

- **Barcoding**

The system has a barcoding feature to manage the dissemination and collection of questionnaires.

- **Data entry**

The system has the capability to set up data entry at any level (national, subnational, and institutional). Data entry takes place on a computer keyboard locally as a manual process. Data entry takes place over a browser using internet protocols. This could involve manual processes in a browser or automated processes with application programming interface (API) calls. The system has the feature to enable organizations to develop and deliver content to mobile devices and takes advantage of mobile device native capabilities (e.g., a contacts app and that app's ability to use either data or wi-fi).

- **Data quality assurance**

The system has built-in quality assurance rules, such as authentication and validations.

- **Learner registration tracking system**

The system has the ability to store the unit-level record data of learners and teachers in a central national database with the function to track the movement of individual learners from school to school and from year to year.

- **Aggregated data collection system**

The system collects summary (aggregated) data from institutions for reporting and statistical purposes.

- **Web-based system**

The EMIS is designed to be managed and accessed through the internet.

- **Data warehousing**

The system uses a data warehouse or data mart for data mining.

- **Security and confidentiality**

Strict access control, data security, privacy, data protection, confidentiality, authentication, and encryption are key features in the software solution. Users are uniquely identified and verified in the system. Every user may have a unique username and password linked to individual or group roles and privileges. System ensures that users have access only to the data they require.

Step 4: Data dissemination

A data dissemination plan should be well articulated in the design phase of any monitoring plan. This will ensure that the monitoring results meet the information needs of the end-users and are delivered in a timely and practical way. Please see the section on data analysis for additional information.

Step 5: Data quality and feedback loops

Every monitoring exercise should be built on the premise of continual improvements in quality and coverage of the data. Regular assessments of data quality should thus feature prominently in the integration of hybrid learning in an EMIS. Feedback loops should be established with both data providers and data users and used for improvements to processes and output of the monitoring exercise.

Strategies for gathering feedback on the integration of hybrid learning in an EMIS may include:

- Establishing a technical task force to provide oversight and technical guidance
- Assessing the status of the EMIS nationally and building on existing systems to integrate hybrid learning.
- Involving all stakeholders (e.g., policymakers, planners, principals, teachers, learners, parents) in the review of the data collected, managed, and produced.
- Sharing education data with all interested government departments with a focus on interoperable systems to serve to advance national development priorities in education, health, economics, and the environment.

The quality of data can be defined in terms of the following dimensions:

1. **Completeness** — Data values are present for all records and reporting entities (e.g., schools, learners).
2. **Relevance** — Collected data will be used to drive education decisions.
3. **Accuracy** — The data collection and validation processes prioritize accurate data. It should be confirmed that data is within the normal and expected range for each data element.
4. **Timeliness** — Data must be collected, updated, and available on a timely basis.
5. **Accessibility** — Users across all levels of the education system should be able to access the data. Privacy and security concerns, in addition to the country’s multisectoral data policy, should also be considered.¹⁶⁷

8.3. Further reading

Below are additional resources that a decision-maker can refer to on the subject of EMISs.

Title	Organization	Description
Guidebook for planning education in emergencies and reconstruction¹⁶⁸	IIEP-UNESCO	Chapter 5.7 is focused on data collection and EMISs. It provides information on the planning and management of education services and how to contribute to a national system for collection, processing, and utilization of education data.
Education Management Information Systems Data Collection Instrument Training Manual¹⁶⁹	World Bank	This manual supports the collection, analysis, benchmarking, and dissemination of data about EMISs. It details how to use the SABER-EMIS data collection instruments.
EMIS and Data Community of Practice (on LinkedIn)¹⁷⁰	UNESCO	This Community of Practice (CoP) is focused on gathering individuals seeking to drive international cooperation, knowledge sharing, and the building of common best practices to develop futures of EMISs.

¹⁶⁷ UNESCO Institute for Statistics, *Efficiency and Effectiveness in Choosing and Using an EMIS*, 2020, p. 22.

¹⁶⁸ For more information, please refer to: <https://unesdoc.unesco.org/ark:/48223/pf0000190223>

¹⁶⁹ For more information, please refer to: <https://documents1.worldbank.org/curated/en/947771496404522835/pdf/115466-wp-public-SABER-EMIS-Training-Manual-August2015.pdf>

¹⁷⁰ Please sign into LinkedIn to access the following link: <https://www.linkedin.com/groups/9079563/>



9. Ethics considerations



9. Ethics considerations

When monitoring hybrid or any other form of learning, ethics and safeguarding considerations must not be overlooked. In the wake of Covid-19, the shift from in-person to remote data collection lends itself to several challenges that should be addressed, including online data confidentiality; participant anonymity; and procedures for obtaining valid consent from individuals participating in data collection. Roberts (2015)¹⁷¹ emphasizes, “Prior to conducting qualitative research in online communities, researchers have an ethical obligation to identify and weigh possible risks and benefits to both the community and community members.”

The [Code of Human Research Ethics](#)¹⁷² outlines several principles, two of which are especially relevant to the monitoring of hybrid learning:

1. Respect for the autonomy, privacy, and dignity of individuals and communities;
2. Maximizing benefits and minimizing harm.

9.1. Respect for the autonomy, privacy, and dignity of individuals and communities

Obtaining consent when conducting interviews may be more difficult during remote data collection, compared to in-person methods. Researchers must ensure that participants receive sufficient information about the study and any relevant risks of participation for valid consent to be obtained. Standard and robust processes can be put in place to confirm consent and the dignity of participating individuals and communities.

When conducting a phone interview, the researcher should read a consent statement that covers the interview purpose and how data will be used. Participants should always be aware of their right to withdraw from the study. Verbal consent

should be recorded if possible, given that it is not possible to give written consent in this remote context.¹⁷³

For an online questionnaire, it is advisable for a researcher to include a designated consent page, where a participant can indicate consent via checkboxes with explicit statements.¹⁷⁴

Privacy and anonymity can come with major risks during remote data collection. In some cases, large amounts of data can be collected, which, when stored online, may reveal a participant’s identity via AI / machine learning. The storage of data online may also lead to the leaking of sensitive information. Data management thus becomes a crucial factor in secure data storage; only team members who need to see or analyze the data should have access to it. Researchers should additionally ensure that participants are aware of how their data will be safely stored and / or transported (e.g., emails are often not secure and can be forwarded to other parties).

9.2. Maximizing benefits and minimizing harm

It is critical to assess risks of monitoring activities against a backdrop of Covid-19 and its impact on already vulnerable communities. For instance, during the Covid-19 pandemic, there are general considerations for ‘duty of care’ to ensure that both field staff and local communities are not spreading and / or exposed to the risk of contracting Covid-19 due to data collection activities. Risk assessments should be carried out frequently, given the rapidly changing nature of the pandemic and at appropriate levels of the education system. Mitigation measures should be designed to minimize risk and assure the safety of all stakeholders to the extent possible.

The decision-tree below provides a simple but critical framework for risk assessment.¹⁷⁵

171 Lynne D. Roberts, ‘Ethical Issues in conducting qualitative research in online communities,’ *Qualitative Research in Psychology*, 2015, pp. 314–325.

172 British Psychological Society, ‘BPS Code of Human Research Ethics,’ 2021. <https://www.bps.org.uk/news-and-policy/bps-code-human-research-ethics>.

173 ITAD, ‘Ethics in evaluation and COVID-19: New practices in a changing world,’ 2020. <http://www.itad.com/article/ethics-evaluation-covid-19-new-practices-changing-world/>

174 British Psychological Society, *Ethics guidelines for internet-based mediated research*, 2017.

175 IMPACT Initiative, *SOPs for Data Collection during COVID-19*, 2020.

Figure 16. Risk assessment framework.¹⁷⁶



'Maximizing benefits and minimizing harm' further considers the scientific value (i.e., quality, integrity, and contribution) of a study, while also ensuring that participants are protected from harm. To minimize the risk of doing harm, ethical guidelines for in-person and remote data collection can be applied. As previously discussed, this includes gaining valid consent and ensuring privacy. Further, researchers must take adequate precautions to identify and minimize risks by anonymizing data and reviewing data sharing practices. As more and more

data is stored online, researchers may be more likely to share their research data publicly. Prior to doing so, potential risks to participants must be evaluated.

Online video interviews should be conducted on secure platforms and networks. This can include the use of password-protected meeting spaces and private internet connections (instead of networks in public spaces which are accessible by everyone).¹⁷⁷



¹⁷⁶ Ibid.
¹⁷⁷ British Psychological Society, *Ethics guidelines for internet-based mediated research*, 2017.

9.3 Further reading

Below are additional resources that a decision-maker can refer to on the subject of ethics in monitoring.

Title	Organization	Description
<p>Remote data collection on violence against women and children during Covid-19</p> <p>Part 1¹⁷⁸</p> <p>Part 2¹⁷⁹</p>	UNICEF	This two-part report of 'Conversations with experts' examines what Covid-19 means for data collection efforts on violence against women and children.
<p>Research in insecure times and places: ethics of social research for emerging ecologies of insecurities¹⁸⁰</p>	SSRC	This introductory essay looks at security challenges, new methodologies for gathering data remotely and the need to reflect on the changing roles of institutions during Covid-19.
<p>Internet research: ethical guidelines 3.0¹⁸¹</p>	Association of Internet Researchers	This document explains Internet Research Ethics (IRE) and highlights two key elements: attention to research stages and the problem of informed consent, which has become a regular problem in Big Data research methodologies.
<p>National guidelines for conduct of research during coronavirus disease 2019 (Covid-19) pandemic¹⁸²</p>	Uganda National Council for Science and Technology	This source from the Uganda National Council for Science and Technology outlines guidance for conducting studies on humans that are ethical and in line with benefitting local communities and communities abroad without causing unnecessary harm or inconveniences to the study participants.
<p>Research on violence against children during the COVID-19 pandemic: guidance to inform ethical data collection and evidence generation¹⁸³</p>	UNICEF	This source highlights the challenges of collecting information from children and caregivers during lockdowns and restrictions, but also notes the importance of gathering more evidence on violence against children to better inform policies and programming. It also provides alternative data collection methods that can support information collection.

178 For more information, please refer to: <https://www.unicef-irc.org/article/1997-remote-data-collection-on-violence-against-women-during-covid-19-a-conversation-with.html>

179 For more information, please refer to: <https://www.unicef-irc.org/article/2004-collecting-remote-data-on-violence-against-children-during-covid-19-a-conversation.html>

180 For more information, please refer to: <https://items.ssrc.org/covid-19-and-the-social-sciences/social-research-and-insecurity/research-in-insecure-times-and-places-ethics-of-social-research-for-emerging-ecologies-of-insecurity/>

181 For more information, please refer to: <https://aoir.org/reports/ethics3.pdf>

182 For more information, please refer to: <https://www.unhro.org/ug/assets/images/resources/covidnationalguidelines.pdf>

183 For more information, please refer to: <https://data.unicef.org/resources/research-on-violence-against-children-during-the-covid-19-pandemic-guidance/>



10. Conclusions



10. Conclusions

10.1 Effective approaches

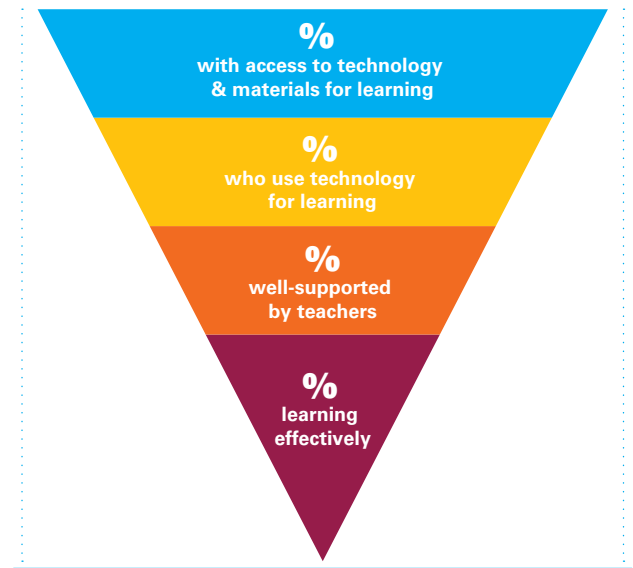
Monitoring is an ongoing process that can help decision-makers with their understanding of how many students are accessing and using hybrid learning materials and technologies and are well-supported by teachers. These components all play a role in whether students are learning effectively (see Figure 17).

By monitoring this information, the data collected and analyzed is used to better inform the decision-making process through the following steps:^{184, 185}

1. Collect data—Use data collection mechanisms (e.g., phone surveys) to collect data.
2. Gather and clean data—Collect all data in one database or spreadsheet, and clean the data.
3. Analyze data—Let the data speak. Which findings are there? Which conclusions can be drawn?
4. Define action points—Which actions can be taken to make the intervention more likely to be successful?
5. Adjust intervention—Make changes to the intervention and implement the changes.

It has become clear that through the Covid-19 pandemic, there is no singular approach to public health or public education. Similarly, the monitoring of learning through the pandemic will most certainly take different shapes and forms. The key to an effective approach will be the contextualization and customization of generic tools built around a clear vision for monitoring hybrid learning and concrete plans for what will be measured and why. Once these guiding principles are in place, the monitoring team should build from a foundation that ensures the minimum required data with the possibility of scaling up to expand the scope of the monitoring framework.

Figure 17. Components connected to effective hybrid learning.¹⁸⁶



The philosophy of starting small, planning carefully, and building to meet data user requirements is key. The deciding factor on the success and effectiveness of the approach to monitoring will be the timeliness and relevance of the data to those relying on it for decisions.

10.2. Features and characteristics of an effective monitoring system

An effective hybrid learning monitoring system shares many parallels with sound management information systems (MISs). The key features and characteristics of an effective hybrid learning system include:

- Relevance
- Accuracy
- Reliability
- Usefulness
- Completeness
- Reflexiveness
- Timeliness.¹⁸⁷

¹⁸⁴ Tom Kaye, Caspar Groeneveld, and Amreen Bashir, *Monitoring Distance Education: A Brief to Support Decision-Making in Bangladesh and Other Low- and Lower-Middle Income Countries*, 2020, p. 24.

¹⁸⁵ UNESCO, *COVID -19 Response – Hybrid Learning*, 2020a, p. 46.

¹⁸⁶ UNICEF, and ADB, 'Distance Learning Reach & Effectiveness in South Asia,' 2021.

¹⁸⁷ Bert Markgraf, 'Characteristics of a Good Management Information System,' 2019. <https://smallbusiness.chron.com/characteristics-good-management-information-system-59060.html>

Ensuring monitoring systems meet these standards is paramount, especially in preparation for unexpected disruptions like the Covid-19 pandemic. Regular assessment, coupled with improvement plans, can help to ensure information systems are adequately prepared. In the education sector, tools such as the UNESCO Ed-DQAF and the World Bank SABER allow for the assessment of information systems.

Data can be used to inform priorities and policy targets for hybrid learning (e.g., the direction, pace, and / or magnitude of change). For example, during sector diagnosis, when the data shows low access due to external factors such as security, the use of hybrid learning could be suggested as a priority when implementing programmes for access.¹⁸⁸ The MICS-EAGLE project uses Multiple Indicator Cluster Survey (MICS) data to enable Education Analysis and Global Learning

for Equity (EAGLE). In other words, it supports governments to effectively use education data for evidence-based policymaking. 'Education factsheets' on school completion rates, foundational learning skills, access to EdTech tools, etc. are first developed and shared with government officials. Governments then utilize the information in the factsheets towards the development of education sector plans and other policy documents.¹⁸⁹ An additional initiative that exemplifies data-driven decision-making is 'Data Must Speak', which provides technical support to ministries of education and develops resources used to analyze education data. The Data Must Speak initiative emphasizes community empowerment, such as through the creation of "easy-to-use profile cards, accessible to low-literacy audiences, to help parents, teachers and students stay informed and hold school managers to account."¹⁹⁰

10.3. Improvements and gaps

The framework and the suggested tools and approaches within are living, evolving documents. As our collective and individual response to the pandemic will evolve, so should these tools. On a number of occasions through out the publication, the authors have recognized the importance of the noted, critical next step of contextualization to meet local realities. These documents may guide and inform, but much is reliant on local knowledge and the understanding of the strengths, weaknesses, and opportunities for monitoring learning.

Beyond this, it is clear that the indicator framework would benefit from 'crowd-sourcing' input for further development and elaboration. An area of interest would be the interplay between different modes of learning and the frequency, ordering, and teacher / learner engagement of each, and as a whole.

It is for this reason that these documents not only build extensively on previous publications and work but also are further developed and released under the Creative Commons Attribution-ShareAlike 4.0 International (CC BY-SA 4.0) or similar Creative Commons license. It is the hope that these documents continue to be improved to be more and more responsive to the needs of the education community that they intend to serve.



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188 UNESCO IIEP, and GPE, *Guidelines for Education Sector Plan Preparation*, 2015.

189 Peggy Kelly, 'Countries Using Data to Inform Education Policies', 2021. <https://www.globalpartnership.org/blog/countries-using-data-inform-education-policies>.

190 UNICEF, 'Data Must Speak', (no date). <https://www.unicef.org/education/data-must-speak>.

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12. Annexes



12. Annexes

Annex A: Risks and capacity-building

Table 4 below contains a summary of risks that a decision-maker may come across when monitoring the implementation of hybrid learning. The risk can fall into one of the following categories:

- Access
- Budget
- Capacity
- Cultural barriers

The table further covers the likelihood that a decision-maker will come across the risk, the impact that the risk will have on the implementation of hybrid learning, and recommended mitigation steps to respond to the risk.

Table 4. Potential risks linked to monitoring hybrid learning.

Risk Description	Likelihood	Impact	Mitigation Steps		
			Measure/s	When / Frequency	Risk Owner
ACCESS Lack of learner, teacher, and institution connectivity	Medium / High	Critical	1. Conduct a mapping of schools and learners that are least likely to be connected to the internet. 2. Work with the Broadband Commission for Sustainable Development to increase access for learners within a country. 3. Conduct in-person, face-to-face interviews in remote areas when safe.	Before beginning monitoring hybrid learning in remote or non-connected areas.	Ministry of Education
ACCESS Assessment opportunities are limited by access to devices and internet	Medium / High	Critical	Schools could organize in-person assessments.	Throughout implementation of hybrid learning monitoring.	Ministry of Education
BUDGET Budget limits scope of hybrid learning monitoring	Medium	Critical	1. Leverage extra-budgetary funding opportunities to support short-term monitoring initiatives. 2. Deploy low cost / sustainable solutions to ensure continuous monitoring. 3. Seek opportunities to create synergies in data collection / monitoring.	During project implementation	Ministry of Education

Risk Description	Likelihood	Impact	Mitigation Steps		
			Measure/s	When / Frequency	Risk Owner
<p>CAPACITY Limited capacity and human resources, particularly in rural settings</p>	Medium	Critical	<ol style="list-style-type: none"> 1. Utilize evidence to make informed decisions on deployment of staff. 2. Execute multifaceted approaches to capacity development, through targeted training and institutional partnerships. 3. Leverage data to inform policy decisions on staff deployment. 4. Identify collaborative and intuitive ways to build and maintain skills of staff. 	During project implementation	Ministry of Education
<p>CAPACITY Lack of capacity to effectively monitor hybrid learning through EMIS or other means</p>	High	Critical	<ol style="list-style-type: none"> 1. Participatory training for national stakeholders responsible for data collection, analysis, and use. 2. Ensuring participation of stakeholders throughout the duration of hybrid learning monitoring. 	Throughout implementation of hybrid learning monitoring.	Ministry of Education
<p>CAPACITY Lack of capacity to effectively assess learner learning remotely.</p>	High	Critical	<ol style="list-style-type: none"> 1. Training for teachers on strategies to assess learning remotely (formative and summative). 2. Ongoing support can also be provided to teachers (e.g., communities of practice that take place in person or via social media channels). 	Throughout implementation of hybrid learning monitoring.	Ministry of Education
<p>CAPACITY Poor system design leading to ineffective monitoring.</p>	Medium	Critical	<ol style="list-style-type: none"> 1. Use the available governance mechanisms to receive the required information early in the process of hybrid learning monitoring. 2. Working with international partners to strengthen national EMIS, by expanding on existing systems or putting in place new and more effective systems. 	Recommend undergoing this step before monitoring hybrid learning.	Ministry of Education
<p>CAPACITY Staff turnover leading to unavailability of adequate technical personnel to administer and monitor hybrid learning.</p>	Low	Critical	<ol style="list-style-type: none"> 1. Inclusion of staff profile requirements during the beginning of the monitoring phase. 2. Identification of relevant staff profile and prequalification requirements for the training phase. 	Recommend undergoing this step before monitoring hybrid learning.	Ministry of Education

Risk Description	Likelihood	Impact	Mitigation Steps		
			Measure/s	When / Frequency	Risk Owner
<p>CAPACITY Lack of capacity to undergo sampling design to better understand the impact of hybrid learning of learners, teachers, parents / caregivers, institutions, and programs.</p>	Medium	Critical	<ol style="list-style-type: none"> 1. Work with domestic and international partners specializing in sampling design, specifically in the context of emergencies. 2. Developing Ministry capacity around design and survey sampling to conduct effective information around hybrid learning. 	Recommend undergoing this step before monitoring hybrid learning.	Ministry of Education
<p>CAPACITY Lack of capacity to undergo data collection necessary to track the suggested Hybrid Learning Monitoring Indicators</p>	Medium	Critical	Work with domestic and international partners specializing in data collection, specifically in the context of emergencies.	Recommend undergoing this step before monitoring hybrid learning.	Ministry of Education
<p>CULTURAL BARRIERS Socio-cultural barriers may prevent engagement in opportunities and further prevent data collection and use for monitoring hybrid learning.</p>	Medium	Critical	<ol style="list-style-type: none"> 1. Engage and encourage project beneficiaries to engage in the implementation of surveys, design sampling, etc. 2. Individuals conducting data collection should also be aware of and sensitive to these socio-cultural barriers, partnering with the local community where possible. 3. Develop strategies with development partners to promote project objectives. 	During project implementation	Government Development partners Civil society
<p>DATA Limited or no access to parent contact information</p>	Low / Medium	High	Develop a database for storing parent/guardian contact information in national EMIS or other information system	Recommended on an annual basis to update contact registries.	Ministry of Education
<p>DATA Limited or no access to accurate lists of learners within schools, regions, etc.</p>	Low / Medium	High	Work with national school systems to develop up-to-date lists of learners who are currently in school and those that are out of school due to the Covid-19 pandemic, or other factors.	Recommend undergoing this step before monitoring hybrid learning, but can also be accomplished in tandem with further information collection.	Ministry of Education

Risk Description	Likelihood	Impact	Mitigation Steps		
			Measure/s	When / Frequency	Risk Owner
INFRASTRUCTURE Weak IT infrastructure for monitoring hybrid learning	Medium	Critical	1. Propose cloud hosting alternatives while local IT infrastructures are upgraded. 2. Utilize offline data collection methods. 3. Validation of the readiness of the necessary infrastructure to optimally operate the systems.	During project implementation	Ministry of Education
INFRASTRUCTURE Low levels of data quality due to coordination issues	Medium	Critical	1. Strengthen coordination mechanisms to ensure project initiatives are utilising data quality management tools. 2. Automate identification of data gaps, latency, and outliers through early detection of issues at the time of data capture. 3. Identify collaborative and intuitive ways to engage and facilitate data completeness between all levels of stakeholders. 4. Generate data quality feedback reports for supervisors and administrators. 5. Generate notifications for data reporting deadlines.	During project implementation	Ministry of Education
INFRASTRUCTURE Data gaps on emerging areas of priority and importance for monitoring hybrid learning	Medium	Critical	1. Leverage configuration of data collection, tools to accommodate emerging data requirements 2. Capacity building for system administrators to design and conduct surveys to fill in data gaps	During project implementation	Ministry of Education

Further reading

A number of the risks listed above are linked to capacity for effective monitoring systems, as monitoring is frequently hindered by limited resources and / or lack of skilling to carry out sampling design, data collection, etc. This Operational Guide, as well as the resources listed below, can support decision-makers with capacity-building.

Title	Organization	Description
Section 10: Monitoring and Evaluation (in The OECD DAC Handbook on Security System Reform: Supporting Security and Justice) ¹⁹¹	OECD	<p>Pages 13 through 15 of this resource cover questions for international actors to ask when exploring the monitoring and evaluation (M&E) capacity of partner countries. Such questions include:</p> <ul style="list-style-type: none"> • Is analysis of the partner country's M&E system already available? • How does the partner country currently assess the effectiveness of programs and learn lessons? • What relevant data and analysis are available?
Building Country Capacity for Monitoring and Evaluation in the Public Sector: Selected Lessons of International Experience ¹⁹²	World Bank	The World Bank's Evaluation Capacity Development (ECD) unit works with countries to strengthen their M&E capacity. This paper shares some lessons learnt and outstanding questions from the work of the ECD unit.
Monitoring, Evaluation, and CLA Toolkits ¹⁹³	USAID	These three toolkits from USAID Learning Lab contain resources to implement and integrate monitoring, evaluating, and Collaborating, Learning, and Adapting (CLA) into programming.
Monitoring and Evaluation in E-Learning: Five M&E Practices to Measure and Boost the Impact of Online Education Programs ¹⁹⁴	NextBillion	This article contains five insights related to M&E that decision-makers can apply to online learning programming. Several of these findings are based on the work of the William Davidson Institute (WDI) at the University of Michigan.

¹⁹¹ For more information, please refer to: https://www.oecd.org/dac/conflict-fragility-resilience/publications/ssr_section%2010.pdf

¹⁹² For more information, please refer to: <https://gsdrc.org/document-library/building-country-capacity-for-monitoring-and-evaluation-in-the-public-sector-selected-lessons-of-international-experience/>

¹⁹³ For more information, please refer to: <https://usaidearninglab.org/mel-toolkits>

¹⁹⁴ For more information, please refer to: <https://nextbillion.net/monitoring-evaluation-measure-impact-online-education/>



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Annex B: Innovations

To monitor and support hybrid learning, countries around the world are using innovative measures to deliver education, facilitate learning and support learners and teachers throughout the Covid-19 pandemic. With the support of various United Nations and national stakeholders, these initiatives are providing resources and education access for millions of learners across the world.

In this annex, several of these innovations will be highlighted, but these do not encompass all of the efforts being put forward by education authorities.

East Asia and the Pacific

Mongolia: The government is testing an innovative chatbot to collect feedback from parents on TV lessons.¹⁹⁵

East and Southern Africa

Ethiopia: To support remote monitoring of food security and the socio-economic effects caused by Covid-19 in Ethiopia, USAID and other international organizations supported the development of a community of practice that is responsible for discussing data collection and harmonization to better understand the ongoing situation in the country.¹⁹⁶

Kenya: UNHCR is working with the Ministry of Education and schools in Kenya on an initiative that supports teachers to broadcast lessons using community radio stations. This is supporting children among the 200,000 refugees at the Dadaab camp.¹⁹⁷

Uganda: UNICEF and UNHCR in Northern Uganda established a communal e-learning platform that sought to (i) Create a space for young people out of schools, such as community or youth centers or an empty classroom, to gather and access learning products through any of the open-source digital learning solutions. This pilot project used Kolibri.¹⁹⁸ The sessions were guided by a community volunteer, such as a retired teacher, a community development officer, or any young person who dropped out of school but at a higher grade. UNICEF tracked the learners' behaviors and preferences. Agriculture and food security were the main categories accessed by the young people in refugee camps.

Europe and Central Asia

Croatia: UNICEF has completed an assessment on the possible implementation of virtual home visits for children with developmental delays and disabilities.¹⁹⁹

Moldova: U-Report, which is a real-time social messaging tool that allows young persons to communicate directly with

¹⁹⁵ UNICEF ECARO, *Novel Coronavirus (COVID-19): Situation Report No. 4*, 2020b, p. 3.

¹⁹⁶ USAID, *Guide for Adopting Remote Monitoring Approaches During COVID-19*, 2020a, p. 2.

¹⁹⁷ UNHCR, *Supporting Continued Access to Education During COVID-19: Emerging Promising Practices*, 2020, p. 7.

¹⁹⁸ For more information, please refer to: <https://learningequality.org/kolibri/>

¹⁹⁹ UNICEF ECARO, *Novel Coronavirus (COVID-19): Situation Report No. 3*, 2020a, p. 9.

decision-makers, has been implemented in the country to understand a variety of topics, such as the status of remote learning, child rights, and other topics. The results of recent polls are published to a public dashboard.²⁰⁰

Tajikistan: UNICEF developed a Risk Communication and Community Engagement (RCCE) Rapid Assessment tool to generate key data necessary for addressing the ongoing challenges presented by the Covid-19 pandemic.²⁰¹

Turkey: Given that only one in six children aged 3–4 years engage with their father in early learning activities, UNICEF Innocenti developed guidance to target parent engagement, especially for fathers, to work with young learners following feedback from parents in Turkey.²⁰²

Latin America and the Caribbean

Argentina: The Juana Manso Federal Education Platform, which includes virtual classrooms, a federal archive of open educational content, and a monitoring and analysis module based on open data generation, was built by the government. Teachers will be able to configure their classes from a distance using the classrooms and the repository, publish content and work for their learners, communicate virtually via message or videoconference, assign notes, and engage in other practices while having Open Educational Resources and multimedia produced by the government at their disposal.²⁰³

Brazil: Educational Podcast Let Me Tell (Déjame contar) was created to provide educational opportunities to children aged 4–10 and their families in the event of a school closure.²⁰⁴

El Salvador: The Ministry of Education launched a microsite where learners and teachers can access all educational materials published by the government.²⁰⁵

Honduras: Educatrachos Portal was established to provide educational content, activities, tools, and resources in various formats to be used by teachers and learners.²⁰⁶

Venezuela: Educación Lugarizada, a child-centered teaching and learning platform based on the principle of participation in the convention of the Rights of the Child, has been developed by the government.²⁰⁷

Middle East and North Africa

Iraq: A Multidimensional Vulnerability Index assessment was conducted, which led to the development of a map highlighting areas of Iraq that are most vulnerable based on the number of confirmed cases of Covid-19. This assessment calls for scaling-up of learning during the Covid-19 pandemic through parenting programmes, TV, and radio to allow for a quick and safe return to school.²⁰⁸

Lebanon: A Learning Readiness Rapid Assessment (LeaRA) was conducted with parents / caregivers of more than 25,000 refugee children enrolled in non-formal education (NFE) activities with the sector partners. Importantly, this assessment found that most parents highlighted that messaging applications, like WhatsApp, are the most effective way of providing content and guidance that support learners through hybrid and remote learning.²⁰⁹

South Asia

Maldives: During school closures due to Covid-19, the Ministry of Education monitored learners' participation in teleclasses by utilizing QR codes. Teachers were also able to continue to monitor attendance to online classes using MEMIS (Maldives Education Management Information System), using that information for follow-up on students with low or no attendance. When schools reopened, the same system could be used to monitor return to school and which students were not returning or frequently absent.²¹⁰ Such a monitoring system allows for the systematic monitoring of the reach and, with the addition of other questions, even the effectiveness of distance learning at different levels (e.g., school, national). This information could then be used to improve the reach and effectiveness of distance / hybrid learning.

200 For more information, please refer to: <https://moldova.ureport.in/opinion/1648/>

201 UNICEF ECARO, *Novel Coronavirus (COVID-19): Situation Report No. 3*, 2020a, p. 9.

202 Dita Nugroho et al., *COVID-19: Trends, Promising Practices and Gaps in Remote Learning for Pre-Primary Education*, 2020, p. 4.

203 For more information, please refer to: <https://recursos.juanamanso.edu.ar/home>

204 UNICEF, *LACRO COVID-19 Education Response: Updated 20 COs Achievements, Challenges and Next Steps*, 2020e, p. 5.

205 For more information, please refer to: <https://www.mined.gob.sv/>

206 UNICEF, *LACRO COVID-19 Education Response: Updated 20 COs Achievements, Challenges and Next Steps*, 2020e, p. 14.

207 UNICEF, *LACRO COVID-19 Education Response: Updated 20 COs Achievements, Challenges and Next Steps*, 2020e, p. 23.

208 UNICEF, *Assessment of COVID-19 Impact on Poverty and Vulnerability in Iraq*, 2020a

209 Inter-Agency Coordination Lebanon, *Learning Readiness Assessment: Analysis Report*, 2020, p. 1.

210 UNICEF ROSA, *COVID-19 Situation Report No. 6*, 2020a, p. 8.



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Further reading

Below are additional resources that a decision-maker can refer to on the subject of innovations in hybrid learning.

Title	Organization	Description
Remote learning, distance education and online learning during the COVID19 pandemic²¹¹	World Bank	This resource list, developed by the World Bank's EdTech team, details platforms, software, and resources that can be used to support remote learning. It encompasses platforms that support assessment, file management, training, and video conferencing.
Remote Learning and COVID-19²¹²	World Bank	This briefing note, developed by the World Bank's EdTech team, provides guidance on existing evidence and knowledge surrounding remote and online learning in response to disruptions to education. It covers topics pertaining to students, remote learning content, teachers, parents and families and policymakers.
Alternative Solutions to School Closure in Arab Countries to Ensure that Learning Never Stops²¹³	UNESCO	This report, developed by UNESCO Beirut, summarizes policy responses taken by Arab countries to ensure continuity of learning in response to Covid-19-related school closures. Alternatives include: setting up a national online learning platform, educational television, radio-based learning, interactive online classes by teachers and social media.

211 For more information, please refer to: <https://documents1.worldbank.org/curated/en/964121585254860581/pdf/Remote-Learning-Distance-Education-and-Online-Learning-During-the-COVID19-Pandemic-A-Resource-List-by-the-World-Banks-Edtech-Team.pdf>

212 For more information, please refer to: <https://documents1.worldbank.org/curated/en/266811584657843186/pdf/Rapid-Response-Briefing-Note-Remote-Learning-and-COVID-19-Outbreak.pdf>

213 For more information, please refer to: <https://en.unesco.org/news/alternative-solutions-school-closure-arab-countries-ensuring-learning-never-stops>

Annex C: Data collection questionnaires

To monitor the status and impact of hybrid learning, the following questionnaires and surveys have been provided to guide monitoring and evaluation efforts in education and across other domains.

Sample questions

The below questions, taken from UNICEF ROSA's report on *Monitoring Distance Learning During School Closures*, can be used to collect baseline data and conduct regular monitoring of a hybrid learning initiative.²¹⁴ Any questions developed for monitoring hybrid learning should be linked to specific indicators, made appropriate for data collection methods and modified to ensure relevance in local contexts.

Teacher engagement:

In the past week, how often have you and your teachers been in contact with each other?

1. 5 days
2. 4 days
3. 3 days
4. 2 days
5. 1 day
6. 0 day

What was the primary method the teacher used to contact you?

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Phone call 2. SMS 3. Video or audio call or voice notes through (insert popular social messaging platforms used in the country) 4. Text messages through (insert popular social messaging platforms used in the country) | <ol style="list-style-type: none"> 5. Online platforms and virtual classrooms 6. Message through a community member 7. A teacher has not contacted me |
|--|--|

Connectivity and devices

Do you have internet access?

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Yes, reliable internet 2. Yes, but it is unreliable or slow or insufficient credit limiting usage | <ol style="list-style-type: none"> 3. We have no internet |
|---|--|

Which of the following are currently present in your household? *

i. Radio	ii. Television	iii. Computer, laptop or tablet	iv. Regular Cell Phone	v. Smart phone with touch screen	vi. Special printed materials provided by the school	vii. School textbooks	viii. Learning materials purchased by parents/ family
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Yes

No

214 UNICEF ROSA, *Monitoring Distance Learning During School Closures*, 2020c, pp. 27–62.

Learning

Which method has your child used to learn while schools are closed? Select all that apply.

1. Listening to educational programs broadcasted on radio
2. Watching educational programs on TV
3. Online classes through a computer, laptop or tablet
4. Other activities through a computer, laptop or tablet
5. Through a basic mobile phone with no Internet
6. Through a smartphone, using (insert popular social messaging apps used in country, e.g. WhatsApp)
7. Through a smartphone, using other apps or websites
8. Through special printed materials provided by the schools
9. Through school textbooks
10. Through online classes provided by the school
11. Through private tuition / tutor
12. Other, please specify: _____

On average, over the past one week when schools have been closed, how many hours a day have you spent on education?

1. 4 or more hours per day
2. About 2 to 3 hours a day
3. About one hour a day
4. About half an hour each day
5. Currently, I am not spending any time on education

Compared to the amount you were learning BEFORE schools closed, how much do you think you are learning NOW?

1. A lot less
1. Little bit less/Less
2. The same amount
3. Little bit more/More
4. A lot more
5. I don't know/ I'm not sure

Through which method have you mainly been learning while schools are closed? Select one only.

1. Parent/family supported learning using online lessons or materials
2. Parent/family supported learning using other means (radio, TV, printed materials, textbooks)
3. Teacher supported learning through SMS or calling
4. Teacher supported learning through (insert popular social messaging platforms used in the country)
5. Teacher supported learning through an online platform

6. Private tutor supported learning
7. Community organized free learning activities
8. Independent learning without support
9. Other, please specify: _____

How effective has this primary learning method been for your child's learning while schools were closed?

1. Extremely ineffective
2. Ineffective
3. No change
4. Effective
5. Extremely effective

For respondents who selected "Extremely effective," what are the top 3 factors that you believe contributed to an extremely effective learning environment for your child?

1. Children received regular and effective support from their teachers
2. Children received regular and effective support from parents or other family members
3. High quality learning materials online
4. High quality teaching programs broadcasted on TV
5. High quality teaching program broadcasted on the Radio
6. High quality printed material provided by the school
7. High quality learning programme developed by the school
8. Had sufficient infrastructure such as laptops/computers
9. A quiet place to study
10. Other (please specify)

For respondents who selected "Extremely ineffective," what are the top 3 factors that you believe contributed to an extremely ineffective learning environment for your child?

1. Children did not receive regular and effective support from their teachers
2. Children did not receive regular and effective support from parents or other family members
3. Low quality learning materials online
4. Low quality teaching programs broadcasted on TV
5. Low quality teaching program broadcasted on the Radio
6. Low quality printed material provided by the school
7. Low quality learning programme developed by the school
8. Did not have sufficient infrastructure such as laptops/computers
9. A lack of a quiet place to study
10. Other (please specify)

Further reading

There is a growing set of resources that can serve as the building blocks of data collection questionnaires.

Title	Organization	Description
Children's World Survey: 2013–15 ²¹⁵	University of York	<i>The survey's goal is to collect representative data from a variety of countries in order to identify gaps in children's lives and well-being from their own perspectives. It examines various aspects of a child's life, including home and family, money and possessions, friends, and other relationships. This survey helped to identify gaps that existed in each country where the survey was conducted.</i>
COVID-19 Business Pulse Survey ²¹⁶	World Bank	<i>This survey was used to inform governments on how to better support businesses during the Covid-19 crisis. It investigated the various effects of the pandemic on business, as well as their future expectations regarding the pandemic. It kept track of the government's performance in combating the pandemic and how they should proceed in the future, with a focus on small and medium-sized businesses.</i>
Education key indicators and questions for COVID-19 assessment ²¹⁷	Global Education Cluster	<i>The document includes key indicators and questions designed to assess the severity of Covid-19's impact on the education system and children's learning. It investigates a country's ability to continue with learning activities during a pandemic.</i>
RECOVR survey ²¹⁸	Innovations for Poverty Action	<i>The IPA's RECOVR Survey monitors how the Covid-19 pandemic affects people's lives, helping policymakers to better grasp the situation in their respective nations and make data-driven policy decisions. It is a panel survey that allows comparisons, documents real-time patterns of policy relevance, and informs decision-makers on the economic toll of the pandemic.</i>
Collective Action of School Leaders during Coronavirus Pandemic Survey ²¹⁹	Innovation for Poverty Action	<i>The study was carried out to evaluate the impact of adopting a school scorecard intervention in Ugandan primary schools, in which local actors are educated to monitor concerns at their school. It also relies on prior studies performed during the Ebola outbreak in order to better understand a crucial mechanism of impact: collective action. It discovered that principals in schools that had received the scorecard exhibited higher levels of collective action.</i>
Schooling disrupted, schooling rethought ²²⁰	OECD, Harvard Graduate School of Education	<i>This survey focused on school organisation, management, and instruction to understand how ministries of education and school administrations were addressing the challenges faced during fully remote or hybrid learning. An outcome of the survey showed that there is considerable capacity for innovation in education.</i>
Survey on National Education Responses to COVID-19 School Closures ²²¹	UNESCO, UNICEF, World Bank	<i>The survey instrument was designed to capture de jure policy responses and perceptions from government officials on their effectiveness, providing a systematic understanding of deployed policies, practices, and intentions to date. The survey results will help to better inform local and national responses and to prepare for school reopening in other countries. The results will also help support the decisions and actions of partners in support to governments, including through the Global Education Coalition launched by UNESCO</i>
Reimagine Education Survey ²²²	UNICEF ESARO	<i>The survey was administered to UNICEF East and Southern African (ESA) country offices and collected data on: the situation of digital learning in ESA countries, and countries' funding requirements for moving forward with the Reimagine Education agenda. The findings will support improved digital learning programs, facilitate South-to-South exchange and help mobilize resources for the agenda. The survey consisted of 76 questions, spread across the five pillars of Reimagine Education (Connectivity, Affordable Data, World Class Digital Learning Solutions, Devices, and Youth Engagement) and the cross-cutting themes of Systems and Financing.</i>

215 For more information, please refer to: <https://eprints.whiterose.ac.uk/95207/1/8yearsoldreport.pdf>

216 For more information, please refer to: <https://www.worldbank.org/en/data/interactive/2021/01/19/covid-19-business-pulse-survey-dashboard>

217 For more information, please refer to: <https://educationcluster.app.box.com/s/lz0psr31v59s1ltkxs42oef8qeu1yr7>

218 For more information, please refer to: <https://www.poverty-action.org/recovr/recovr-survey>

219 For more information, please refer to: <https://www.poverty-action.org/questionnaire/collective-action-school-leaders-during-coronavirus-pandemic-survey>

220 For more information, please refer to: https://globaled.gse.harvard.edu/files/geii/files/education_continuity_v3.pdf

221 For more information, please refer to: <https://tcg.uis.unesco.org/survey-education-covid-school-closures/>

222 UNICEF ESARO, *Reimagine Education Survey*, forthcoming in 2022.

Annex D: Standard operating procedures for data collection

IMPACT Initiatives, a Geneva-based think-tank, developed Standard Operating Procedures (SOPs) to guide research teams on how to undertake data collection during the Covid-19 outbreak and other health crisis contexts in partnership with WHO and Global Health Cluster colleagues.²²³ These guidelines outline an approach to assessing and mitigating risks by identifying appropriate data collection methods and developing context-specific recommendations for data collection:

1. Assess risks related to data collection during Covid-19 to ensure the protection of field staff, beneficiaries and local communities at all times.
2. Identify appropriate data collection methods based on risks identified so as to fill critical information gaps.
3. Formulate context-specific recommendations for data collection (face-to-face vs. remote).

The SOPs emphasize the following points:

- Protection and safety of staff members and local communities is key.
- Mandatory measures based on national and global guidance must be followed.
- Only essential data collection should be carried out during crisis contexts. Further, coordination across stakeholders is crucial to ensure that there is no duplication of data collection efforts.
- Maintain the robustness of data collection efforts and document any biases linked to remote data collection.
- Assess existing data management systems and processes to ensure that they can accommodate remote data collection and maintain participant privacy.



© UNICEF/UN0512129/

223 IMPACT Initiative, *SOPs for Data Collection during COVID-19*, 2020.

Annex E: Data output examples

The following figures are examples of tables, maps, graphs and infographics that visualize data outputs.

Other sample infographics can be accessed through the following sources:

- [EduView Dashboard](#)²²⁴
- [World Inequality Database on Education \(WIDE\)](#)²²⁵

Figure 18. UNICEF Child-Friendly Spaces (CFS) Map of Yemen.²²⁶

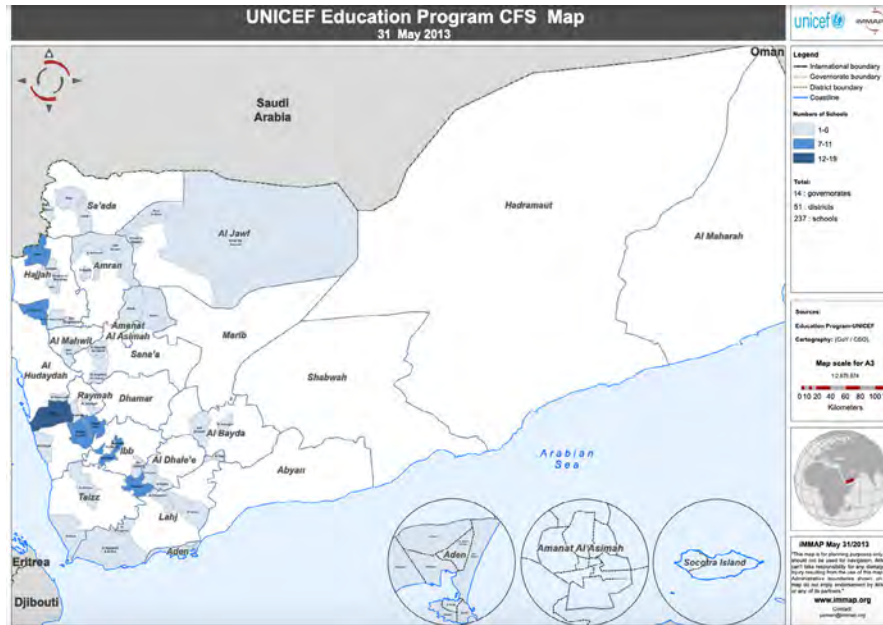


Figure 19. Infographic on data on equity in education.²²⁷



Annex F: Data security and protection²²⁸

This annex contains guidelines for data security and privacy, compliant with international standards for education data management. The Principles of Digital Development, created in consultation with organizations such as Gates Foundation, the Swedish International Development Cooperation Agency (SIDA), UNICEF, WHO, USAID emphasize the importance of data security: “Addressing privacy and security in digital development involves careful consideration of which data is collected and how data is acquired, used, stored and shared. Organizations must take measures to minimize collection and to protect confidential information and identities of individuals represented in data sets from unauthorized access and manipulation by third parties.”²²⁹

224 For more information, please refer to: <https://data.unicef.org/resources/eduview-education-dashboard/>

225 For more information, please refer to: <https://www.education-inequalities.org/>

226 UNICEF, ‘UNICEF Education Program CFS Map (as of 31 May 2013),’ 2013.

227 UNESCO-UIS, *Handbook on Measuring Equity in Education*, 2018.

228 OpenEMIS, ‘OpenEMIS Data Security Practices,’ (no date). <https://www.openemis.org/>.

229 Principles for Digital Development, ‘Address Privacy & Security,’ (no date). <https://digitalprinciples.org/principle/address-privacy-security/>.

The Conceptual Framework and Operational Guide propose the collection and use of data to strengthen education planning and monitoring. These data may include information about learners, guardians, staff, and other people in the community. Therefore, it is essential to ensure the education authority has a clear and well-articulated data security policy that meets the following conditions:

- Complies with data protection law and follows good practices
- Protects the rights of learners, guardians, staff, and the community
- Is transparent about how the system stores and processes individuals' data
- Protects itself from the risks of a data breach

Data protection law

Most countries have data security policies that describe how personal information on individuals should be collected, managed, stored, and distributed. These policies apply regardless of whether data is stored electronically, on paper or on other media. To comply with the laws that support these policies, personal information must be collected and used fairly, stored safely, and not disclosed unlawfully.

These laws are generally underpinned by eight important principles that state that personal information is to:

1. Be processed fairly and lawfully;
2. Be obtained only for specific, lawful purposes;
3. Be adequate, relevant, and not excessive;
4. Be accurate and kept up-to-date;
5. Not be held for any longer than necessary;
6. Be processed in accordance with the rights of data subjects;
7. Be protected in appropriate ways;
8. Not be transferred to another territory without adequate levels of protection.

Any initiative to monitor hybrid learning should adhere to national data protection laws.

People, risks, and responsibilities

A data policy on monitoring hybrid learning should encompass all authorized users involved in the collection, processing, and use of data, as well as all staff, contractors, volunteers, and other people working on behalf of the education authority.

A data security policy should apply to all data relating to identifiable individuals. This can include:

- Names of individuals;
- Contact information such as addresses, phone numbers, and email addresses;
- Identity information;
- Health information;
- Academic information;
- ...plus any other information relating to individuals

Data protection risks

This policy helps to protect the monitoring initiative from some data security risks, including:

- Breaches of confidentiality. For instance, information being given out inappropriately.
- Failing to offer choice. For instance, all individuals should be free to choose how the data is used relating to them.
- Reputational damage. For instance, the initiative could suffer if hackers successfully gained access to sensitive data.

Responsibilities

Everyone working in the monitoring initiative should assume responsibility for ensuring data is collected, stored, and handled appropriately. Each team that handles personal data must comply with these policy and data protection principles.

General guidelines

The only people authorized to access data covered by this policy are those who need the data to carry out their official responsibilities.

- Data should not be shared informally. When access to confidential information is required, authorized users must request approval in writing from their line managers.
- All people handling information system data need to understand their responsibilities when handling the data.

- All people authorized to access information system data must ensure that all data is secure, by taking appropriate precautions and following the guidelines herein:
 - In particular, strong passwords must be used and should never be shared.
 - Personal data should not be disclosed to unauthorized people, either within the team or externally.
 - Data should be regularly reviewed and updated if out of date. If no longer required, the data should be deleted and disposed of.
 - Anyone using the data should request help from their line manager if they are unsure about any aspect of data security and protection.

Data access

The policy should provide guidance on who, how, and what type of data should be accessed:

- The only people authorized to access the data covered by this policy are those who require the data to carry out their approved roles and responsibilities.
- The data always remains the property of the education authority and is not authorized for use for any reason without the written consent of the client.
- In digital systems, access to the data should only be allowed via approved application programming interfaces (APIs). Direct access to databases should be only authorized to system administrators with the approved roles and responsibilities for managing the backend of the system.

Data storage

These rules describe how and where data must be safely stored. Questions about storing data safely should be directed to the IT director.

When data is stored on paper, it should be kept in a secure place where unauthorized people cannot see it. These guidelines also apply to data that are usually stored electronically but have been printed out for any reason.

- When not required, the paper or files should be kept in a locked drawer or filing cabinet.
- Employees should make sure paper and printouts are not left where unauthorized people could see them, like on a printer.
- Data printouts should be shredded and disposed of securely when no longer required.

When data is stored electronically, it must be protected from unauthorized access, accidental deletion, and malicious hacking attempts:

- Data should be protected by strong passwords that are changed regularly and never shared with others.
- If data is stored on removable media (like a CD-ROM or USB drive), these should be kept locked away securely when not being used.
- Data should only be stored on designated drives and servers, and should only be uploaded on approved cloud computing services.
- Servers containing personal data should be situated in a secure location, away from general office space.
- Data should be backed up frequently and securely stored. These backups should be tested regularly, in line with industry-standard backup procedures.
- Data should never be saved directly to laptops or other mobile devices like tablets or smartphones.
- All servers and computers containing data should be protected by approved security software and a firewall.

Data use

There is a significant data security risk when data is accessed and used. During this time, there is the greatest risk of loss, corruption, or theft.

- When working with personal data, authorized users should ensure the screens of their computers are always locked when left unattended.
- Personal data should not be shared informally. In particular, it should never be sent by email, as this form of communication is not secure.
- Data must be encrypted before being transferred electronically; the IT director can explain how to send data to authorized external contacts.
- Authorized users should not save copies of the data to their own computers; — always access and update the centralized instance of the database.

Data accuracy

Like with all data collection exercises, the education authority should take reasonable steps to ensure data is kept accurate and up-to-date. To ensure accuracy in storage, the following are recommended:

- Data is stored in as few places as necessary and authorized users do not create any unnecessary additional data sets.

- Data is updated as inaccuracies are discovered, and, if no longer required, the data is removed from the database.

Subject access requests

All individuals who are the subject of personal data held by the education authority should be entitled to:

- Ask what information is held about them and why;
- Ask how to gain access to it;
- Be informed how to keep it up-to-date;
- Be informed how the education authority is meeting its data protection obligations.

If an individual contacts the education authority requesting this information, this is called a subject access request. These requests should be made in writing. The identity of anyone making a subject access request will need to be verified and approved before providing any information.

Disclosing data for other reasons

In certain circumstances, laws may allow data to be disclosed to law enforcement agencies without the consent of the data subject. Under these circumstances, the education authority should determine whether they will comply and disclose requested data. It is suggested that due diligence is undertaken to ensure the request is legitimate, seeking assistance from management and legal advisers when necessary.

Annex G: Data security practices²³⁰

Security aspects should be a major concern in any data collection exercise. Indeed, since the data collection and storage is undertaken by or for a government agency (such as ministries of education or education authority), data security is an inherent aspect of the implementation of such an initiative.

Below is a list of some common threats to online EMIS or data capture / management solutions and suggestions to manage risk:

Password hashing

Password hashing is one of the most basic security practices that must be performed. Without it, every stored password can be stolen if the storage medium (typically a database) is compromised. Any stolen password can then immediately be used to fraudulently access not only one application but also other applications if the user uses the same password elsewhere.

By applying a hash to the password before storing it, you make it very difficult for an attacker to know the original password, and you still have the ability to compare the hashed password to a received string.

Many industry-standard software packages use the hash functions to set up secure password storage logic. It is possible to establish additional security enhancement mechanisms for password management. This is a technique consisting of password hashing with additional data. In cryptography, this technique is called 'A grain of salt' or 'salt'. It is applied during the hashing process to eliminate the possibility of dictionary attacks (hashes recorded in a large list and compared in use with an algorithm using the brute force principle).

Figure 20. Visualization of password hashing.



230 OpenEMIS, 'OpenEMIS Data Security Practices,' (no date). <https://www.openemis.org/>.

SQL (Structured Query Language) injection and code injection

The SQLi flaw, an abbreviation of 'SQL Injection', is a group of security flaw operating methods of an application interacting with a database. It allows for the injection in the SQL query in progress, a piece of query not foreseen by the system and which can compromise its security.

An injection flaw occurs when unreliable data is sent to an interpreter as part of a command or query. The attacker's hostile data can fool the interpreter into executing accidental commands or accessing unauthorized data. This type of attack is most common.

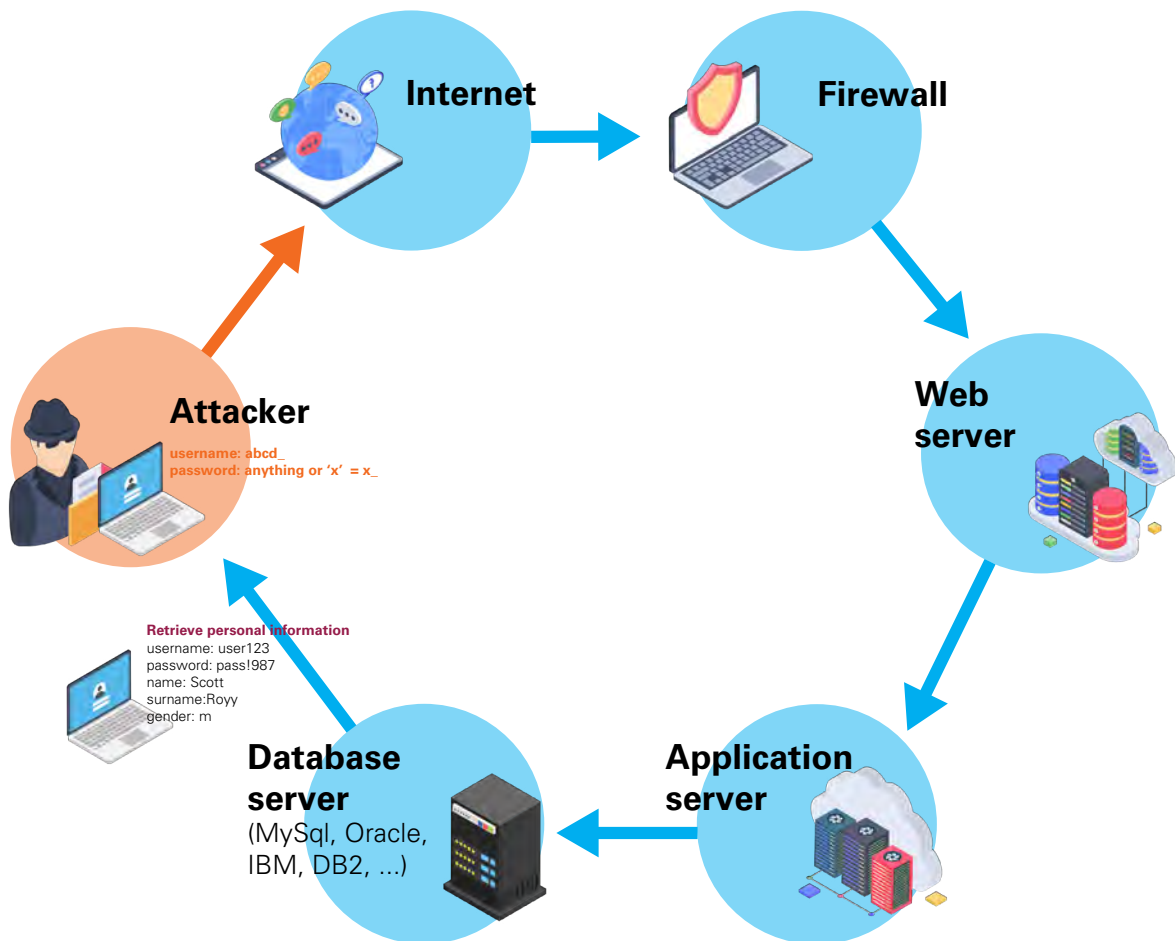
Preventing injection requires separating unreliable data from commands and queries. The best option is to use a healthy API that avoids any use of the interpreter or provides a customizable interface.

These customizable APIs manage a set of mechanisms and best practices (including escaping special characters using interpreter-specific escape syntax).

Brute-force attack

A brute-force attack, or comprehensive attack, is a method used by hackers and in cryptanalysis to discover the password or key.

Figure 21. Visualization of SQL injection.



Several strategies can be implemented to prevent brute force attacks:

Use of robust passwords

The first defence against this attack is to strengthen the password by avoiding the pitfalls that brute-force optimized attacks exploit. Reinforcing passwords requires:

- Lengthening the password or key if possible (the longer the password, the more difficult it is to hack)
- Use the widest possible range of symbols (lower case, upper case, punctuation, numbers); the introduction of national characters (Â, ÿ...) makes it more difficult for pirates to work

Random password generation

Random password generation algorithms are recommended.

Temporal limitation of connections

There are many plugins that manage the number of connection attempts. This is a tool for setting the maximum number of unsuccessful login attempts and the time a user needs to wait before trying to login again after an account is blocked. This plugin can be used during the authentication process.

Falsification of inter-site CSRF requests

A Cross-Site Request Forgery (CSRF) attack forces an authenticated victim's browser to send a forged HTTP request to a vulnerable web application, including the victim's session cookie and any other information automatically included.

This allows the attacker to force the victim's browser to generate requests that the vulnerable application believes are legitimate requests from the victim.

Prevention of such attacks includes:

- Requesting user confirmations for critical actions.
- Use of validity tokens in forms: This is to ensure that a mailed form is accepted only if it has been produced a few minutes previously: the validity token will be proof of this. The validity token must be transmitted as a parameter and checked on the server-side. There are CSRF components that provide protection against CSRF attacks.

- Avoiding using HTTP GET requests to perform actions: this technique will naturally eliminate simple attacks based on images, but will let pass attacks based on JavaScript, which are very simply capable of launching HTTP POST requests.
- Checking the referer in sensitive pages: knowing the client's source makes it possible to secure this type of attack. This consists of blocking the client's request if the value of its referer is different from the page from which it should theoretically come.

Cross-Site Scripting (XSS)

Cross-Site Scripting, more commonly known as XSS, is a flaw that allows HTML or JavaScript code to be injected into poorly protected variables. This is a common threat to online systems.

XSS vulnerabilities occur whenever an application accepts unreliable data and sends it to a web browser without proper validation. XSS allows attackers to execute scripting in the victim's browser to hijack user sessions, disfigure websites, or redirect the user to malicious sites.

There are actually two types of XSS:

- **Reflected XSS (not permanent)**

This rift is the simpler of the two. It is called non-permanent because it is not stored in a file or database. So it is ephemeral.

- **XSS stored (permanent)**

The permanent flaw is the most serious XSS flaw because the script is saved in a file or a database. It will therefore be displayed each time the site is opened.

Prevention

As this attack is not managed natively it is important to implement a customized defense mechanism to counter this type of attack.

The most suitable solution against this flaw consists of validating any information sent by users to the system. It is a question of using good development practices allowing the technical and business validation of the data. The use of character chain sanitization functions occupies a prominent place in the prevention of this type of attack.

For example Php's `htmlspecialchars()` function filters symbols of type `<`, `&` or `"`; replacing them with their HTML equivalent. The CakePhp API offers several methods allowing us to sanitize the character string before saving it to the database.

Denial of Service (DoS)

A Denial of Service attack (DoS) is a computer attack designed to render a service unavailable, to prevent legitimate users of a service from using it. It can involve:

- flooding of a network in order to prevent its operation;
- disruption of connections between two machines, preventing access to a particular service;
- obstructing access to a service to a particular person;
- sending billions of bytes to an internet box.

DoS attacks can block a file server, make it impossible to access a web server, or prevent email distribution in a company.

File recovery

One of the most critical issues for applications is securing data, including documents hosted on a data server. This vulnerability is better known as an unsecured direct reference to an object. A direct reference exists when a developer displays a reference to the internal implementation of an object, such as a file, a directory, a database record, or a key such as a parameter of a form or URL. An attacker can then manipulate the object reference directly to access other objects without authorization, even with access control checks in place.

Protection

The best protection is to avoid exposing a direct reference to an object, by using an index, an indirect reference equivalence or another indirect method that is easy to validate. If a direct reference to an object is to be used, it is essential to verify that

the user is authorized before using it. The implementation of a reference method to the application objects is important:

- Avoid exposing private object references to users, whenever possible, such as primary keys or file names.
- Validate all references to private objects without reserve, via the method of acceptance of good values.
- Check authorization to all referenced objects.

Annex H: Evolution of education data analytics

1990 — Yearbook

A traditional approach for EMIS data collection continues to be implemented by many countries where the focus is on the production of an annual school census report. The data is usually collected on paper forms by hand. The yearbook contains a few dozen tables of aggregated data and occasionally some charts.

2000 — Online Tables

Many countries shift towards the automation of the annual school questionnaire which is often summarized in online tables of aggregated information.

2010 — Dashboards

More recently, many countries are able to leverage the power of information technology to capture and publish data on individual learner enrolment tracked online and analyzed in interactive dashboards with graphs and maps.

2020 — Real-time analytics

Modern, robust EMIS technology now allows for daily tracking of learner attendance, behavior and assessment data. This information can be used by artificial intelligence to generate predictive models to guide policies for better education. For example, patterns in learner attendance can be used in the early identification and mitigation of the risk of school dropouts.

