COVID-19 in Sub-Saharan Africa:
Monitoring Impacts on Learning Outcomes

MAIN REPORT

GPE Transforming Education

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ACRONYMS

ACARA	Australian Curriculum, Assessment and Reporting Authority
ACER	Australian Council for Educational Research
AMPL	Assessments for Minimum Proficiency Levels
AMPL-b	Assessments for Minimum Proficiency Levels for SDG 4.1.1b
ASER	Annual Status of Education Report
CONFEMEN	Conference of the Ministers of Education of French speaking countries
COVID-19	Coronavirus Disease, 2019
DEPP	Evaluation, Prospective and Performance Department
DIF	Differential Item Functioning
EQAP	External Quality Assessment Programme
GAML	Global Alliance to Monitor Learning
GEM	Global Education Monitoring
GPE	Global Partnership for Education
GPF	Global Proficiency Framework
HDI	Human Development Index
ICCs	Item Characteristics Curves
ICILS	International Computer and Information Literacy Study
ICT	information communication technology
IDI	ICT Development Index
IEA	International Association of the Evaluation of Educational Achievement
INEE	Inter-agency Network for Education in Emergencies
INVALSI	National Institute for the Evaluation of the Education and Training System
IRT	Item Response Theory
ITU	International Telecommunication Union
JRR	Jackknife Repeated Replication
MCMLM	Mixed Coefficients Multinomial Logit Model
MILO	Monitoring Impacts on Learning Outcomes
MNSQ	mean square
MPL	Minimum Proficiency Level
NAS	National Assessment Survey
NASMLA	National Assessment System for Monitoring Learner Achievement
NRA	National or regional learning assessment
OECD	Organisation for Economic Co-operation and Development
PASEC	Programme for Analysis of Educational Systems
PCA	Principal Component Analysis
PIRLS	Progress in International Reading Literacy Study
PISA	Programme for International Student Assessment
PVs	Plausible Values
REDS	Responses to Educational Disruption Survey
RP	Response Probability
SDG	Sustainable Development Goal
SEAMEO	South East Asian Ministers of Educational Organization
SEA-PLM	The Southeast Asia Primary Learning Metrics
SES	Socio-economic status
TCG	Technical Cooperation Group
TIMSS	Trends in International Mathematics and Science Study
UIS	UNESCO Institute for Statistics
UKAID	United Kingdom Agency for International Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization
WLE	Weighted Likelihood Estimates

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Executive summary

PURPOSE OF THE MILO PROJECT

The COVID-19 pandemic has caused major disruptions to education. Across the world, schools have been partially or wholly closed, teachers and students have been forced to quarantine at home for short or extended periods of time, social learning opportunities have been cancelled and community interactions have been curtailed. Countries have been forced to find ways to adapt to these educational disruptions, by providing remote learning for students, adapting curriculum and assessments, and supporting the health and wellbeing of students, teachers and families.

The COVID-19 MILO (Monitoring Impacts on Learning Outcomes) study was designed to provide information on the impact of the pandemic on learning outcomes in six countries in Africa – Burkina Faso, Burundi, Côte d'Ivoire, Kenya, Senegal and Zambia. As these countries work towards the goal of meeting Sustainable Development Goal (SDG) 4.1.1b,[1] it is essential that progress towards this goal continues to be monitored. The MILO project was implemented to provide a way for countries to measure learning progress against SDG 4.1.1b prior to, during and after the pandemic.

MAIN GOALS OF THE MILO PROJECT

The four overarching goals of the MILO project were to:

- evaluate the impact of COVID-19 on reading and mathematics learning outcomes by reporting against SDG indicator 4.1.1b
- identify the impact of different distance learning mechanisms put in place to remediate the learning disruption generated by COVID-19
- expand the UIS bank of items for primary education
- generate a toolkit to scale assessment results to international benchmarks, reporting against SDG 4.1.1.b.

THE MILO STUDY DESIGN

The main aim of the MILO study was to determine the impact of COVID-19 on learning outcomes at the end of primary schooling. Data on learning outcomes prior to the pandemic were available through the national or regional assessments (historical assessments) that had been administered by the six countries in 2019, or 2016 in the case of Zambia.

The historical assessments were re-administered in the six MILO countries in 2021. These assessment data provided a comparison against assessment data from previous years. The performance for the target population in 2021 was compared against an equivalent cohort prior to the outbreak of the COVID-19 pandemic in 2019 (or 2016 in the case of Zambia).

Assessments for Minimum Proficiency Levels for SDG 4.1.1b (AMPL-b) tests were developed in the MILO project to provide a measure against SDG 4.1.1b. The AMPL tests were administered in 2021 alongside the national/regional assessments. Learning outcomes were reported through the proportion of students in the end of primary schooling population who met the Minimum Proficiency Levels (MPL). The link to this benchmark, established in the AMPL, was retrospectively applied to the historical assessment results. Knowledge about current and prior learning outcomes will also lay the foundation for the MILO countries to compare future learning outcomes, in order to measure ongoing progress towards SDG 4.1.1b.

PARTICIPATING COUNTRIES

Students from Burkina Faso, Burundi, Côte d'Ivoire, Kenya, Senegal and Zambia who were at or near the end of primary schooling were involved in the MILO project. Burkina Faso, Burundi, Côte d'Ivoire, and Senegal assessed Grade 6 students; Grade 7 students were assessed in Kenya and Grade 5 students in Zambia.

Contextual data were gathered from the target students, principals and system-level representatives from each country in order to understand how the COVID-19 disruption affected learning and to identify ways to support student learning.

AMPL READING AND MATHEMATICS ASSESSMENTS

- The AMPL for reading assesses key aspects of reading comprehension at upper primary level (Table 2.1).
- The AMPL for mathematics assesses key aspects of mathematics at upper primary level (Table 3.1).
- The AMPL for reading and AMPL for mathematics were developed using items from the UIS's Global Item Bank. The AMPL reading and mathematics are both strongly aligned to the Global Proficiency Framework enabling reporting against SDG 4.1.1b.
- Test booklets were provided to students in their language of instruction (French or English) and students had one hour to complete the booklet.

PERFORMANCE OF MILO COUNTRIES

- Across the six countries, the proportion of students who met the MPL in 2021 in reading ranged from 0.1% in Burundi to 46.7% in Kenya (Table 4.1).
- Comparisons of reading proficiency levels between 2021 and before the pandemic could be made for Burkina Faso, Burundi, Côte d'Ivoire, Senegal and Zambia.
- There was no difference in any of the five countries between the pre-pandemic and 2021 reading assessments. No differences were found in the proportions of students who met the MPL in reading at the end of primary schooling (Table 4.2).
- There was no difference in the reading performance between the performance of boys and girls on the AMPL within any of the participating countries (Table 4.2).
- Across the six countries, the proportion of students who met the MPL in 2021 in mathematics ranged from 2.1% in Zambia to 74.1% in Kenya (Table 4.3).

- Comparisons of mathematics proficiency between 2021 and before the pandemic could be made for all six MILO countries.
- There was no difference in Burundi, Côte d'Ivoire, Senegal, Kenya and Zambia between the pre-pandemic and 2021 mathematics assessments. No differences were found in the proportions of students who met the MPL in mathematics at the end of primary schooling (Table 4.4).
- Burkina Faso had a statistically significant difference in the proportion of students at the end of primary who met the MPL in mathematics. About 18% of the population met the MPL in 2019 and almost 24% met the MPL in 2021 (Table 4.4).
- For mathematics, there was some evidence of learning loss for boys in Kenya, with the proportion of boys who met the MPL dropping to about 74% in 2021, compared to almost 83% in 2019. (Table 4.4)

IMPACT OF COVID-19 ON TEACHING AND LEARNING

National contexts

Senior government officials in the six MILO countries completed the MILO System Questionnaire and indicated the ways in which the COVID-19 pandemic affected their education systems. Five of the six countries closed their schools as a consequence of the pandemic; Burundi was the only country where schools did not close (Figure 5.1). All five countries that experienced school closures had national plans or policies to provide directions for teaching and learning, as well as health and wellbeing, in response to the disruption.

School contexts

Principals completed the MILO School Questionnaire and indicated the ways in which the pandemic affected schooling, teaching and learning. There were considerable commonalities in principals' responses across countries.

- Overwhelmingly, principals reported they expected that the pandemic would have a negative impact on academic outcomes for all students (Table 6.3).
- Most schools did not offer remote learning programs universally. In many countries, teachers remained onsite during the entire pandemic period (Table 6.4).
- Changes to school policies and procedures mostly focused on increased hygiene and cleaning. Policies relating to supplementing face-to-face teaching with remote instruction, or continuing remote instruction during the pandemic were less common (Table 6.5).
- The key barriers to remote learning were student access to digital devices or to the internet (Table 6.6).
- Academic progress and students' health and wellbeing were key concerns (Table 6.10).

With school closures impacting many countries, teaching and learning needed to adapt in order to support students during and after the closure.

- Although a limited proportion of students had access to live virtual lessons or digital materials, many schools suggested educational TV and radio to students during the pandemic (Table 6.11).
- To minimise the impact on teaching and learning, schools most commonly engaged the broader community and increased communication between staff and students (Table 6.12).
- Throughout the pandemic, schools undertook a number of activities to support student health and wellbeing, mainly checking in with students and contacting families (Table 6.14).

Teachers were expected to maintain assessment and monitoring of students and provide feedback to them during the pandemic.

- Most schools expected and required teachers to continue to assess students (Table 6.15).
- Consistently, teachers were expected and required to provide feedback to students about their schoolwork (Table 6.16).

Student contexts

Students completed the MILO Student Questionnaire and indicated the ways in which the COVID-19 disruption impacted their access to education and their health and wellbeing.

- Students in Kenya and Senegal were most likely to have reliable internet access and access to digital devices. Across the other four countries most students did not have access to the internet or digital devices (Table 7.1).
- Across all six MILO countries, students were most likely to report that their family had to be more careful with money. Students in Kenya and Senegal experienced more family difficulties during the COVID-19 disruption than students in other countries (Table 7.2).
- Students in all MILO countries reported higher anxiety levels during the COVID-19 disruption compared to before the pandemic (Table 7.3).
- At least half of the students in the five countries that experienced school closures (Burkina Faso, Côte d'Ivoire, Kenya, Senegal and Zambia) reported that they experienced difficulties when they returned to school (Table 7.4).

Support given to students from their families, schools and teachers was examined in relation to reading and mathematics proficiency in 2021.

- Students in Kenya and Senegal were most likely to report that they received support for school-related tasks from their families (Table 7.5).
- Students in Burundi, Côte d'Ivoire, Kenya, Senegal and Zambia who received more support from their families tended to be more proficient in reading and mathematics compared to students who received less support (Figure 7.2).
- Students in Kenya and Senegal were most likely to report that they frequently received support from their school during the COVID-19 disruption (Table 7.6).
- Students in Côte d'Ivoire, Senegal and Zambia who received more support from their school tended to be more proficient in reading and mathematics (Figure 7.3).
- Students in Kenya were more likely to report that they received support from their teachers, whereas students in Côte d'Ivoire were least likely to report receiving support from their teachers (Table 7.7).
- Students in Kenya who received more support from their teachers tended to show greater proficiency in reading and mathematics (Figure 7.4).

The home background of students, including wealth, and parental literacy and education, was particularly relevant for students who experienced school closures during the COVID-19 disruption. Students with lower family wealth tended to have lower proficiency in both reading and mathematics than students with higher levels of family wealth (Figure 7.5).

UNDERSTANDING THE IMPACT OF COVID-19 ON LEARNING OUTCOMES

In the six MILO countries, students at the end of primary schooling have maintained learning outcomes in reading and mathematics since the onset of the pandemic, at least until mid-2021. There are several possible reasons for this:

- learning gains that may have otherwise been achieved since the previous assessment may have been suppressed by the pandemic

- students already on track to achieving the MPLs may have been less impacted by the COVID-19 disruption
- low proportions of students meeting the MPLs in historical assessments makes decline difficult to observe
- students may already have recovered from any learning loss by the time they undertook the assessment
- mitigation strategies may have lessened the impact on reading and mathematics outcomes compared to other academic and non-academic areas
- families, schools and educational systems were able to offset much of the impact of the disruption.

IMPLICATIONS FOR POLICY AND PRACTICE

Encouragingly, in the six MILO countries, schools, teachers, parents and students showed great resilience during the pandemic. However, the MILO results also show that there is still some way to go to support all students to reach the MPLs for SDG 4.1.1b. Importantly, there is also a need to continue to support the wellbeing of everyone in the school community. This report makes the following recommendations for policy and practice:

- prepare for the provision of effective remote teaching and learning in the case of future disruptions
- Continue to emphasise supporting the wellbeing of the school community during and after the pandemic
- ensure that there are effective systems in place to continue to monitor learning outcomes.

IMPLICATIONS FOR MEASURING SDG 4.1.1

The AMPL-b is a robust and efficient tool that measures the proportion of students who meet SDG 4.1.1b. Beyond 2021, the AMPL-b are resources provided by the UIS that can be used by countries and assessment programs to monitor progress against SDG 4.1.1b.

The AMPL-b can be implemented by countries, regions or systems to suit their reporting needs. The AMPL-b can be used as a standalone assessment to efficiently report against SDG 4.1.1b. They can also be integrated into existing national or regional assessments to measure and describe the broad range of abilities that children at the end of primary schooling may exhibit in reading and mathematics, in addition to reporting against SDG 4.1.1b.

The development of the AMPL-b is a significant step forward and has the potential to align national and cross-national assessment programs to a single set of global standards in mathematics and reading as articulated in SDG 4.1.1, and elaborated by the definitions of the MPLs (Australian Council for Educational Research Global Education Monitoring Centre [ACER-GEM], 2019, 2020) and the Global Proficiency Frameworks (United States Agency for International Development [USAID] et al., 2020a, 2020b). The AMPL-b is currently available in English and French but can readily be adapted and translated, and could include additional items set above or below the MPLs.

Currently, the AMPL-b covers the end of primary schooling outcomes, SDG 4.1.1b. However, the same methods could be applied if further assessments are developed to measure learning outcomes at the end of lower secondary to address SDG 4.1.1c (AMPL-c) or the end of lower primary, SDG 4.1.1a (AMPL-a).

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CHAPTER 1

Introduction

BACKGROUND OF THE STUDY

The COVID-19 pandemic has disrupted education in many ways. Across the world, schools have been partially or wholly closed, teachers and students have been forced to quarantine at home for short or extended periods of time, social learning opportunities have been cancelled and community interactions curtailed. This has added a further obstacle to the achievement of the Sustainable Development Goals (SDGs) related to education (United Nations Department of Economic and Social Affairs, 2020; UNESCO, 2020a).

Simulations on the impact of COVID-19 school closures on learning outcomes have suggested that school closures could result in significant learning loss, which could continue to accumulate even after schools re-open. School closures can reduce the number of effective years of basic schooling that students achieve in their lifetime with the consequence of reduced or lost future earnings (Azevedo et al., 2020; Kaffenberger, 2021).

Initial evidence from Africa has suggested that the pandemic had negative consequences for students, with fewer undertaking learning activities leading to considerable learning losses and compounding disadvantage for students who come from households with fewer resources available (Ardington et al., 2021; Dang et al., 2021). Other research has shown that students who were already behind in their learning are also at risk of falling further behind compared to those who already had mastery of skills (Tarricone et al., 2021). These findings highlighted the need for an investigation into the impact of COVID-19 on learning outcomes and what efforts countries are making to help mitigate any learning loss.

In order to adequately measure any changes in learning outcomes, there needs to be data collected at two or more points in time; one prior to the outbreak of COVID-19 (a baseline measure) and one after the disruption (to determine any change over time). While other research in Africa during the COVID-19 pandemic has relied on simulations, retrospective data or smaller non-representative data collections, the Monitoring the Impact of Learning Outcomes (MILO) project is unique in that it is able to use reliable and valid assessments of reading and mathematics at two points in time. Using sampling approaches that represent the target populations, the MILO project allows direct comparison of student performance before the pandemic to performance in 2021 following the period of disruption. As described further, the MILO project also provides a way for countries to measure progress towards Sustainable Development Goal (SDG) indicator 4.1.1b:

> The proportion of children and young learners ... at the end of primary ... achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex. (United Nations, 2015)

This introduction provides information about the purpose of the MILO project, outlining its overarching goals. It provides an overview of the study design, including information about the assessment blueprint for the tests, the conceptual framework for the contextual questionnaires, the MILO instruments, the historical instruments and the MILO countries and samples. Lastly, this chapter provides an outline of the rest of this MILO report.

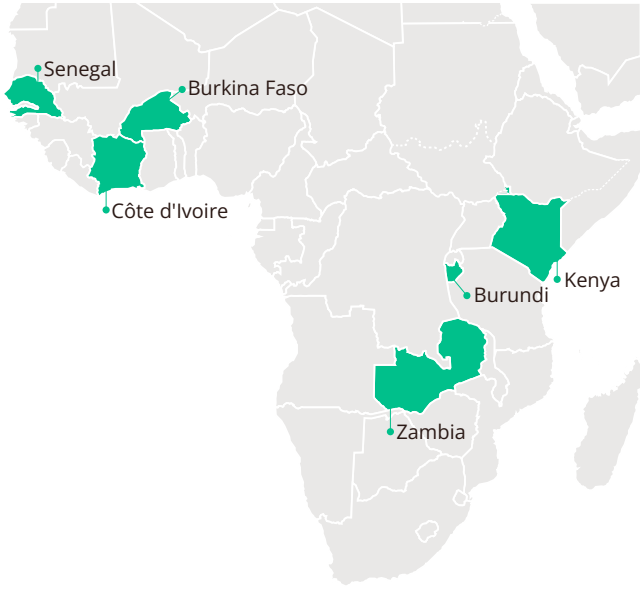
PURPOSE OF MILO

The MILO study is a UNESCO Institute for Statistics (UIS) project and was funded by the Global Partnership for Education (GPE).

The four overarching goals of the project were to:

- evaluate the impact of COVID-19 on reading and mathematics learning outcomes by reporting against SDG indicator 4.1.1b.

FIGURE 1.1 Map of MILO countries



- identify the impact of different distance learning mechanisms put in place to remediate the learning disruption generated by COVID-19
- expand the UIS bank of items for primary education
- generate a toolkit to scale assessment results to international benchmarks, reporting against SDG 4.1.1b.

The MILO project focused on six African Anglophone and Francophone countries, chosen by the UIS as they had existing pre-pandemic national or regional assessment data. The countries were Burkina Faso, Burundi, Côte d'Ivoire, Kenya, Senegal and Zambia, as shown in Figure 1.1. A National Centre in each country was responsible for implementing the project within their country. The Australian Council for Educational Research (ACER) was the technical partner for this project and technical and implementation support was provided by The Conference of Ministers of Education of French-Speaking Countries (CONFEMEN).

This report will focus on the first two goals. The report addresses the first goal by evaluating the degree to which learning outcomes for students at the end of primary schooling change between two time points: one pre-pandemic and the other

in mid-2021 after the pandemic had inflicted substantial disruption upon education contexts. The report addresses the second goal by examining contextual factors at the student, family, school and system levels for their response to the pandemic disruption. How these contextual factors relate to any change in outcomes over time is also explored. Discussion on the variety of educational responses to COVID-19 and recommendations for building more resilient education systems are included in this report. For details on how the MILO project addressed the third and fourth goals, see Box 1.

BOX 1

The Global Item Bank and the Assessments for Minimum Proficiency Levels

The UIS's Global Item Bank provides a global public repository of items which can be used to generate assessment data to measure reading and mathematics and report against SDG 4.1.1. As part of the MILO project, items were added to the Global Item Bank expanding the pool of high quality items available to countries. Quality assurance guidelines were also developed to enhance future contributions to the item bank.

The Global Item Bank can be used to develop assessments efficiently using high-quality material that enables reporting against SDG 4.1.1. In the MILO project, the Assessments for Minimum Proficiency Levels (AMPL) were created using English and French-source items from the UIS's Global Item Bank (see Chapters 2 and 3).

Additionally, the MILO project generated a set of tools for the UIS that can be used by countries to measure and report leaning outcomes against SDG 4.1.1b. The toolkit includes the AMPL-b, along with supporting documentation used in the MILO project to support the implementation – technical standards, the assessment blueprint, contextual framework, field operations guidelines and a description of the analysis methods used in the study (see Appendix B).

The AMPL-b is a robust and efficient assessment tool that measures the proportion of students meeting SDG 4.1.1b. Beyond 2021, the AMPL-b are resources provided by the UIS that can be used by countries and assessment programs to monitor progress against SDG 4.1.1b. Should a country, region or system want to report against SDG 4.1.1b in the future, the AMPL-b can be implemented as a standalone assessment. The AMPL-b targets the Minimum Proficiency Levels (MPLs). However, should a country, region or system want to measure and describe the broad range of abilities that children at the end of primary school may exhibit in reading and mathematics, in addition to reporting against SDG 4.1.1b, the AMPL-b can be integrated into existing national or regional assessments. For example, this can be done by administering the AMPL-b forms alongside existing assessments, as was done in the MILO project.

The development of the AMPL-b is a significant step forward and has the potential to align national and cross-national assessment programs to a single set of global standards in mathematics and reading as articulated in SDG 4.1.1, and elaborated by the definitions of the Minimum Proficiency Levels (ACER-GEM, 2019, 2020) and the Global Proficiency Frameworks (USAID et al., 2020a, 2020b). The AMPL-b is currently available in English and French but can readily be adapted and translated, and could include additional items set above or below the MPLs.

Currently, the AMPL-b covers the end of primary schooling outcomes, SDG 4.1.1b. However, the same methods could be applied if further assessments are developed to measure learning outcomes at the end of lower secondary to address SDG 4.1.1c (AMPL-c) or the end of lower primary, SDG 4.1.1a (AMPL-a).

A major finding of the MILO project was that, in general, the learning outcomes across time were stable (see Chapter 4). That is, the student population assessed after the pandemic did not perform worse than the population assessed before the pandemic. This report details key information about the design of the MILO study that allows that measurement to take place, the contexts in which the stability of outcomes took place (at the student, home, school and educational system level), the possible reasons why no changes were observed, and the implications of the findings for students in the region.

STUDY DESIGN

The main aim of this study was to determine the impact of COVID-19 on learning outcomes at the end of primary schooling. To quantify current learning outcomes, an assessment of reading and mathematics was administered to students at the end of primary school in mid-2021. These assessment data also provided a means of comparison against assessment data from previous years. The performance for the target population was compared against an equivalent cohort prior to the outbreak of the COVID-19 pandemic in 2019.[2] For further information about the methods used to compare the results pre-pandemic to the results in 2021, see Appendix B.

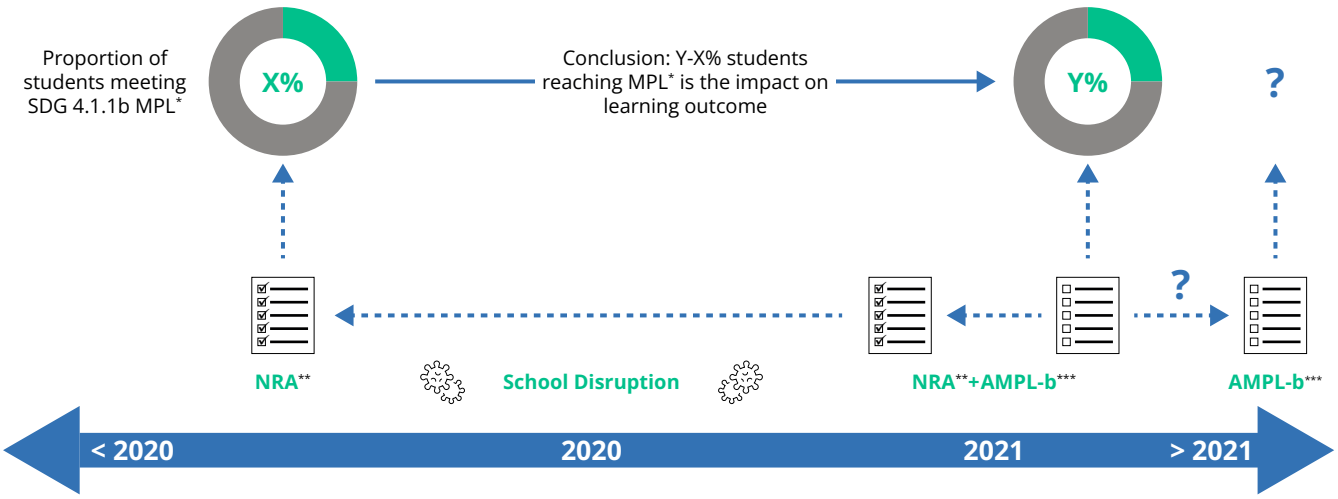
The design of the study is outlined in Figure 1.2. The figure shows that prior to the onset of the pandemic, students in the MILO countries participated in a national or regional learning assessment (NRA). This assessment is referred to as 'the historical assessment' in this report. A sub-set of the same historical assessment was administered to an equivalent cohort in 2021 alongside the *Assessments for Minimum Proficiency Levels for SDG 4.1.1b* (AMPL-b) tests, with the period of COVID-19 disruption somewhere in-between.

Assessment blueprint for AMPL-b tests

The MILO Assessment Blueprint outlines details of the two learning areas that are assessed in the MILO project: reading and mathematics. In line with the Global Proficiency Frameworks (GPFs) (USAID et al., 2020a, 2020b), reading and mathematics are referred to as 'learning areas', which are then broken down into domains, constructs, and sub-constructs.

The MILO project focuses on students at the end of primary schooling. However, the definition of 'the end of primary schooling' differs across systems and countries. In this Study, the benchmark used to indicate learning outcomes is aligned with SDG indicator 4.1.1b.

FIGURE 1.2 Study design



* MPL: Minimum Proficiency Level ** NRA: National or regional learning assessment
*** AMPL - b: Assessments for Minimum Proficiency Levels for SDG 4.1.1b at the end of primary

The assessments used in the MILO project are labelled Assessments for Minimum Proficiency Levels for SDG 4.1.1b (AMPL-b). The Minimum Proficiency Level (MPL) in reading for end of primary schooling is:

> Students independently and fluently read simple, short narrative and expository texts. They retrieve explicitly-stated information. They interpret and give some explanation about the main and secondary ideas in different types of texts, and establish connections between main ideas in a text and their personal experiences. (ACER-GEM, 2020, p. 6)

The MPL in mathematics for end of primary schooling is:

> Students recognise, read, write, order, compare and calculate with whole numbers, simple fractions and decimals. Students can measure length and weight using standard units, calculate the perimeter of simple 2D shapes and area of rectangles. They read, interpret and construct different types of data displays such as tables, column graphs and pictographs and recognise, describe and extend number patterns. They can solve simple application problems. (ACER-GEM, 2020, p. 4)

The items in the AMPL-b tests were chosen to match the constructs expressed through the GPF (USAID et al., 2020a, 2020b). A participatory standard setting exercise involving experts from all six MILO countries was used to set a single cut-point for reading and a single cut-point for mathematics in the tests. The cut-point is the MPL at the end of primary schooling, as referred to in SDG 4.1.1b These cut-points were used to determine the proportion of students above and below the SDG 4.1.1.b MPLs in 2021 and in the historical assessments.

Note that AMPL-b focused on a single cut-point of the MPL for efficiency. An assessment that would be used to more deeply describe the entire range of reading or mathematics outcomes in a population requires more items, more development time, and they are usually more complex to implement and analyse. The urgent need for information on the impact of the pandemic precluded such a lengthy process. The AMPL-b were designed to be efficiently developed and implemented. AMPL-b are fit for the purpose of providing estimates against a single global indicator of learning outcomes. For further information about the standard setting exercise, see Appendix A, and full details about the AMPL-b tests can be found in Chapters 2 and 3.

Conceptual Framework for contextual questionnaires

A Conceptual Framework underpins the design of the MILO questionnaires. It includes the types of data needed in order to achieve the MILO objectives, which were:

- to understand how the COVID-19 disruption affected learning
- to quantify any learning loss
- to identify how to support student learning.

The Framework is organised into six themes, and the impact of the COVID-19 disruption organised into three layers (see Figure 1.3):

- student characteristics
- the home environment
- the school environment, which includes two sub-themes, teaching and learning, and assessment and monitoring.

Six themes were used to provide a comprehensive picture of the way the pandemic affected each of these three levels:

- **UNDERSTANDING THE COVID-19 DISRUPTION:** Data were collected on how the pandemic disruption impacted different school systems, schools and students. This was the foundation on which other data were collected, in that the other data related to the effects of COVID-19.

- **STUDENT CHARACTERISTICS:** Student characteristics data were collected based on demographic categories that included, gender, students with disability or special needs, and students from ethnic, linguistic, refugee or internally displaced backgrounds. These categories were derived from the literature, where evidence shows that students with particular qualities or from certain backgrounds are more vulnerable to learning loss during emergencies in education.

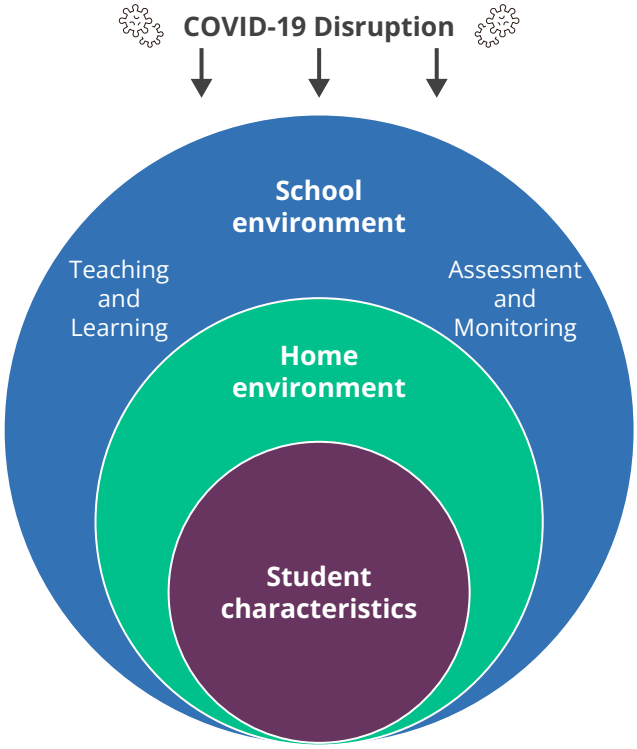
- **HOME ENVIRONMENT:** Data about the home environment focused on the home circumstances of students that might enable or inhibit learning during the COVID-19 disruption, regardless of more enduring personal characteristics. The contexts of the home environment are expected to have a profound influence on the degree in which the COVID-19 disruption enables or inhibits learning, regardless of more enduring personal characteristics.

- **SCHOOL ENVIRONMENT:** School environment data related to the resources and actions of schools within their national systems and which could either exaggerate or insulate children from the COVID-19 disruption. While policies and procedures at the school to combat disruption were often dictated at the system level, individual school characteristics and individual school responses to address these policies may play a role in reducing the extent of the disruption on students. This included factors such as school leadership, school characteristics, resources and location as well as national policies and plans that impact schools.

- **TEACHING AND LEARNING:** Teaching and learning practices fall within the broader school environment and data were collected about pre- and post-disruption classroom and school practices as well as about student experiences in their school work.

- **ASSESSMENT AND MONITORING:** There is greater risk of unequal learning progress during periods of disruption. The MILO questionnaires captured information on assessments conducted on students and the degree to which both students and staff were monitored throughout the disruption in relation to wellbeing and for students, academic progression.

FIGURE 1.3 Conceptual Framework for MILO contextual data



The MILO instruments

There was a suite of MILO instruments:

- The AMPL-b **test of reading performance** consisted of 29 items within the reading comprehension domain that covered the constructs *retrieve information*, *interpret information* and *reflect on information*. The same items were used in two AMPL-b test booklets with the items presented by domain in set order; Booklet 1 contained reading and then maths items, and Booklet 2 contained maths and then reading items. The AMPL was created using items from the UIS's Global Item Bank and is used to estimate the proportions of students who meet the MPL referred to in SDG 4.1.1b. See Chapter 2 for more information.

- The AMPL-b **test of numeracy performance** consisted of 29 items within the mathematics domain relating to number and operations, measurement, geometry, statistics and probability and basic concepts of algebra. The same items were used in two booklets. As with reading, the AMPL was created using items from the UIS's Global Item Bank and is used to estimate the proportions of students who meet the MPL referred to in SDG 4.1.1b. See Chapter 3 for more information.
- A **Student Questionnaire** was given to the same students who completed each of the two AMPL-b tests. The questionnaire consisted of 91 items grouped into 27 questions, with topics about demographic and home characteristics of the students, their experiences using technologies as a result of the pandemic and information about the nature of their schooling during the pandemic.
- A **School Questionnaire was completed by school principals or their delegates** and consisted of 177 items grouped into 27 questions. The questionnaire collected information about how COVID-19 impacted each school's ability to deliver teaching and learning activities, as well as any ongoing consequences of the pandemic. In addition, the questionnaire elicited information about schools in general to aid the interpretation of the reading and numeracy performance and Student Questionnaire responses.
- **A System Questionnaire of 13 questions was completed by respondents at the national level** who were asked to provide responses about the education system of the whole country with specific regard to the impacts of COVID-19. They were asked how the period of disrupted schooling could be characterised, how responsibility for the pandemic response was distributed in the school sector, and what plans and policies had been implemented to respond to the COVID-19 disruption.

The historical instruments

Historical assessment data were used for each of the six participating MILO countries to compare the performance of the MILO target population against equivalent populations before the outbreak of the pandemic. Only a subset of historical items was readministered as part of MILO in order to minimise the testing time required for students. The historical assessments used for comparison in MILO were:

- Programme for Analysis of Educational Systems (PASEC) 2019 (CONFEMEN, 2020) (used for Burkina Faso, Burundi, Côte d'Ivoire, Senegal)
- National Assessment Survey (NAS) Grade 5, 2016 (used for Zambia)
- National Assessment System for Monitoring Learner Achievement (NASMLA) Grade 7, 2019 (Karogo et al., 2020) (used for Kenya - only a link to mathematics is available; the 2019 assessment of English in Kenya did not contain a sufficient number of reading comprehension items to align with the reading constructs within the GPF.)

Sampling approach

The MILO Sampling Framework sets out the standards of participation in terms of sampling, and these are aimed at maximising the comparability of survey outcomes across countries before and after the onset of the pandemic. The target grade in the MILO project was the grade closest to the end of primary schooling within each country for which historical assessment data were available to use as the pre-pandemic baseline. All students enrolled in the target grade in each participating country were included in the target population. This included students from schools across all educational sub-systems and types within a country where the language of instruction was English or French. Some school and student-level exclusions applied, consistent with other large-scale surveys.

The MILO countries and samples

The language of administration as well as the sampling characteristics of all six countries are shown in Table 1.1. The school participation rate in all countries was extremely high (with replacements where necessary). All countries were able to achieve a very high level of student response rate (the proportion of students who were sampled to participate who actually participated). The grade level of the students assessed in 2021 in each of these countries was selected to replicate the grade levels assessed in the historical assessment and enable comparisons between the populations.

One of the overarching goals of the MILO project is to identify whether learning loss took place from the time of the historical assessments (held in 2016 for Zambia and 2019 for other countries) to the time of the MILO data collection in 2021. Therefore, it is important to compare characteristics of the two populations. This allows any differences observed in achievement over time to be taken into context (given the established relationship between student and home background characteristics and achievement, see Chapter 7 for further details).

TABLE 1.1 Numbers of students and schools participating in MILO with participation rates

Country	Language of administration	Grade assessed	Participating schools (no.)	School response rate (%)*	Participating students (no.)	Student response rate (%)*
Burkina Faso	French	6	289	100	5684	84
Burundi	French	6	252	100	4993	95
Côte d'Ivoire	French	6	250	100	4867	96
Kenya	English	7	265	100	6417	98
Senegal	French	6	247	99	4675	98
Zambia	English	5	252	99	4954	93

* Unweighted response rate including substitutes

Table 1.2 presents comparative data on wealth of students, gender, age, maternal and paternal literacy and school type for populations of students from the historical assessments and the AMPL.[3] In many ways, the characteristics of populations are similar across the two points in time, although some differences can be observed. For instance, students in the 2021 population were comparatively wealthier in Kenya and Senegal, but comparatively less wealthy in Burkina Faso in comparison to the historical population. The literacy rate of parents in Burundi and Côte d'Ivoire, and the proportions of students who attended public schools in Burkina Faso were also comparatively higher for the MILO population.

TABLE 1.2 Student and home background characteristics of historical assessment and AMPL

	AMPL-NATIONAL ASSESSMENT WEALTH INDEX (LOGITS)			GENDER (% GIRLS)			AGE (YRS)		
Country	**AMPL**	**Historical**	**Difference (AMPL-Historical)**	**AMPL**	**Historical**	**Difference (AMPL-Historical)**	**AMPL**	**Historical**	**Difference (AMPL-Historical)**
Burkina Faso	-0.79	-0.36	-0.42	56	53	3	13.1	13.5	-0.4
Burundi	-1.73	-1.82	0.09	56	56	0	14.4	14.7	-0.3
Côte d'Ivoire	-0.30	-0.41	0.11	48	46	2	12.0	12.1	-0.1
Kenya	0.58	0.19	0.39	51	55	-4	12.6	12.5	0.1
Senegal	0.28	-0.20	0.48	54	46	8	14.8	14.5	0.3
Zambia	N/A	N/A	N/A	51	N/A	-	12.3	N/A	-
	MATERNAL LITERACY (%)			**PATERNAL LITERACY (%)**			**SCHOOL TYPE (% PUBLIC)**		
Country	**AMPL**	**Historical**	**Difference (AMPL-Historical)**	**AMPL**	**Historical**	**Difference (AMPL-Historical)**	**AMPL**	**Historical**	**Difference (AMPL-Historical)**
Burkina Faso	46	50	-4	57	66	-9	87	68	0
Burundi	78	67	11	83	73	10	98	94	0
Côte d'Ivoire	49	37	12	70	56	14	81	83	0
Kenya	63	N/A	-	79	N/A	-	77	82	0
Senegal	56	60	-4	78	77	1	87	91	-4
Zambia	79	N/A	-	86	N/A	-	83	N/A	-

OUTLINE OF THE REPORT

This report explores the findings from the MILO project with a focus on comparing learning outcomes over time, as well as the contexts for teaching and learning during the COVID-19 pandemic.

Chapters 2 and 3 explore the AMPL-b reading and mathematics assessments, with respect to the framework, construction and contents. Chapter 4 provides details on the proportions of students across countries who met the SDG 4.1.1b MPLs in reading and mathematics.

Chapters 5, 6 and 7 explore the second overarching goal of the MILO project by investigating the impact of different distance learning mechanisms to remediate the pandemic learning disruption. Contexts at the system, school and student level help explain how learning loss was not recorded and these explanations are discussed in Chapter 8.

Chapter 5 describes the national contexts of each MILO country. It describes how each participating country was impacted by the COVID-19 disruption, details the aspects of national policies of the educational systems in response to the pandemic, discusses national communication and outreach during the pandemic and summarises assessment and data collection used by each country. Chapter 5 draws primarily on information from the MILO System Questionnaire.

Chapter 6 focuses on the school and classroom contexts of the MILO countries during the pandemic. It presents information on how schools in each country were impacted during the period of COVID-19 disruption, provides details on school infrastructure and teaching and learning resources available during the disruption, and discusses assessment and monitoring during and after the period of disruption. These findings draw on data from the MILO School Questionnaire.

Chapter 7 focuses on the contexts for students in the MILO countries. It explores student performance in the AMPL reading and mathematics by subgroups of students based on home background characteristics and those students who may be considered vulnerable. The chapter will also present various supports available to students during periods of COVID-19 disruption to their studies and detail various impacts of the disruption on students. The findings in the chapter will largely draw on data from the MILO Student Questionnaire.

Chapter 8 provides a summary of the main findings about the national contexts, the school and classroom contexts, and the student contexts and how they address the four overarching goals of the project. This chapter discusses possible reasons why no learning loss was observed as a whole across the MILO countries. The findings are presented in the context of other similar research, where mixed findings about the impact of the pandemic on learning outcomes were found. Possible implications for policy and practice of the findings of the study are presented, and recommendations are made for building more resilient education systems as well as future considerations for evaluating the impact of the pandemic on educational systems.

Appendix A provides further details about the standard setting exercise to determine the level of performance that corresponds to students meeting the MPLs at the end of Primary School, as referred to in SDG 4.1.1b.

Appendix B includes technical descriptions of data analyses used to link the MILO data with past historical assessment results.

Appendix C provides additional supplementary tables including information about the GPF reading and mathematics domains, constructs and sub-constructs and tables containing the standard errors for the proportion of students meeting the MPLs for reading and mathematics and information about contributors to the MILO project.

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CHAPTER 2

The reading assessment

HIGHLIGHTS

- The Assessments for Minimum Proficiency Levels (AMPL) for reading assesses the following key aspects of reading comprehension at upper primary level: retrieving information, interpreting information and reflecting on information (Table 2.1).
- The AMPL for reading is strongly aligned to the Global Proficiency Framework enabling reporting against SDG 4.1.1b.
- The assessment material included in the AMPL was selected from the UIS's Global Item Bank using a set of quality assurance guidelines. The 29 selected reading items came from nine different sources, with some originating in French, and others in English.
- The AMPL booklets contained a set of reading material and a set of mathematics material. The booklets were provided to students in their language of instruction (French or English) and students had one hour to complete the booklet.

INTRODUCTION

As outlined in Chapter 1, a main goal of the MILO study was to determine the impact of COVID-19 on learning outcomes for students at the end of primary school. In order to achieve this aim, Assessments for Minimum Proficiency Levels (AMPL) were designed to measure proficiency in reading and mathematics at the end of primary school in 2021. The construct validity of these assessments is addressed in this chapter. The development process led to highly reliable instrumentation (for details see Appendix B).

The performance of the 2021 population was compared to that of an equivalent cohort from a period prior to the COVID-19 outbreak. For a technical description of the analysis methods used to link the MILO data with the past historical assessment results, see Appendix B. The focus of this chapter is on the features of the AMPL for reading.

ASSESSMENT OF READING PERFORMANCE IN MILO

The MPL for upper primary for reading provided the overarching conceptualisation of reading in the AMPL. The parts of reading referred to in the MPL (described in detail later in this chapter) parallel those in the Global Proficiency Framework (GPF) (USAID et al., 2020a). As defined by the GPF, the Reading learning area comprises the following three domains:

- comprehension of spoken or signed language
- decoding
- reading comprehension.

The emphasis of the AMPL was on the third domain, reading comprehension. Comprehension of spoken or signed language was not included because it is discussed in the GPF only in relation to Grades 1–3. Decoding was also not included in the AMPL, partly because it is most relevant in the earliest years of school, and partly because these skills are most easily elicited in one-to-one assessments. In addition, the MPL for reading for upper primary (SDG 4.1.1b) assumes that these decoding skills have been largely mastered (ACER-GEM, 2019). The domain of reading comprehension, the emphasis of AMPL, is further broken down into three constructs: *retrieve information*, *interpret information* and *reflect on information*.

In order to ensure good coverage of the constructs in the AMPL, an assessment blueprint that specified targets for each of the three constructs within the domain of reading comprehension was developed. The targets were a range rather than a single number. The targets for each of the three constructs within the domain of reading comprehension were as follows:

- retrieve information: 35–45%
- interpret information: 45–55%
- reflect on information: 15–25%

These targets were developed with reference to existing large-scale and regional assessments, and the work of the GPF alignment group.[4] In relation to the former, this breakdown is analogous to that used in the large-scale international assessment PIRLS (Progress in International Reading Literacy Study) (Mullis & Martin, 2019) in which the equivalent breakdown is 20% retrieve information, 60% interpret information and 20% reflect on information. The slightly greater emphasis on items relating to retrieving information in AMPL was considered appropriate to match with the prior assessment experiences of students in the six MILO countries.

The AMPL assessment is strongly aligned to the GPF. An assessment is considered strongly aligned, and therefore, suitable for reporting against SDG4.1.1b when there are at least five items that assess the construct retrieve information and at least five items that assess the construct *interpret information*. Additionally, as a set, the items should cover at least 50 per cent of the Reading sub-constructs defined in the GPF.[5] The targets for the AMPL allow this specification to be met. Table 2.1 shows the classification of the items in the assessment against the specified targets, revealing that the final selection was closely aligned to the targets. Appendix C provides further detail about the constructs and sub-constructs in the GPF.

Items were selected from the UIS's Global Item Bank to meet the assessment blueprint after an extensive review process. Two expert reviewers for each of English and French independently reviewed a set of material. The review included only multiple-choice or complex-multiple-choice

TABLE 2.1 Final AMPL reading items and targets by construct

Construct	Items in AMPL (no.)	Items in AMPL (%)	Target percentage (%)
Retrieve information	10	34	35–45
Interpret information	14	48	45–55
Reflect on information	5	17	15–25

Note: Due to rounding, percentages do not add to 100%.

items as it was desirable to exclude any items that could not be scored automatically. The reviewers were provided with item review guidelines and asked to consider issues such as construct validity (whether the item assesses a part of reading comprehension), translatability (whether there are features of the material that might make it difficult to translate), cultural issues and technical criteria (clarity and correctness, centrality, appropriate level of difficulty). Only items that attained a high overall rating and for which no significant concerns were identified were considered for inclusion in the AMPL. From the set of suitable items, a selection was made that:

- met the requirements of the assessment blueprint
- contained items that originated in each of English and French
- represented a range of sources (nine different sources for the 29 items included)
- represented a range of materials (e.g. narrative texts, information texts)
- represented a range of difficulty levels that was considered appropriate for the target population and for measuring the minimum proficiency levels at the end of primary school.

There were two AMPL booklets; each contained a set of reading material and a set of mathematics material. The same set of material was used in each, but the order in which the material appeared was reversed: in Booklet 1 the reading material appeared first, and in Booklet 2 the mathematics material appeared first. This was to minimise any possible effects of position – for example, if students became fatigued while completing the second half of the booklet, they might underperform. This study design, in which the material could be completed either in the first or second half of the assessment, mitigates the effects of the position of the content. In order to minimise the effects of fatigue, the testing time was limited to one hour (30 minutes each for reading and mathematics).

As described in Chapter 1, a key goal of the MILO project was to evaluate the impact of COVID-19 on learning outcomes by reporting against SDG indicator 4.1.1b '...the proportion of children and young learners ... at the end of primary ... achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex.' (United Nations, 2015).

The MPL for the end of primary for reading is discussed and illustrated in the section that follows. This information is taken from a paper that was presented and endorsed in a 2019 meeting of the Global Alliance to Monitor Learning entitled 'Minimum Proficiency Levels: Described, unpacked and illustrated.' (ACER-GEM, 2019).

The MPL is described and elaborated in the following four ways, targeted at different audiences:

1. A nutshell statement: provides brief information for all readers about each learning area, by educational level.
2. An expanded statement: provides information suitable for those working in the field of education.

3. Descriptors by construct: these elaborations use more technical language, and are suitable for educators and researchers.

4. Sample items: a small set of sample items, one below, one at, and one above the MPL.

READING: END OF PRIMARY (SDG 4.1.1B)

1. Nutshell statement

Students independently and fluently read simple, short narrative and expository texts. They retrieve explicitly-stated information. They interpret and give some explanations about the main and secondary ideas in these texts, establish connections between main ideas in a text and their personal experiences.

2. Expanded statement

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

3. Constructs and Descriptors

Decoding

In a short, simple narrative or expository text, students read at a pace and with a level of accuracy and prosody that meets minimum standards for fluency in the language of instruction.

Reading comprehension

RETRIEVING INFORMATION

Students use morphological or contextual clues to identify the meaning of most unfamiliar words, familiar words used in unfamiliar ways, different shades of meaning of closely related words, synonyms or basic figurative language.

They locate most pieces of explicit information when the information is prominent and found within a single paragraph containing no competing information.

INTERPRETING INFORMATION

Students establish the main idea of a text most of the time, when it is stated prominently in the text. They make simple inferences by relating two or more prominent pieces of explicitly stated information, when there no competing information, in order to identify behaviours, feelings, events and factual information.

REFLECTING ON INFORMATION

Students establish basic connections between the key ideas in a text and personal knowledge and experience.

They distinguish between text types (narrative and expository) and recognise some other common text types (e.g, poetry, recipe, game instructions.) when the content and structural clues are obvious.

SAMPLE ITEMS

Three sample items are included, one below, one at, and one above the MPL. Two English items and one French item are included. Two of the sample items are released items from the PASEC (Program for the Analysis of Education Systems) 2014 assessment (CONFEMEN, 2015) and were included in the AMPL.[6] The other sample item is from ACER-GEM (2019).

EXAMPLE 1: An item below the MPL

Choose the picture that shows a **foot**.

A B C D

Source: PASEC (CONFEMEN, 2015)

Domain	Construct	Descriptor	International percentage correct
Reading comprehension	Retrieve information[7]	Match an image to a word.	75%

Task solution and commentary

Option C is selected. The matching of images to words is an important early reading skill and scaffolds the development of fluency. However, the MPL for upper primary states that students are able to read short texts 'independently and fluently'. Students at this MPL have therefore mastered such skills that act to support fluent reading. This item therefore falls below the upper primary MPL.

EXAMPLE 2: An item at the MPL

The Dwarf Lantern Shark

Are you afraid of sharks?

Some sharks are harmless. The Dwarf Lantern Shark cannot hurt you. It is so small you can hold it in one hand. It is a special shark because it can glow in the dark.

The Dwarf Lantern shark lives at the bottom of very deep oceans. There is no light where they live. They make their own light.

Why does the Dwarf Lantern Shark need to glow in the dark?

Source: Minimum Proficiency Levels: Described, unpacked and illustrated (ACER-GEM, 2019)

Domain	Construct	Descriptor	International percentage correct
Reading comprehension	Interpreting information	Link information from the end of one paragraph to the beginning of the next paragraph.	N/A Item not included in AMPL

Task solution and commentary

Students can link information across paragraphs when the information follows from the end of one paragraph to the start of the next paragraph. In 'The Dwarf Lantern Shark', students need to link the information about the shark glowing in the dark to the information about living in deep oceans where there is no light in order to understand why they make their own light. This item is an example of an item at the upper primary reading MPL (ACER-GEM, 2019).

EXAMPLE 3: An item above the MPL

Un drôle de rêve

1. Trois voleurs rencontrent un jour un paysan monté sur un âne et
2. tirant une chèvre au bout d'une corde. Le premier fait alors le pari de
3. dérober à l'homme sa chèvre, le deuxième parie qu'il lui prendra l'âne, et
4. le troisième qu'il le dépouillera même de ses habits.
5. Le premier voleur s'approche doucement, attache à la queue de l'âne la
6. clochette qui était suspendue au cou de la chèvre, et fuit avec celle-ci. Le
7. paysan, s'étant aperçu du vol, rencontre le deuxième voleur et lui
8. demande s'il n'a pas vu quelqu'un s'enfuyant avec une chèvre.
9. - Si, dit le voleur. Il est parti par là. Dépêche-toi, tu peux le rejoindre. Si
10. tu veux, je garderai ton âne pendant ce temps-là.
11. Le pauvre paysan court dans la fausse direction et, quand il revient,
12. l'homme et l'âne ont évidemment disparu. Il arrive en gémissant devant
13. un puits au bord duquel un homme gémit aussi. Cet homme est le
14. troisième voleur. Il se plaint au paysan :
15. - J'ai laissé tomber au fond de ce puits une caisse pleine d'argent. Je ne
16. sais comment la rattraper car je ne suis pas très adroit et j'ai peur de
17. l'eau.
18. - Qu'à cela ne tienne ! dit le paysan, qui est très serviable. Moi, je peux te
19. la retrouver.
20. - Si tu le fais, peut-être que je te donnerai une partie de l'argent qu'elle
21. contient, dit le voleur.
22. Le paysan se déshabille donc et descend dans le puits. Il n'y trouve
23. aucune caisse mais, quand il remonte, le voleur a disparu avec ses
24. vêtements.
25. Je me suis réveillé tout en sueur, heureusement que ce n'était qu'un
26. rêve !

L'histoire dit « Il arrive en gémissant devant un puits…» à la ligne 12.
Comment le paysan se sent t-il à ce moment de l'histoire ?

A. il est désespéré
B. il a soif
C. il est nerveux
D. il a sommeil

Source: PASEC (CONFEMEN, 2015)

Domain	Construct	Descriptor	Percentage correct in French-speaking countries[8]
Reading comprehension	Interpreting information	Link information in order to make an inference about a character's feelings	23%

Task solution and commentary

Option A (il est désespéré) is selected. This item requires students to link information across two paragraphs. The description of the 'interpreting' construct above states that students at the MPL can make simple inferences by relating two or more prominent pieces of explicitly stated information, when there is no competing information. To correctly answer this item, students do need to make an inference. However, it is not a simple one, since the information is not prominent, and there is also competing information (a fairly long text with many characters). Therefore, this item is above the upper primary MPL.

CHAPTER 3

The mathematics assessment

HIGHLIGHTS

- The AMPL for mathematics assesses the following five key aspects of mathematics at upper primary level: number and operations, measurement, geometry, statistics and probability, and algebra (i.e. number patterns and missing number problems) (Table 3.1).
- The AMPL for mathematics is strongly aligned to the Global Proficiency Framework, enabling the reporting against SDG 4.1.1b.
- The assessment material included in the AMPL was selected from the UIS's Global Item Bank using a set of quality assurance guidelines. The 29 selected mathematics items came from nine different sources, with some originating in French, and others in English.
- The AMPL booklets contained a set of mathematics material and a set of reading material. The booklets were provided to students in their language of instruction (French or English) and students had one hour to complete the booklet.

INTRODUCTION

As outlined in Chapter 1, a main goal of the MILO study was to determine the impact of COVID-19 on learning outcomes for students at the end of primary school. In order to achieve this aim, assessments for minimum proficiency levels (AMPL) were designed to measure proficiency in reading and mathematics at the end of primary school in 2021. The construct validity of these assessments is addressed in this chapter. The development process led to highly reliable instrumentation (for details see Appendix B).

The performance of the 2021 population was compared to that of an equivalent cohort from a period prior to the COVID-19 outbreak. For a technical description of the analysis methods used to link the MILO data with the past historical assessment results see Appendix B. The focus of this chapter is on the features of the AMPL for mathematics.

ASSESSMENT OF MATHEMATICS PERFORMANCE IN MILO

The MPL for upper primary for mathematics provided the overarching conceptualisation of mathematics in the AMPL. The parts of mathematics referred to in the MPL (described in detail later in this chapter) parallel those in the Global Proficiency Framework (GPF) (USAID et al., 2020b) and the GPF was used to provide additional detail for the item selection. The AMPL included five domains of mathematics in line with the GPF. As outlined in the MILO assessment blueprint, content targets were set at the domain level.

These targets were:

- Number and operations items make up 35–45% of the assessment
- Measurement items make up 15–20% of the assessment
- Geometry items make up 15–20% of the assessment
- Statistics and probability items make up 10–15% of the assessment
- Algebra items make up 10-15% of the assessment.

The mathematics targets were developed with reference to existing large-scale and regional assessments, and the work of the GPF advisory group on alignment.[4] For example, the content breakdown is analogous to that used in the large-scale international assessment Trends in International Mathematics and Science Study (TIMSS) (Mullis & Martin, 2017). In TIMSS Grade 4, the equivalent breakdown is 50% Number (including Algebra as defined in the GPF), 30% Measurement and geometry, and 20% Data.

Table 3.1 shows the classification of the final items in the assessment against the specified targets.

TABLE 3.1 Final AMPL mathematics items and targets by construct

Construct	Items in AMPL (no.)	Items in AMPL (%)	Target percentage (%)
Number and operations	12	41	35–45
Measurement	4	14	15–20
Geometry	5	17	15–20
Statistics and probability	4	14	10–15
Algebra	4	14	10–15

The GPF advisory group on alignment specified that in order to be considered 'strongly aligned' with the GPF, an assessment needs to include:

- at least five items from the Number and operations domain
- at least five items from the Measurement and Geometry domains
- at least five items from the Statistics and probability, and Algebra domains
- a total of 50% of all the sub-constructs in the mathematics GPF that are relevant to the target grade level. For example, if there are 20 sub-constructs at Grade 5, at least 10 of the sub-constructs should be included in the assessment.

The upper primary MPL has been defined by the Global Alliance for Monitoring Learning and the Technical Cooperation Group (TCG) on the Indicators for SDG 4 as spanning grade levels 4, 5 and 6. There are 23 sub-constructs in the GPF for mathematics that are relevant to either or all of these three grade levels. Of the 23 sub-constructs relevant to Grades 4, 5 and/or 6, there were 16 included in the AMPL. The AMPL was therefore strongly aligned to the GPF, with all mathematics targets met. Appendix C provides further detail about the coverage of GPF constructs and sub-constructs within the AMPL.

Items were selected from the UIS's Global Item Bank to meet the assessment blueprint after an extensive review process. Two expert reviewers for each of English and French independently reviewed a set of material. They were provided with item review guidelines and asked to consider issues such as construct validity (whether the item assesses a part of mathematics as described in the GPF), translatability (whether there are features of the material that might make it difficult to translate), cultural issues and technical criteria (clarity and correctness, centrality, appropriate level of difficulty). Only items that attained a high overall rating and for which no significant concerns were identified were considered for inclusion in the AMPL. From the set of suitable items, a selection was made that:

- met the requirements of the assessment blueprint
- contained items that originated in both English and French
- represented a range of sources (nine different sources for the 29 items were included)
- represented a range of materials (e.g. context-free items, real-world problems)
- represented a range of difficulty levels that were appropriate for the target population and for measuring the minimum proficiency levels at the end of primary.

As described in Chapter 2, there were two AMPL booklets, each containing a set of mathematics material and a set of reading material. The testing time was one hour (30 minutes each for reading and mathematics.

As described in Chapter 1, a key goal of the MILO project was to evaluate the impact of COVID-19 on learning outcomes by reporting against SDG indicator 4.1.1b '... the proportion of children and young learners ... at the end of primary ... achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex' (United Nations, 2015).

The MPL for the end of primary for mathematics is discussed and illustrated in the section that follows. This information is taken from two papers that were presented and endorsed in 2019 and 2020 meetings of the Global Alliance to Monitor Learning entitled 'Minimum Proficiency Levels: Described, unpacked and illustrated.' (ACER-GEM, 2019) and 'Minimum Proficiency Levels Revisions Proposed by ACER' (ACER-GEM, 2020).

The MPL is described and elaborated in the following four ways, providing different levels of detail for different audiences:

1. A nutshell statement: provides brief information for all readers about each learning area, by educational level.
2. An expanded statement: provides information for those working in the field of education.
3. Descriptors by construct: these elaborations use more technical language and are suitable for educators and researchers.
4. Sample items: a small set of sample items, one below, one at, and one above the MPL.

MATHEMATICS: END OF PRIMARY (SDG 4.1.1B)

Nutshell statement

Students recognise, read, write, order, compare and calculate with whole numbers, simple fractions and decimals. Students can measure length and weight using standard units, calculate the perimeter of simple two-dimensional shapes and area of rectangles. They read, interpret and construct different types of data displays such as tables, column graphs and pictographs and recognise, describe and extend number patterns. They can solve simple application problems.

Expanded statement

Students can add and subtract whole numbers within 1000 and demonstrate fluency with multiplication facts up to 10 × 10 and related division facts; solve simple real-world problems with whole numbers using the four operations (consistent with the grade and performance level) and identify simple equivalent fractions; select and use a variety of tools to measure and compare length, weight and capacity/volume; understand the relationships between different units of time, e.g. seconds, minutes, hours, days, weeks, months, and years; retrieve multiple pieces of information from data displays to solve problems; recognise and name two-dimensional shapes by their simple attributes; and apply the concept of equivalence by finding a missing value in a number sentence.

Constructs and Descriptors

Number knowledge

NUMBER SENSE (COUNTING, READING, WRITING, COMPARING, AND ORDERING)

Read, write, compare, and order whole numbers up to 10,000.

Skip count forwards and backwards using twos, fives, tens, hundreds, and thousands.

NUMBER SENSE (USING PLACE VALUE AND ROUNDING)

Round numbers up to the nearest hundred and thousand.

OPERATIONS (ADDING AND SUBTRACTING)

Add and subtract whole numbers within 1000.

OPERATIONS (MULTIPLYING AND DIVIDING)

Demonstrate fluency with multiplication facts up to 10 × 10, and related division facts.

REAL-WORD PROBLEMS

Solve simple real-world problems using the four operations, with the unknown in different positions.

FRACTIONS

Identify simple equivalent fractions where one denominator is a multiple of another (e.g. $\frac{1}{3} = \frac{2}{6}$).

Compare and order unit fractions (e.g. $\frac{1}{4}, \frac{1}{3}, \frac{1}{2}$) or fractions with the same denominator ($\frac{1}{8}, \frac{3}{8}, \frac{5}{8}$).

DECIMALS

Identify and represent decimal numbers up to the tenths place (e.g. identify that 0.8 is 8 tenths).

Compare and order decimal numbers up to the tenths place (e.g. sort the following decimals from high to low: 0.8, 0.3, 0.1).

Measurement

MEASUREMENT UNITS (STANDARD AND NON-STANDARD)

Select and use a variety of tools to measure and compare length, weight, and capacity/volume.

AREA, PERIMETER, AND VOLUME

Solve problems, including real-world problems, involving the perimeter of a rectangle using concrete or pictorial representations of units (e.g. grid squares).

TIME

Tell time using an analogue clock to the nearest quarter hour.

Solve problems involving elapsed time in half hour increments within an hour (e.g. difference between 3.00 and 3.30).

Understand the relationships between different units of time (e.g. seconds, minutes, hours, days, weeks, months, and years).

Statistics and probability

DATA MANAGEMENT

Complete missing information in simple data displays using data arranged into categories, with some support provided (e.g. labelled horizontal and/or vertical axes).

Retrieve multiple pieces of information from data displays to solve problems (e.g. calculate a total represented by multiple bars on a graph).

Geometry

CONSTRUCTIONS

Compose a larger two-dimensional shape from a small number of shapes in more than one way (if possible).

Decompose a larger two-dimensional shape into a small number of shapes in more than one way (if possible).

Recognise parallel and perpendicular lines.

PROPERTIES

Recognise and name two-dimensional shapes by their attributes (e.g. their lines and informal angle properties).

Recognise the congruence and similarity of two-dimensional shapes (e.g. shapes that have been reflected, translated, rotated, enlarged, or reduced).

POSITION AND DIRECTION

Follow more complex directions and/or give simple directions to a given location (e.g. go straight, turn right at the corner with the tree, turn left at the next corner, keep going to the green house).

Algebra

PATTERNS

Describe numerical patterns as increasing by a constant value but starting at a number that is not a multiple of the value of the pattern (e.g, the pattern 5, 8, 11, 14 starts at 5 and goes up by 3).

RELATIONS AND FUNCTIONS

Demonstrate understanding of equivalence by finding a missing value in a number sentence using addition or subtraction of numbers within 100 (e.g. 23 + ____ = 29).

SAMPLE ITEMS

Three sample items are included, one below, one at, and one above the MPL. Two English items and one French item are included. Sample items are released items from the PASEC 2014 assessments (CONFEMEN, 2015) and were included in the AMPL.[9]

EXAMPLE 1: An item below the MPL

What units do you use to measure the length of a classroom?

A. metres
B. kilograms
C. litres
D. hours

Source: PASEC (CONFEMEN, 2015)

Domain	Construct	Descriptor	International percentage correct
Measurement	Length, weight, capacity, volume, area and perimeter	Select appropriate standard units to measure length and distinguish from mass, capacity and time units.	65%

Task solution and commentary

Option A (metres) is selected. This task invites students to consider a familiar measurement task (length of a classroom); and then to identify the relevant unit to use for the measurement from those presented. Given that, of the units offered, only the first option is a length unit, this should be a very straightforward task for end of primary students. The relevant MPL statement at the end of primary states 'Select and use a variety of tools to measure and compare length, weight, and capacity/volume'. As this item requires students to recognise a common unit, it is below the end of primary MPL.

EXAMPLE 2: An item at the MPL

Le tableau suivant donne le nombre de filles et de garçons dans les classes d'une école

	CP1	CP2	CE1	CE2	CM1	CM2
Filles	16	15	18	16	20	1
Garçons	20	18	15	12	16	14

Quel est le nombre total de filles de CP1 et CP2?

A. 15
B. 16
C. 31
D. 38

Source: PASEC (CONFEMEN, 2015)

Domain	Construct	Descriptor	International percentage correct
Statistics and probability	Data management	Interpret a two-way table to calculate a total running across two categories.	45%

Task solution and commentary

Option C (31) is selected. This task requires students to read a two-way table and select multiple pieces of information to solve a simple word problem. The MPL at the end of primary refers to the ability to 'retrieve multiple pieces of information from data displays to solve problems'. Therefore, this item is clearly at the end of primary MPL. The skill of adding two-digit numbers, which is also a feature of this item, is well below the descriptor at the end of primary MPL, which refers to the ability to 'add and subtract whole numbers within 1000.' Therefore, the major cognitive load in this item is on the statistical skill of retrieving data from a table, rather than the skill of adding two-digit numbers.

EXAMPLE 3: An item above the MPL

The length of a rectangle is 50 m, and its area 500 m^2.
What is the width of the rectangle?

A. 10m
B. 50m
C. 450m
D. 550m

Source: PASEC (CONFEMEN, 2015)

Domain	Construct	Descriptor	International percentage correct
Measurement	Length, weight, capacity, volume, area and perimeter	Given an area and the length of a rectangle, identify the width of the rectangle.	38%

Task solution and commentary

Option A (10 m) is selected. This task requires students to have a sound conceptual understanding of the method for calculating the area of rectangle, and also knowledge of how to apply this to a slightly more complex problem. The task is not just a straightforward application of area where students multiply side lengths of the rectangle to calculate area. Rather this item requires students to use a given area and one side length to find an unknown width. The MPL at the end of primary refers to the ability to 'calculate the perimeter of simple 2D shapes and area of rectangles'. This question goes beyond the simple calculation of the area of a rectangle, as it requires students to use a strategy such as transposing the relationship length multiplied by width to divide area by length and find the unknown width, or to set up a 'missing number' problem such as 50 × ? = 500 and then identify which of the options provided would be the required missing number. Therefore, this item is above the end of primary MPL.

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CHAPTER 4

Performance of MILO countries in reading and mathematics

HIGHLIGHTS

- The Assessments for Minimum Proficiency Levels (AMPL) estimated reading and mathematics proficiency. The AMPL enabled the percentages of students who reached the minimum proficiency levels (MPLs) for SDG 4.1.1b to be reported.
- There were five countries (Burkina Faso, Burundi, Côte d'Ivoire, Senegal and Zambia) for which comparisons could be made between reading proficiency levels in 2021 and pre-pandemic levels. In these five countries, there was no difference in the proportions of students who met the MPLs in reading at the end of primary schooling between 2021 and before the pandemic (Table 4.2).
- In all six MILO countries, the learning outcomes for mathematics in 2021 were compared to pre-pandemic levels. In Burundi, Côte d'Ivoire, Senegal, Kenya and Zambia, there were no differences in the proportions of students who met the MPLs in mathematics at the end of primary schooling between 2021 and before the pandemic (Table 4.4).

TABLE 4.1 Proportions of students who met or exceeded SDG-aligned MPLs for reading, AMPL and historical assessments, by country and gender

Country	STUDENTS WHO REACHED OR EXCEEDED MPL IN 2021 AMPL: READING (%)			STUDENTS WHO REACHED OR EXCEEDED MPL IN HISTORICAL ASSESSMENT: READING (%)		
	All	Boys	Girls	All	Boys	Girls
Burkina Faso	9.0	9.3	8.8	5.8	5.6	5.9
Burundi	0.1	0.1	0.1	0.3	0.3	0.4
Côte d'Ivoire	10.8	9.9	11.7	10.4	9.9	10.9
Kenya[11]	46.7	44.9	48.4			
Senegal	13.3	11.6	14.6	14.7	14.1	15.2
Zambia	2.3	2.4	2.2	1.8	1.5	2.1

- Only Burkina Faso had a statistically significant difference in the proportions of students at the end of primary schooling who met the MPLs in mathematics. Approximately 18% of the population met the MPL in 2019. This increased by 6 percentage points to 24% in 2021 (Table 4.4).
- For mathematics, there was some evidence of learning loss for boys in Kenya, with an approximately 9 percentage point decrease in the proportions of boys who met the MPLs, dropping from 83% in 2019 to 74% in 2021 (Table 4.4).

INTRODUCTION

The MILO project was designed to measure differences in learning outcomes at the end of primary schooling in 2021 compared to those prior to the pandemic, in order to identify the impact of COVID-19. Proficiency in reading and mathematics is reported in terms of the percentages of students who reached or exceeded the MPL for upper primary, overall, and for girls and boys.

A standard-setting exercise was conducted in order to establish the MPLs for students at the end of primary schooling. This determined the score in the AMPL associated with the minimum level of skill or knowledge required to meet the MPL. Appendix A provides further details.

STUDENT PROFICIENCY IN READING

Table 4.1 shows the percentages of students who met or exceeded the end of primary reading MPLs in 2021, as measured by the AMPL. It also shows the percentages of students who completed the historical assessment in 2019 or 2016[10] and who had met or exceeded the end of primary MPLs. For a technical description of the data analyses used to link the AMPL results with the historical assessment results see Appendix B. For details of standard errors, see Appendix C.

Reading proficiency in 2021

The percentages of students who met or exceeded the MPLs ranged from 0.1% in Burundi to 46.7% in Kenya. There were no statistically significant differences in results between boys and girls in any country.

Changes in reading proficiency over time

Table 4.2 shows changes (percentage point differences) in the proportions of students who met or exceeded the Reading MPLs in 2021 compared to prior to the pandemic. The results are provided overall and by gender. A positive value indicates a higher estimate in 2021 than in the historic assessment.

In five MILO countries (Burkina Faso, Burundi, Côte d'Ivoire, Senegal and Zambia), there were no statistically significant differences in the proportions of students who met the MPLs in reading between 2021 and prior to the pandemic. Note that in the case of Kenya, results are not included as the 2019 assessment of English in Kenya did not contain a sufficient number of reading comprehension items to align with the reading constructs within the GPF.

Chapter 8 will draw on the cognitive and contextual results from the MILO project with reference to other relevant literature in a discussion about these findings.

STUDENT PROFICIENCY IN MATHEMATICS

Table 4.3 shows the percentages of students who met or exceeded the end of primary mathematics MPLs in 2021, as measured by the AMPL. It also shows the percentages of students who completed the historical assessment in 2019 or 2016[11] who had met or exceeded the end of primary MPLs. For a technical description of the data analyses used to link the AMPL results with the historical assessment results see Appendix B. For details of standard errors, see Appendix C.

TABLE 4.2 Changes in proportions of students who met or exceeded the reading MPLs in 2021 compared to the pre-pandemic assessments, by gender

Country	PERCENTAGE POINT DIFFERENCES 2021 AMPL - HISTORICAL ASSESSMENT: READING					
	All		Boys		Girls	
Burkina Faso	3.2	-	3.6	-	2.8	-
Burundi	-0.2	-	-0.1	-	-0.3	-
Côte d'Ivoire	0.4	-	0.0	-	0.9	-
Kenya						
Senegal	-1.4	-	-2.5	-	-0.6	-
Zambia	0.5	-	1.0	-	0.1	-

- difference between AMPL and historical assessment outcomes is not statistically significant

TABLE 4.3 Proportions of students who met or exceeded SDG-aligned MPLs for mathematics, AMPL and historical assessments, by country and gender

Country	STUDENTS WHO REACHED OR EXCEEDED MPL IN 2021 AMPL: MATHEMATICS (%)			STUDENTS WHO REACHED OR EXCEEDED MPL IN HISTORICAL ASSESSMENT: MATHEMATICS (%)		
	All	Boys	Girls	All	Boys	Girls
Burkina Faso	23.7	25.8	22.1	17.9	18.8	17.1
Burundi	13.5	16.5	11.1	17.0	22.0	12.9
Côte d'Ivoire	8.9	8.8	9.1	7.6	8.2	6.9
Kenya	74.1	73.5	74.6	79.7	82.8	78.4
Senegal	34.0	34.1	33.9	34.6	34.6	34.7
Zambia	2.1	2.0	2.1	3.5	3.7	3.4

Mathematical proficiency in 2021

The percentages of students who met or exceeded the MPLs ranged from 2.1% in Zambia to 74.1% in Kenya. Burundi was the only country to have a statistically significant difference in the results between boys and girls.

Changes in mathematical proficiency over time

Table 4.4 shows the changes (percentage point differences) in the proportions of students who met or exceeded the mathematics MPLs in 2021 compared to prior to the pandemic. The results are provided overall and by gender. A positive value indicates a higher estimate in 2021 than in the historic assessment.

For most countries, there were no significant differences between 2021 and the historical assessments. Only Burkina Faso had a statistically significant difference overall, with a 6 percentage point increase in the proportions of students who met or exceeded the MPL in 2021 (23.7%) compared to the historical assessments (17.9%). There was also a statistically significant improvement in mathematics learning outcomes for both boys and girls. In 2021 for boys, there was a 7 percentage point improvement in the proportion meeting the MPLs from 18.8% in 2019 to 25.8% in 2021. For the girls, there was a 5 percentage point increase in the proportion meeting the MPLs from 17.1% in 2019 to 22.1% in 2021.

In Kenya, there was evidence of learning loss for boys between 2019 and 2021. A smaller proportion of boys met or exceeded the MPL in 2021 (73.5%) compared to the historical assessment (82.8%), a decrease of 9.3 percentage points. There was no corresponding statistically significant decline in girls' mathematics learning outcomes in Kenya.

Chapter 8 will draw on the cognitive and contextual results from the MILO project with reference to other relevant literature in a discussion about these findings.

TABLE 4.4 Changes in proportions of students who met or exceeded the mathematics MPLs in 2021 compared to the pre-pandemic assessments, by gender

Country	PERCENTAGE POINT DIFFERENCES 2021 AMPL - HISTORICAL ASSESSMENT: MATHEMATICS					
	All		Boys		Girls	
Burkina Faso	5.8	▲	7.0	▲	5.0	▲
Burundi	-3.5	-	-5.6	-	-1.8	-
Côte d'Ivoire	1.4	-	0.6	-	2.2	-
Kenya	-5.7	-	-9.3	▼	-3.7	-
Senegal	-0.6	-	-0.5	-	-0.7	-
Zambia	-1.4	-	-1.7	-	-1.2	-

▲ *significantly higher than in historical assessment* ▼ *significantly lower than in historical assessment*

\- difference between AMPL and historical assessment is not statistically significant

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CHAPTER 5

National contexts of teaching and learning during COVID-19

HIGHLIGHTS

Senior government officials in the six MILO countries were asked, via the MILO Systems Questions, to indicate how the COVID-19 pandemic affected their education systems. The responses revealed both commonalities and differences in how the pandemic affected education systems:

- In Burkina Faso, schools were fully closed for 9 weeks and partially closed for a further 4 weeks.
- Burundi was the only MILO country where schools were not closed as a consequence of the pandemic.
- Schools in Côte d'Ivoire were fully closed for seven weeks and partially closed for a further six weeks.
- Schools were fully closed in Kenya for 28 weeks, and were subsequently partially closed for a further 10 weeks.
- In Senegal, schools closed fully or partially for 13 and 9 weeks, respectively.
- Schools in Zambia fully or partially closed for 15 and 13 weeks, respectively.

All five countries that experienced school closures had national plans or policies to provide directions for teaching and learning, as well as health and wellbeing, in response to the disruption.

- Remote schooling options were provided, using a mix of technologies such as television, radio and the internet.

- When schooling resumed, modified health management practices were often initiated and included social distancing; stricter water, sanitation and hygiene (WASH) protocols; and mask wearing.
- Countries varied in the extent to which they reported supporting disadvantaged students, with support most commonly given to students with special needs (Table 5.2).
- Countries also included a range of organisational changes, most commonly relating to health and wellbeing at home and school (Table 2.3).
- Most countries prioritised a wide range of responses to address the COVID-19 disruption, although Côte d'Ivoire more narrowly focused their support, including by providing remote instruction and engaging with families (Table 5.4).
- Countries offered a variety of services to support staff wellbeing; peer support and counselling were the most common areas of support provided (Table 5.5).

During the pandemic, education officials in the six MILO countries most commonly communicated with the families of students via radio (Table 5.6). All five countries where schools closed undertook outreach or support measures to encourage students to return to school (Table 5.7).

As a result of the pandemic, the MILO countries introduced health and safety measures during learning assessments and made various changes to their learning assessments and monitoring processes (Table 5.8); four out of the six countries collected regular data on student achievement and student attendance (Table 5.9).

INTRODUCTION

This chapter describes the impacts of COVID-19 on the six MILO countries and the national education system policies developed to respond to the pandemic. These include the plans and policies to support students and staff, and changes to the organisation of schooling. The communication and outreach strategies that countries used during the pandemic are also presented, including the mode of communication to families and students and the support measures developed to encourage students to return to school. This chapter also examines countries' assessment and monitoring practices, including the changes they implemented to monitor the impact of the pandemic on students and teachers.

The information reported is predominantly drawn from the MILO System Questionnaire, where each country completed questions that related to a specified COVID-19 disruption period, as identified by each country, on the basis of when there was the most disruption to education, as shown in Table 5.1.

TABLE 5.1 COVID-19 disruption periods for MILO countries

Country	Defined COVID-19 disruption period
Burkina Faso	14 March – 31 May 2020
Burundi	January – 28 February 2021
Côte d'Ivoire	20 March – mid-May
Kenya	March 2020 – January 2021
Senegal	Mid-March – late-May 2020
Zambia	Early March – 20 September 2020

The System Questionnaire was completed by one senior government official from each MILO country. The respondents were asked to gather input, where necessary, from other officials such as those working across ministries of education and examinations centres. Many questions referred to the 'target grade', which was the grade of the students who undertook the MILO assessment.

Data from the System Questionnaire are supplemented by other relevant data and research on the system-level context underpinning learning outcomes in each MILO country. The National Education Responses to COVID-19 School Closures Survey created by UNESCO, UNICEF, the World

Bank and the OECD is a key supplementary data source (hereafter referred to as the School Closures Survey). This survey identified responses to school closures stemming from COVID-19 to inform future responses and prepare for school reopening (UIS et al., 2020a).

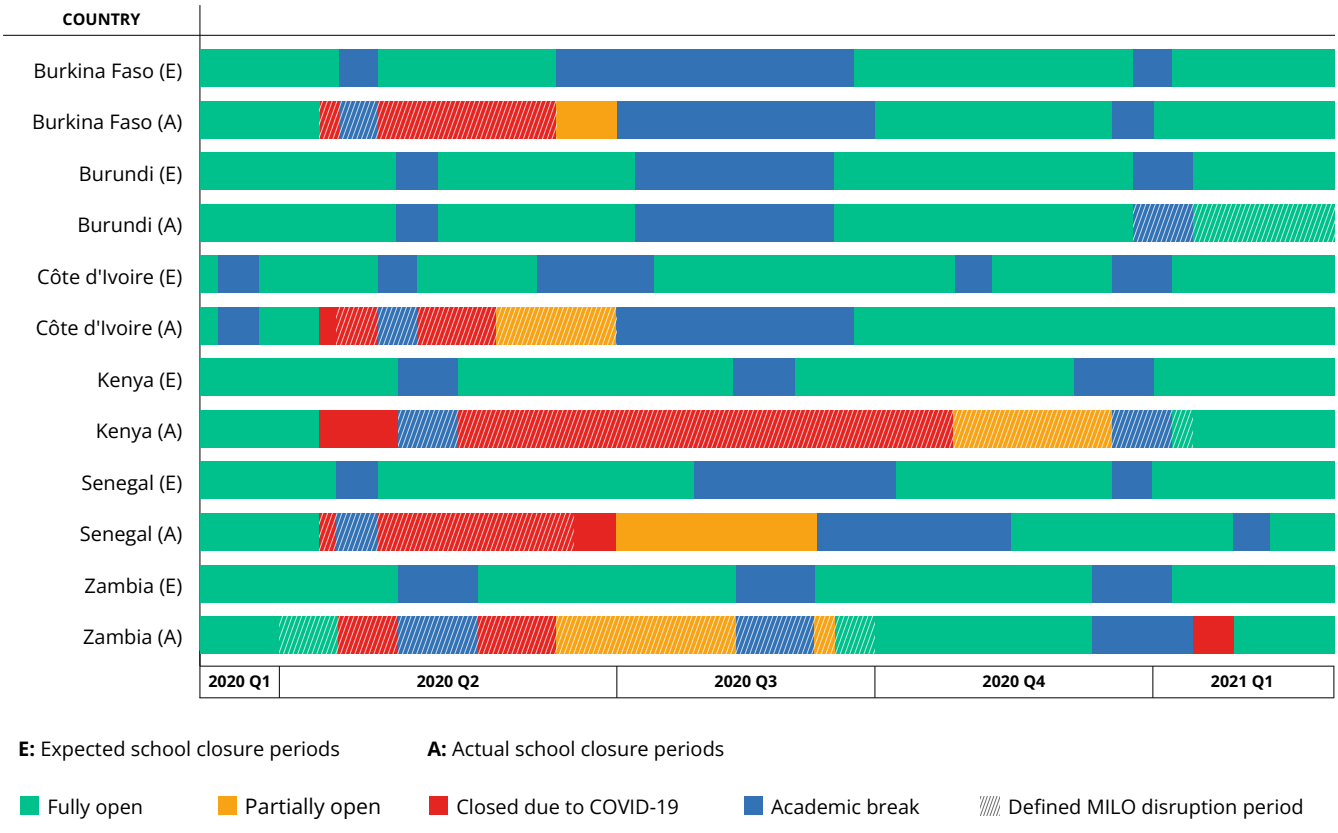
IMPACT OF COVID-19 ON EDUCATIONAL SYSTEMS

Senior government officials were asked to indicate how the pandemic affected school closures within their country. Figure 5.1 provides an overview of the main impact on education systems (the closure and partial closure of schools between January 2020 and March 2021). These closures are compared to those scheduled for expected academic breaks. In all MILO countries except Burundi, academic breaks were extended and shifted in the school calendar. Academic breaks are distinct from school closures by the absence of remote teaching.

Schools were most likely to be closed in response to the pandemic in the second quarter of 2020. In the third quarter, academic breaks played a larger role, where they were generally shifted or extended, except for in Zambia and Burundi. By the beginning of the fourth quarter of 2020, schools were open in four of the six countries, with only Kenya and Senegal still experiencing school closures. Zambia experienced a further school closure period in early 2021.

Each country's expected and actual school closures, partial opening, remote teaching and how schooling was modified when students did attend, is described below, and summarised in Figure 5.1. There were insufficient data about modified schooling for Burkina Faso and Côte d'Ivoire.

FIGURE 5.1 Expected and actual school closure periods of MILO countries



Sources: Actual school closures: (UIS, 2021), Burkina Faso (E): (Ministères de L'Education, 2019), Côte d'Ivoire (E): (Fortes, 2019) , Kenya (E): (Ministry of Education, Kenya, 2019) , Senegal (E): (Baldé, 2018), Zambia (E): (Education In Zambia, 2019)

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Burkina Faso

SCHOOL CLOSURES

All schools in Burkina Faso were closed from March 2020 for 9 weeks. Schools then partially opened, with all schooling resuming after 14 weeks (UNESCO, 2020a). The school closures affected more than 20,000 educational establishments, and disrupted the education of more than 4.7 million learners.

REMOTE EDUCATION

Remote teaching was undertaken during school closures to ensure continuity of learning. Mass media learning content, including for television, radio and online (UIS et al., 2020b), were developed and made available to students in primary and secondary school. Learners in examination classes, which included the target grade for MILO, were given priority access to learning materials; access was later extended to other learners. Learning materials were translated into national languages to facilitate access by a range of students, including those in rural areas.

Burundi

SCHOOL CLOSURES

Schools in Burundi remained open throughout the pandemic. However, due to cases of COVID-19 being reported, there was some disruption to education caused by increased teacher and student absenteeism.

MODIFIED SCHOOLING

The Ministry of Public Health advised educators and learners in schools to implement social distancing, wear masks and follow handwashing protocols. Although handwashing protocols were implemented, social distancing and mask wearing were deemed impractical, largely due to resource constraints. For example, up to 100 students could be in a classroom (Development and Cooperation, 2021).

Côte d'Ivoire

SCHOOL CLOSURES

Schools in Côte d'Ivoire were closed for two months from mid-March to mid-May 2020. The closures affected those in preschool, primary, general and technical secondary, and vocational training.

REMOTE EDUCATION

In response to school closures, the Ministry of National Education, Technical Education and Vocational Training initiated a distance education program entitled 'My Home School' to allow the completion of the 2019–20 school year. Television, radio and online technologies were all incorporated into the remote education response.

Kenya

SCHOOL CLOSURES

All schools were closed in Kenya for six months, beginning in late March 2020. Schools were partially opened in September 2020, allowing learners in Grades 4, 8 and 12 to return to school (in the System Questionnaire, these classes were described as Grade 4, Class 8 and Form 4). Schooling for all grades resumed in January 2021. The school calendar was rescheduled, with terms being delayed. Grades 4, 8 and 12 completed Terms 2 and 3 of the 2020 academic calendar in October to December 2020 and January to March 2021, respectively. The remaining school grades completed Terms 2 and 3 of 2020 during January to March 2021, and March to July 2021. The delay of the terms, combined with shorter holiday periods in 2020 and 2021, were designed to allow the normal academic calendar to resume in 2023.

REMOTE EDUCATION

During school closures, remote teaching was undertaken to ensure the continuity of learning. The Kenyan Government provided support related to equipment, internet connectivity and training of teachers, especially for teachers of students from low socioeconomic households. Educational content and instruction were also delivered through television and radio (UIS et al., 2020a).

MODIFIED SCHOOLING

Upon the resumption of schooling, new health and safety protocols were implemented. These measures included: wearing masks, social distancing (additional desks were provided), handwashing using soap and running water, hand sanitising, checking body temperatures, and regular fumigation. Teachers aged 58 years and above were encouraged to work from home.

Senegal

SCHOOL CLOSURES

Schools in Senegal were closed in mid-March 2020. Schooling resumed for examination classes in all schools in late June 2020 to enable learners to undertake exams in September 2020. To facilitate social distancing, other grades did not resume schooling until early to mid-November 2020.

REMOTE EDUCATION

While schools were closed, students were expected to engage in remote learning through the 'Learning at home' initiative. This program helped maintain students' connection to school and prepared them for returning to school. Television and radio technologies were used for remote learning (UIS et al., 2020a).

MODIFIED SCHOOLING

When schooling resumed, adapted health and safety protocols were mandated. This included greater teacher support for students made possible via smaller class sizes.

Zambia

SCHOOL CLOSURES

All schools closed in Zambia during March 2020. Examination classes (Grades 7, 9 and 12) in both primary and secondary returned to school in June 2020. All other grades (including the MILO target grade) returned to school in late September; this period encompassed two academic breaks. The UNESCO School Closures Survey indicated that schools in Zambia were fully closed for 15 weeks and partially closed for 13 weeks. The UNESCO survey had three iterations of data collection, when it was found that schools in Zambia closed again during the second quarter 2021 after the MILO System Questionnaire had been returned (UIS et al., 2020c). The school calendar was re-scheduled; with terms being delayed. Term 2 was conducted from June to August 2020, and Term 3 from September to December 2020.

REMOTE EDUCATION

To facilitate remote learning during the school closures, online 'E-learning' and 'Smart Revision' platforms were introduced. The E-learning platform contained educational resources, such as e-books and links for specialised services and the Smart Revision platform contained past examination papers with model answers. In June 2020, an Educational Television channel was launched to provide lessons across all grades. The Ministry of General Education also developed self-study materials and distributed them to all schools.

MODIFIED SCHOOLING

When schooling resumed, different grades were scheduled to attend on alternate days. Examinations for end-of-primary school (Grade 7), junior secondary (Grade 9) and O-levels (Grade 12), were delayed by one month to enable students adequate time to prepare.

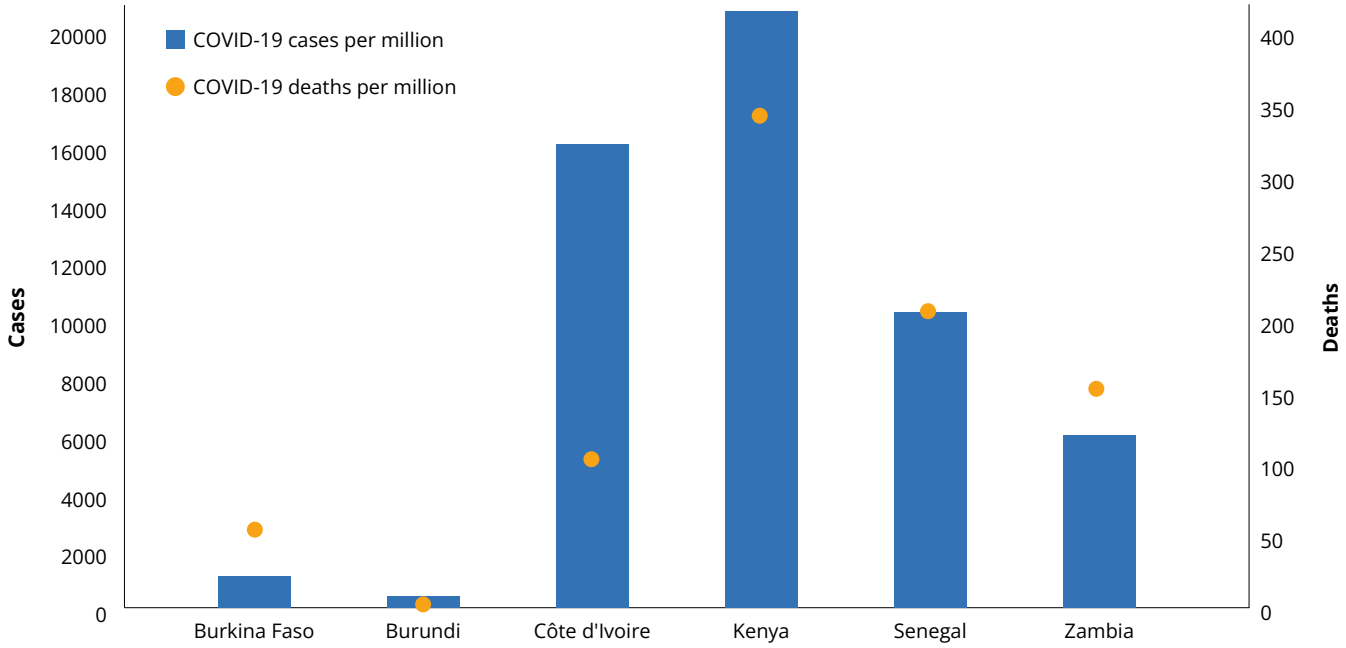
SEVERITY OF COVID-19

The extent to which education was disrupted in each country can be interpreted within the context of the severity and impact of COVID-19 in each country. Figure 5.2 shows the number of reported COVID cases and deaths due to COVID.

Globally, there were on average over 13,000 cases per million people by July 2021, compared to 2,865 cases per million people for Zambia, the MILO country with the largest proportion of cases. However, it is likely that cases have been under-reported in many less developed countries, including the MILO countries, due to a lack of testing (Ritchie et al., 2020). There was likely inconsistency in testing rates between MILO countries.

The three countries that reported higher numbers of cases and deaths (Zambia, Kenya and Senegal) had longer periods of school closures compared to countries that reported fewer cases and deaths. Côte d'Ivoire, Burkina Faso and Burundi reported lower numbers of cases and deaths and had shorter periods of school closure (none in the case of Burundi). There might not be direct causation between COVID-19 cases and school closures. Rather, the countries that undertook more testing, and therefore found more cases, might be more likely to close schools. In all MILO countries, there was an upsurge in cases and deaths in the second half of 2021. In the cases of Burundi, Senegal and Zambia, cases peaked after the MILO assessments were conducted (Oxford Martin School, 2021).

FIGURE 5.2 COVID-19 total confirmed cases and deaths per million people (until 31 July 2021)



Source: (Oxford Martin School, 2021)

POLICIES OF EDUCATIONAL SYSTEMS IN RESPONSE TO COVID-19

The five MILO countries that experienced school closures due to the pandemic had national policies and plans (hereafter referred to as 'policy approaches') approaches to direct teaching and learning at schools during the COVID-19 disruption. Burkina Faso and Zambia also had policy approaches at the state/provincial level. These approaches related to:

- providing extra support to groups of disadvantaged students
- changing school organisation
- minimising academic disruption
- offering support services to staff.

Policy approaches for disadvantaged students

School shutdowns disproportionally affect the most disadvantaged students (Di Pietro et al., 2020; Wagner & Warren, 2020; UNESCO, 2020b). The MILO countries varied in the extent to which their policy approaches supported specific disadvantaged groups of students, as seen in Table 5.2. Countries most commonly emphasised support for students from socioeconomically disadvantaged homes and students with special needs (special needs were determined by the official criteria of each country). Burkina Faso was the only country to provide support for students who speak minority languages. There were similar findings in the School Closures Survey. Low income countries most commonly considered students with a disability when introducing measures for students at risk of exclusion from remote learning (UIS et al., 2020b).

TABLE 5.2 Emphasis on support given to groups of students in national plans or policies

	Burkina Faso	Burundi	Côte d'Ivoire	Kenya	Senegal	Zambia
Girls	●	**N/A**	○	●	○	○
Students whose heritage language is different from language of instruction	●	**N/A**	○	○	○	○
Students with special needs (i.e. according to official criteria)	●	**N/A**	○	●	●	○
Students from socioeconomically disadvantaged homes	●	**N/A**	○	●	●	○
Students from socioeconomically affluent homes	●	**N/A**	○	●	○	○
Students with an immigrant background (i.e. where both parents/guardians were born in another country)	●	**N/A**	○	●	○	○
Students from an ethnic minority	●	**N/A**	○	●	○	○
Student from refugee or internally displaced backgrounds	●	**N/A**	○	●	○	○
All students in general	●	**N/A**	○	●	●	●

● Yes; ○ No; **N/A** There was an absence of general plans or policies to provide directions and guidance for teaching and learning at schools during the COVID-19 disruption

Policy approaches for school organisational changes

The five MILO countries that closed their schools had national policy approaches to make organisational changes to schooling. As seen in Table 5.3, these changes included initiatives for health and wellbeing at school and home, remote learning, and remedial learning. These changes were consistent with the School Closures Survey where the majority of low income countries indicated that they provided remote learning and would use remedial programmes as a catch-up strategy (UIS et al., 2020b).

The MILO countries developed policy approaches to minimise academic disruptions caused by COVID-19. These included supporting the use of information communication technology (ICT), engaging families, and adjusting teaching and learning.

Policy approaches for minimising academic disruption

The MILO countries developed policy approaches to minimise academic disruptions caused by COVID-19. These included supporting the use of information communication technology (ICT), engaging families, and adjusting teaching and learning. Promoting health and safety in schools was universally prioritised. Four of the five countries either implicitly or explicitly prioritised all aspects, as presented in Table 5.4. In the School Closure Survey, distance instruction was the most common form of support provided to teachers in low income countries (UIS et al., 2020b).

The development context of each country dictates the priorities and organisational changes in their education system policy approach. As a measure of this context, Figure 5.3 presents data from the Human Development Index (HDI) and the ICT Development Index (IDI) for the MILO countries. The HDI was developed by the United Nations Development Programme as an indicator of a country's development in terms of human capabilities. It is a composite measure that provides a value between 0 and 1 of average achievement in three key dimensions: a long and healthy life, being knowledgeable, and having a decent standard of living. The IDI is a composite measure that combines 11 indicators related to access to, use of and skills in ICT. The data for both the IDI and HDI are for the most year that data is available for all six MILO countries, 2017, in the case of IDI and 2019, for HDI.

As can be seen in Figure 5.3, the MILO counties are less developed than the world average. Of all the MILO countries that provided data about school organisational changes in national plans or policies, Burkina Faso had the lowest HDI. It is consistent with this lower level of development that organisational changes tended to be implicit policy approaches, rather than explicit, as with the more developed MILO countries. Explicit approaches largely refer to specific policies being detailed, rather than merely be encapsulated within broader objectives. Based on literature showing the link between development and government capacity (Collier, 2008; Sachs et al., 2004), it could be inferred that a lower level of development results in lower capacity to produce organisational changes, and therefore, such changes are not prescribed in planning and policy documents. Countries with the lowest levels of development generally need relatively greater development assistance to achieve policy outcomes.

TABLE 5.3 Emphasis of national policy approaches for supporting school organisational changes

	Burkina Faso	Burundi	Côte d'Ivoire	Kenya	Senegal	Zambia
Varying school starting times for different groups of students (e.g. by class or grade level)	◎	N/A	●	○	●	●
Varying break times between classes for different groups of students (e.g. by class or grade level)	◎	N/A	○	◎	●	●
Ensuring school access to running water	●	N/A	●	●	●	●
Increasing hygiene facilities (soap/sanitiser)	◎	N/A	●	●	●	●
Increasing cleaning on school premises	◎	N/A	●	●	●	●
Social distancing between students	◎	N/A	●	●	●	●
Social distancing between adults	◎	N/A	●	●	●	●
Smaller class sizes	◎	N/A	●	◎	●	●
Increasing number of teaching staff	○	N/A	○	●	●	◎
Continue remote learning option for students	◎	N/A	●	○	●	◎
Supplementing face-to-face teaching with remote instruction	◎	N/A	●	◎	●	◎
Extending the academic year	◎	N/A	●	●	●	◎
Prioritising particular content within the curriculum	◎	N/A	●	○	●	◎
Need to check-in with students relating to health and wellbeing	●	N/A	●	●	●	◎
Provision of health and wellbeing support to students in need (such as food or medical attention)	●	N/A	●	●	●	◎
Home visits by trained staff (e.g. teachers, health workers)	◎	N/A	○	◎	◎	◎
Informing parents/guardians on how to talk about COVID-19 with their children	◎	N/A	●	●	◎	◎
Delivering educational content to students on television	◎	N/A	●	◎	●	●
Delivering educational content to students on radio	◎	N/A	●	◎	●	●

● The measure is explicitly stated in the plans and policies

◎ The need for this measure is implicit in the plans and policies without being explicitly stated

○ The measure is not mentioned in the plans and policies

N/A No plans or policies were developed to provide directions and guidance for teaching and learning at schools during the COVID-19 disruption

Policy approaches for staff support

In emergencies, the support made available to teachers and staff is an important part of maintaining learning. (le Brocque et al., 2017; Inter-agency Network for Education in Emergencies [INEE], 2010; Ubit & Bartholomaeus, 2018). The support services the MILO countries offered staff during the disruption, as listed in national plans and policies, are presented in Table 5.5. Countries commonly offered formal support networks, peer support, and training to support the social and emotional health of others. Burkina Faso and Zambia also offered mental health services or online wellbeing programs (Burkina Faso and Zambia), with the School Closure Survey showing comparable results for low income countries (UIS et al., 2020b).

TABLE 5.4 Priorities of policy approaches to minimise academic disruption

	Burkina Faso	Burundi	Côte d'Ivoire	Kenya	Senegal	Zambia
Professional development for teachers' use of ICT	●	N/A	○	●	●	◎
Development of ICT-related competencies in students	●	N/A	○	◎	◎	◎
Support for providing remote student instruction using digital technologies	◎	N/A	●	●	●	◎
Support for providing remote student instruction using print material	◎	N/A	○	●	●	●
Use of ICT to improve communication with parents/guardians	●	N/A	○	●	●	◎
Support of students that were falling behind	●	N/A	○	◎	●	●
Changes to grade progression	●	N/A	○	○	●	◎
Collaboration among teaching staff	◎	N/A	○	●	●	●
Guidance for schools about how to support parents/guardians	●	N/A	○	●	●	●
Infection control measures (e.g. mandated wearing of masks)	●	N/A	●	●	●	●
Support for safe working environments and/or healthy work practices	●	N/A	●	●	●	●
Methods to engage with families to support their child's learning	●	N/A	○	◎	●	●
Methods to engage with families to support their child's wellbeing	●	N/A	●	◎	●	●

● The aspect is explicitly stated in the plans and policies

◎ The need for this aspect is implicit in the plans and policies without being explicitly stated

○ This aspect is not mentioned in the plans and policies

N/A No plans or policies were developed to provide directions and guidance for teaching and learning at schools during the COVID-19 disruption

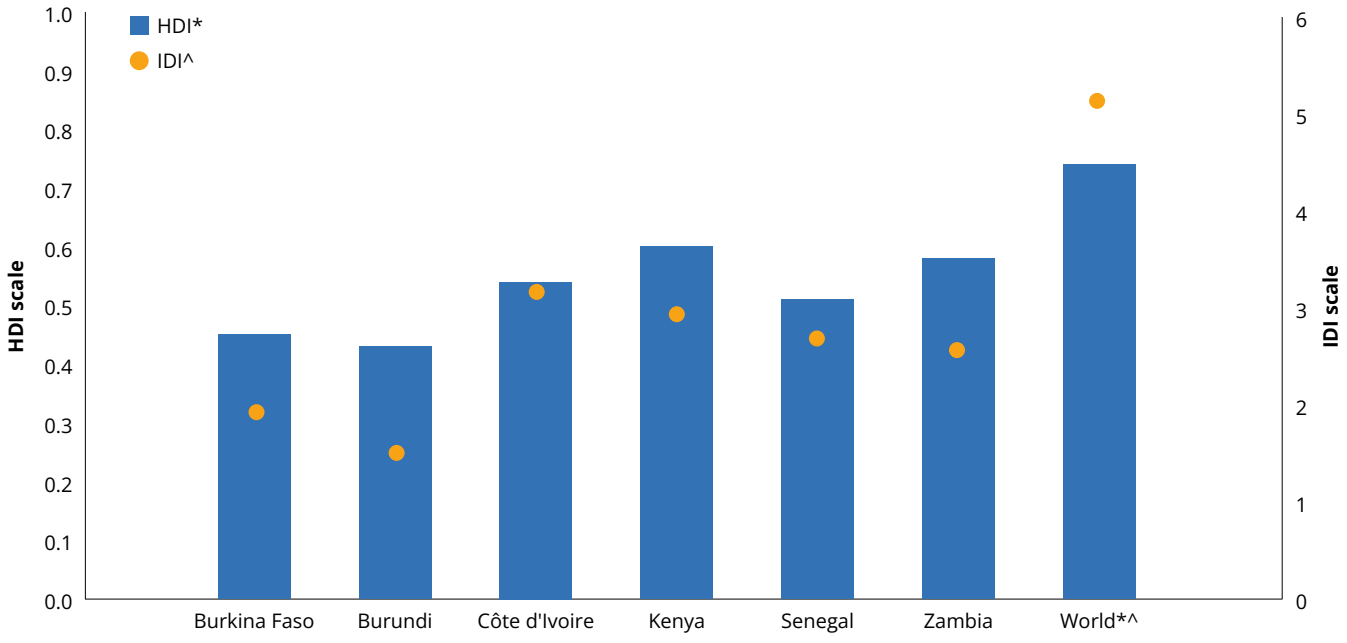
NATIONAL COMMUNICATION AND OUTREACH DURING THE PANDEMIC

Communication with families is an important aspect of maintaining learning when normal education has been disrupted (Codreanu, 2019; Reimers & Schleicher, 2020). Table 5.6 shows that MILO countries implemented various modes of communication. Radio was the most common mode of communication used by MILO countries to communicate with the families of students. Television and public notices were also used by all MILO countries, though the outreach may not have been universal. Social media was widely used, most commonly to target some students. In Burundi (where schools remained open), students were informed of the expected school behaviours during the pandemic.

There is a risk that when schools reopen after a disruption that some students will not return to school (Wagner & Warren, 2020). The MILO countries undertook a range of outreach and support measures to encourage students' return to school, as seen in Table 5.7. Countries commonly endeavoured to ensure the health and safety of the school environment by providing resources that maintained hygiene and sanitation.

Some countries gave extra attention to supporting disadvantaged students. In Senegal, a special monitoring program was established that focused on vulnerable students. In Zambia, a project was implemented to ensure that girls returned to school.

FIGURE 5.3 Human development index (2019) and ICT Development Index (2017) for the MILO countries



Source: (International Telecommunications Union [ITU], 2017; United Nations Development Programme [UNDP], 2021)

TABLE 5.5 National policy approaches for supporting teachers and staff during the disruption

	Burkina Faso	Burundi	Côte d'Ivoire	Kenya	Senegal	Zambia
Formal support networks such as a counselling service	●	N/A	●	○	●	●
Peer support system	●	N/A	●	●	○	●
Additional support for teachers who are primary carers and have children at home	○	N/A	○	○	○	●
Professional associations	○	N/A	○	○	●	●
Mental health services	○	N/A	○	○	○	●
Access to physical activity resources	○	N/A	○	●	●	●
Access to nutritional information and support	○	N/A	○	○	●	●
Online wellbeing management programs and resources	●	N/A	○	○	○	●
Training in the support of social and emotional health of others	●	N/A	○	●	●	●

● Yes; ○ No; **N/A** No plans or policies were developed to provide directions and guidance for teaching and learning at schools during the COVID-19 disruption

TABLE 5.6 Modes of communication with students' families during the pandemic

	Burkina Faso	Burundi	Côte d'Ivoire	Kenya	Senegal	Zambia
Letters	◉	○	●	◉	○	○
Public notices or newspaper advertisements	●	●	◉	●	●	●
Radio	●	●	●	●	●	●
Television	●	◉	●	●	●	◉
Email	◉	○	○	◉	○	◉
SMS	◉	○	◉	◉	○	●
Social media (e.g. WhatsApp, Facebook)	◉	○	◉	◉	●	●

● Yes, for all students; ◉ Yes, for some students; ○ No

ASSESSMENT AND MONITORING AS A RESULT OF THE COVID-19 PANDEMIC

Assessment is an essential element of modern education systems, as it enables data to be collected about learning progress to inform teaching (Belisle et al., 2016; Masters, 2017). The MILO countries recognised this and made various changes to assessments to enable learning progress to continue to be monitored, as seen in Table 5.8. All of the countries introduced additional health and safety measures for students undertaking assessments. Most of the countries rescheduled assessments and adjusted their content. Burkina Faso and Côte d'Ivoire cancelled assessments and public examinations and implemented an alternative approach for high-stakes assessment. In the case of Côte d'Ivoire, the regular end of school exam was replaced by continuous assessment for the passage of students to college.

Assessment is an essential element of modern education systems, as it enables data to be collected about learning progress to inform teaching (Belisle et al., 2016; Masters, 2017).

TABLE 5.7 Support measures initiated to encourage the return to school

	Burkina Faso	Burundi	Côte d'Ivoire	Kenya	Senegal	Zambia
Community engagement to encourage return to school	●	N/A	●	◎	●	◎
Provision of financial incentives (such as cash/ food/transport) or waived fees (such as tuition or uniform fees)	◎	N/A	○	◎	◎	◎
School-based mechanisms to track those not returning to school	◎	N/A	○	●	●	◎
Revision of policies related to the ways in which students can access schooling	●	N/A	◎	○	●	◎
Provision of resources that maintain hygiene and sanitation to ensure health and safety	●	N/A	●	●	●	◎
Social media	◎	N/A	●	○	●	●

(Vulnerable students refer to students most at risk of not returning to school. Some of the reasons for this include: geographical isolation, gender biases, disability or low family income.)

● Yes, for all students; ◎ Yes, for some students; ○ No **N/A** There was an absence of general plans or policies to provide directions and guidance for teaching and learning at schools during the COVID-19 disruption

The MILO countries collected data to monitor the impact of the pandemic, as seen in Table 5.9. The most commonly collected data related to student achievement and attendance. Kenya also collected data about teachers' emotional health and Burundi collected data about students' physical health. None of the six countries indicated that they collected data about students' emotional health or on teachers' physical health, at the national level.

TABLE 5.8 Changes made to national assessments in response to the COVID-19 pandemic

	Burkina Faso	Burundi	Côte d'Ivoire	Kenya	Senegal	Zambia
Rescheduled planned assessments	●	○	●	●	●	●
Adjusted the content of the assessments (e.g. subjects covered or number of questions)	●	○	●	●	●	○
Adjusted the mode of administration (e.g. computer-based or online-based)	○	○	○	○	○	○
Introduced additional health and safety measures (e.g., extra space between desks for distancing students)	●	●	●	●	●	●
Introduced alternative assessment of learning (e.g. appraisal of student learning portfolio or formative assessment)	○	●	○	○	○	○
Cancelled assessments and used an alternative approach for high-stakes decision making (e.g. calculated grades)	●	○	●	○	○	○

● Yes; ○ No

TABLE 5.9 Data collected to monitor the impact of the COVID-19 pandemic on students and teachers

	Burkina Faso	Burundi	Côte d'Ivoire	Kenya	Senegal	Zambia
Student achievement	●	○	○	●	●	●
Student attendance	●	○	○	●	●	●
Students' emotional health	○	○	○	○	○	○
Teachers' emotional health	○	○	○	●	○	○
Students' physical health	○	●	○	○	○	○
Teachers' physical health	○	○	○	○	○	○

● Yes; ○ No

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CHAPTER 6

School contexts of teaching and learning during COVID-19

HIGHLIGHTS

Principals were asked to indicate how the pandemic affected schooling, teaching and learning. There were considerable commonalities in principals' responses across countries.

- The COVID-19 pandemic resulted in school closures across five of the six countries for varying lengths of time (Table 6.2).
- Overwhelmingly, principals reported they expected that the pandemic would have a negative impact on academic outcomes for all students (Table 6.3).
- Most schools did not offer remote learning programs universally. In many countries, teachers remained onsite during the entire pandemic period (Table 6.4).
- Changes to school policies and procedures mostly focused on increased hygiene and cleaning. Policies that related to supplementing face-to-face teaching with remote instruction, or the continuation of remote instruction during the pandemic were less common (Table 6.5).

- The key barriers to remote learning were student access to digital devices or to the internet (Table 6.6).
- In preparing for remote instruction, principals were most likely to report that they provided staff access to digital devices (Table 6.7).
- Academic progress and students' health and wellbeing were key concerns for principals (Table 6.10).

With school closures impacting many countries, teaching and learning needed to adapt in order to support students during and after closures.

- Although a limited proportion of students had access to live virtual lessons or digital materials, many schools suggested educational TV and radio to students during the pandemic (Table 6.11).
- To minimise the impact on teaching and learning, schools most commonly engaged the broader community and increased communication between staff and students (Table 6.12).
- Monitoring students' health and safety was the most common provision when schools returned to regular teaching (Table 6.13).
- Throughout the pandemic, schools undertook a number of activities to support student health and wellbeing, mainly checking in with students and contacting families (Table 6.14).

Teachers were expected to maintain student assessment and monitoring and provide feedback to students during the pandemic.

- Most schools expected and required teachers to continue to assess students (Table 6.15).
- Consistently, teachers were expected and required to provide feedback to students about their schoolwork (Table 6.16).

INTRODUCTION

The school environment and the actions taken by the schools in response to the pandemic, can exaggerate or insulate students from the COVID-19 disruption. One of the four overarching goals of the MILO project was to identify the impact of different distance learning mechanisms used to remediate the learning disruption generated by COVID-19.

This chapter explores the school-level contexts in the six countries that participated in MILO and the effects of the COVID-19 disruption on schools. The data for this chapter were collected mainly from school principals who completed the MILO School Questionnaire, as described in Chapter 1. This chapter looks at the COVID-19 disruption on schools, defined for each country as shown in Table 6.1.

Focusing on these periods, this chapter examines the school environment, teaching and learning and student assessment and monitoring. The information presented in this chapter complements the national contexts discussed in Chapter 5 and the student contexts discussed in Chapter 7.

TABLE 6.1 COVID-19 disruption periods for MILO countries

Country	Defined COVID-19 disruption period
Burkina Faso	14 March – 31 May 2020
Burundi	January – 28 February 2021
Côte d'Ivoire	20 March – mid-May
Kenya	March 2020 – January 2021
Senegal	Mid-March – late-May 2020
Zambia	Early March – 20 September 2020

THE COVID-19 DISRUPTION ON SCHOOLS

While schools in Burundi did not close in response to the pandemic, school closures in the other five MILO countries affected all or almost all schools. Principals were asked to specify the length of time their schools were closed, from the beginning of 2020 due to COVID-19 or another emergency (Table 6.2). School closures were defined as when the school was closed to the majority of students.

Principals' responses regarding the duration of their school closures were largely consistent with the information gathered from the System Questionnaire. Kenya experienced longer school closures; 79% of students attended schools that was reportedly closed for six months or more.[12] In other countries, schools tended to be closed for up to three months, although 28% students in Burkina Faso, 41% in Zambia and 37% in Senegal attended schools that closed for three to six months.

Twenty-nine per cent of students in Burkina Faso, 23% in Senegal, 20% in Côte d'Ivoire, 16% in Zambia and 12% in Kenya attended schools where the principal reported school closures due to an emergency not related to the pandemic, and these closures tended to be for up to three months.

Principals were asked whether they believed the experience of the COVID-19 disruption would have a negative, positive or no impact on academic outcomes. Overwhelmingly, the anticipated impact on academic outcomes was negative (Table 6.3), with the majority of students attending schools where the principal anticipated a negative impact on academic outcomes for *all students*. High-achieving students were considered slightly less at risk compared to other groups; 32% of students in Burundi, 55% in Senegal and 62% in Burkina Faso and Côte d'Ivoire attended schools where the principal expected a negative impact on this group. Comparatively, low-achieving students were more likely to be considered at risk, with almost all principals expecting a negative impact on this group.

Students in Burundi, where schools did not close, were least likely to attend a school where the principal expected a negative impact on academic outcomes. However, 47% and 44% of the students in Burundi attended schools where the principal expected there to be a negative impact on low-income and special needs students respectively.

TABLE 6.2 Principals' reports of the duration of school closures due to COVID-19 or other emergency

		Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Closed emergency NOT COVID-19	Remained open	71	100	80	89	77	83	82
	Up to 3 months	24	<1	19	4	17	8	17
	3-6 months	5	0	1	3	4	5	3
	6 months or more	0	0	0	5	2	3	1
Closed because of COVID-19	Remained open	5	100	4	2	4	1	4
	Up to 3 months	63	<1	86	2	49	47	49
	3-6 months	28	0	9	17	37	41	23
	6 months or more	3	0	1	79	10	10	7

Operational circumstances in schools that closed varied across the countries; however, common patterns can be identified, as shown in Table 6.4. Across the MILO countries, many students attended schools that continued to operate in some form. For example, 79% of students in Zambia and 66% in Senegal attended schools where the principal reported that some or all teachers remained onsite.

In the five countries that experienced school closures, schools closed to most students but often remained open to some students. Most commonly, schools remained open to students from selected grades. In Zambia, 69% of students attended schools that remained open to selected grades. Access to school was also frequently maintained for students with special needs in Zambia, with 30% of students at a school where the principal reported this. Principals less frequently reported that their school stayed open specifically for students at risk or who were children of essential workers.

The System Questionnaire found that school closures affected most of the countries and national plans or policies provided remote learning options. However, across the MILO countries 21% of students attended schools where the principal reported offering remote learning programs to all students. Remote learning programs were most common in Côte d'Ivoire (43%) and Senegal (36%). This is consistent with other research suggesting that in many countries, students were not engaged in remote learning during school closures resulting from the pandemic (Reimers & Schleicher, 2020).

TABLE 6.3 Principals' reports of the expected impact of COVID-19 disruption on academic outcomes

Student groups	Impact	Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
All students	Negative	93	39	86	95	90	94	91
	Positive	2	2	2	3	2	3	2
Target grade	Negative	88	38	83	95	64	93	85
	Positive	4	2	2	2	18	4	3
Low-achieving	Negative	92	39	85	89	84	92	87
	Positive	3	3	2	3	4	6	3
High-achieving	Negative	62	32	62	82	55	85	62
	Positive	6	2	4	6	12	4	5
Low-income	Negative	94	47	90	94	92	95	93
	Positive	2	4	2	2	2	3	2
Special needs	Negative	93	44	86	95	86	93	90
	Positive	2	4	2	1	5	4	3
Other first language (not language of instruction)	Negative	86	38	80	87	84	93	85
	Positive	2	3	4	2	2	2	2

Due to the nature of the pandemic, schools may have changed their policies to promote a safer environment for students, as shown in Table 6.5. Across the MILO countries, 97% of students attended schools where the principal reported increased hygiene facilities and cleaning. Eighty-six per cent and 71% of students attended schools where there was a policy of social distancing between adults and between students respectively.

TABLE 6.4 Principals' reports on operational circumstances during COVID-19 disruption

Operational circumstances	Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Some or all teachers were onsite	44	86	50	24	66	79	58
School buildings remained open to students with special needs	17	92	18	3	30	12	18
School buildings remained open to students considered to be at risk	7	74	11	3	11	8	10
School buildings remained open to students of essential/critical workers	4	78	8	8	15	13	11
School buildings remained open to students from selected grade levels	31	92	13	24	50	69	41
A remote learning program was implemented to support all students	20	16	43	16	36	21	21

Note: This question was specific to those principals who reported their school had closed.

TABLE 6.5 Principals' reports on school policy changes following COVID-19

Policy changes	Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
School starting times	35	17	71	40	70	90	55
Break times	24	20	63	50	66	91	56
Students attending fewer days	13	3	46	8	29	68	21
Increased hygiene facilities	91	88	92	99	96	97	94
Increased cleaning	88	88	95	97	95	97	95
Social distancing between students	56	41	94	64	78	96	71
Social distancing between adults	73	53	94	87	85	94	86
Less time spent inside	45	30	83	34	72	93	59
Continued remote learning option	23	9	42	15	34	35	28
Supplementing with remote learning	20	7	40	18	27	37	23

Principals reported changes to school policies and procedures related to supplementing face-to-face teaching with remote instruction or providing continued remote instruction. Twenty-three per cent and 28% of students attended schools where the principal reported either supplementing face-to-face teaching with remote instruction or continued remote learning options respectively. Such changes were most frequent in Côte d'Ivoire, Zambia and Senegal, and were least likely to occur in Burundi (where schools did not close). This is consistent with the operational circumstances reported in Table 6.4.

Unexpected school closures in developing countries are particularly problematic given there are already existing inequities in digital access that become further compounded (Khlaif & Salha, 2020). Principals experienced a number of barriers that limited their school's capacity to deliver remote instruction, as seen in Table 6.6. These barriers may explain the low proportion of students who attended schools with remote learning programs. Students in Burundi were least likely to attend a school where their principal reported barriers to remote instruction, probably due to the absence of school closures.

Across Burkina Faso, Côte d'Ivoire, Kenya, Senegal and Zambia, the most commonly reported barriers to providing remote instruction were that students lacked internet access and access to digital devices, with the majority of principals reporting that students lack of digital devices and/or internet access impacted their school's ability to provide remote instruction to a large extent. A lack of available teachers was the least commonly reported barrier in the five MILO countries.

Table 6.7 examines preparations for remote instruction. Of the six countries, students in Kenya were most likely to attend a school where the principal reported preparations for remote instruction, and that this was due to COVID-19. Across all countries, students were least likely to attend a school where the principal reported that students were trained in video communication or provided access to digital devices in preparing for remote instruction. Note that as indicated in Table 6.4, 21% of students attended schools where the principal reported that remote learning was implemented, and this was most common in Côte d'Ivoire, Senegal and Zambia (see Table 6.5).

TABLE 6.6 Principals' reports on barriers to providing remote instruction

Barriers to providing remote instruction	Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Inability to communicate	73	9	73	76	71	74	73
Students lack digital devices	81	25	84	83	86	80	82
Teachers lack digital devices	69	25	69	64	65	67	66
Students lack internet access	84	25	83	83	89	80	83
Teachers lack internet access	71	25	70	61	64	69	66
Lack of learning materials	77	33	73	74	72	75	74
Difficulty distributing hard-copy	81	24	75	80	77	78	77
Lack of available teachers	41	24	47	57	37	44	43
Lack of teacher experience	72	23	70	67	76	62	68
Concerns to provide equitable teaching	79	25	75	70	79	68	73

Note: This question was specific to those principals who reported their school had closed.

TABLE 6.7 Principals' reports of preparations for remote instruction

Preparations for remote instruction	Timing	Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Train students video communications	Yes, before COVID	0	0	1	2	2	1	1
	Yes, due to COVID	2	0	2	10	4	5	3
Adapt curriculum plans	Yes, before COVID	2	3	3	8	2	7	3
	Yes, due to COVID	7	2	18	20	17	26	18
Students access to digital devices	Yes, before COVID	1	0	3	10	2	4	2
	Yes, due to COVID	3	1	4	19	5	4	4
Staff access to digital devices	Yes, before COVID	1	0	2	16	3	4	2
	Yes, due to COVID	4	1	6	38	11	17	9
Plan for transition	Yes, before COVID	0	1	6	7	3	3	3
	Yes, due to COVID	7	2	10	32	13	24	12

STUDENT DISADVANTAGE

As highlighted in Chapter 5, school shutdowns disproportionally affect the most disadvantaged students (Di Pietro et al., 2020; Wagner & Warren, 2020; UNESCO, 2020b). For example, research suggests that children whose mother tongue is different from the language of instruction have relatively lower achievement (August et al., 2009; Mazawi, 1999; UNESCO, 2016).

Principals reported the number of students (in total and for the target grade) and estimated the percentage of students at their school whose heritage language was not the language of instruction, had special needs, were from low or high-income backgrounds, were of immigrant backgrounds, ethnic minority groups or from refugee backgrounds. This information is presented in Table 6.8.

Students were most likely to attend a school where the principal indicated that more than half the students were from low-income background homes or their heritage language was different from the language of instruction. The majority of principals reported that less than five per cent of students at their school were from a refugee or internally displaced background, from an ethnic minority or from an immigrant background. Chapter 5 reported that national plans or policies across the MILO countries tended to emphasise support for students with specials needs and students from socioeconomically disadvantaged backgrounds (see Table 5.2).

Other relevant factors for examining potential student disadvantage included the school's location (urban or regional area) and whether the school was private or public. The majority of students across the six countries attended a public school (as reported by their principal). In the MILO project, major urban areas are defined as locations of more than 100,000 and are referred to as 'urban'. Non-major urban and rural areas are towns and communities of fewer than 100,000 and for the purposes of this report are referred to as 'rural'. This definition is consistent with other international studies such as SEA-PLM (UNICEF & Southeast Asian Ministers of Education Organization [SEAMEO], 2020) and ICILS (Fraillon et al., 2020). The majority of students were from schools in rural areas, as can be seen in Table 6.9. Twenty-six per cent of students in Côte d'Ivoire and 29% in Senegal were from schools in larger urban areas.

The vast majority of students attended schools where the principal reported that they were concerned with students' academic process and health and wellbeing to a large extent (Table 6.10). Principals were also almost universally concerned about their staff's and their own ability to cope.

TABLE 6.8 Principals' reports of groups of students within their school

Student groupings	Percentage within school	Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Heritage language	Less than 5%	5	30	5	41	6	37	18
	5 to 50%	3	14	8	12	3	24	10
	More than 50%	92	57	88	47	91	39	72
Special needs	Less than 5%	66	61	69	82	72	68	68
	5 to 50%	27	26	19	18	19	30	22
	More than 50%	7	13	12	0	9	2	8
Low income background	Less than 5%	11	20	8	2	9	3	8
	5 to 50%	42	41	32	24	36	17	34
	More than 50%	47	38	60	73	55	80	58
High income background	Less than 5%	55	39	55	77	52	69	55
	5 to 50%	33	45	36	22	37	30	34
	More than 50%	12	16	9	0	11	1	10
Immigrant background	Less than 5%	85	92	52	93	86	96	89
	5 to 50%	14	7	40	5	13	4	10
	More than 50%	1	1	8	2	1	1	1
Ethnic minority	Less than 5%	85	93	74	83	80	81	82
	5 to 50%	14	7	24	15	19	13	15
	More than 50%	1	0	2	2	2	6	2
Refugee	Less than 5%	85	87	93	90	92	98	91
	5 to 50%	13	11	7	8	7	1	8
	More than 50%	1	1	0	1	1	1	1

TABLE 6.9 School location

Location	Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Rural	87	96	74	93	71	91	89
Urban	13	4	26	7	29	9	11

TABLE 6.10 Principals' reports of concerns following COVID-19

Principals' concerns	Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Own ability to cope	93	85	93	98	88	95	93
Staff ability to cope	93	87	94	95	90	95	94
Students' health and wellbeing	97	90	96	93	95	94	95
Students' academic progress	96	89	97	94	96	96	96

TEACHING AND LEARNING

Teaching and learning during the pandemic involved providing resources for students when schools were closed and implementing strategies to minimise the impact of closures. As students returned to schools, activities and methods for ensuring the health and safety of students and staff were implemented.

It is expected that schools where students have access to better resources for learning are better equipped to deal with the COVID-19 disruption. Access to digital devices and the internet, for example, makes online teaching a possibility and allows students to interact with their teachers and peers in a safe way.

Table 6.11 shows the proportion of students who had access to various resources during the pandemic. Resources could be made available (or suggested) for all or some students, depending on school circumstances. More than half of students attended schools where the principal reported that educational TV or radio was suggested as a resource for students; 81% of students in Côte d'Ivoire and 72% in Senegal attended schools where this was reported by the principal.

Two of the reported main barriers to remote learning were students' lack of access to the internet and/or lack of access to digital devices (see Table 6.6). Across the MILO countries, nine per cent of students attended schools where the principal reported that live virtual lessons or digital materials were available to students.

Teaching and learning during the pandemic involved providing resources for students when schools were closed and implementing strategies to minimise the impact of closures. As students returned to schools, activities and methods for ensuring the health and safety of students and staff were implemented.

Furthermore, in countries where this was slightly more likely, it tended to be for some and not all students (likely those with access to devices and/or the internet).

Strategies used to minimise the impact of the pandemic on teaching and learning are listed in Table 6.12. The most common were engaging the broader community and communication between staff and students; 79% of students attended schools where the principal reported these strategies were quite or very important.

Strategies to minimise the impact of the pandemic on teaching and learning were prominent in countries with school closures.

However, even in Burundi about a quarter of students attended schools that implemented pandemic-related strategies. The most common strategies in Burundi were communication between staff and students, and families; engaging the broader community; additional staff development and distributing learning materials.

TABLE 6.11 Principals' reports on resources for students during COVID-19

Resources	Availability	Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Suggest educational TV/radio	Yes, all students	29	16	53	10	27	17	22
	Yes, some students	27	8	28	42	45	24	28
Hard-copies	Yes, all students	18	26	13	7	18	11	15
	Yes, some students	19	6	10	29	37	46	24
One-to-one support	Yes, all students	2	7	3	3	4	1	3
	Yes, some students	4	2	10	24	21	9	9
Digital materials	Yes, all students	2	3	4	1	3	1	3
	Yes, some students	5	0	3	14	15	6	5
Live virtual lessons	Yes, all students	4	25	8	1	2	5	4
	Yes, some students	4	1	4	9	12	6	5

TABLE 6.12 Principals' reports on strategies minimising impact on teaching and learning

Strategies	Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Encourage educational TV/radio	61	9	61	62	50	56	58
Communication between staff & students	79	25	80	74	81	77	78
Communication between staff & families	56	25	54	39	43	46	44
Engaging broader community	83	25	81	75	82	77	79
Additional staff professional development	54	25	52	37	38	43	41
Distributing learning materials	63	25	66	55	55	56	56
Digital resources for teachers or students	72	17	65	68	61	63	64

TABLE 6.13 Principals' reports on provisions to facilitate regular teaching following COVID-19 disruption

Policy change	Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Additional monitoring of students' health and safety	73	91	83	56	89	81	82
Offer additional support families regarding student wellbeing	44	60	49	31	57	46	48
Provide nutrition for students (eg. Lunch programs)	57	21	34	19	26	14	23
Contact agencies that provide food and other essentials to assist families who need help	9	15	16	17	18	15	15
Spend time going over material previously covered prior or during the disruption	76	58	82	50	87	70	73
Provide extra academic support only to students who have fallen behind	61	26	54	39	63	48	51
Targeted teaching directed to learning areas where student achievement had not progressed to the desired extent	61	36	64	54	74	72	63
Provision of supplementary staff or tutoring to assist in students judged to require additional support	39	25	29	31	46	45	35
Require or encourage more students to repeat a grade level	19	10	21	9	26	48	20

Schools also made provisions for the return to regular teaching following the disruption (Table 6.13). The most common was monitoring students' health and safety; 82% of students attended schools where the principal reported this. Uptake of this provision ranged across the countries, from 56% of students in Kenya to 91% of students in Burundi. The least common provisions for all six countries were contact agencies that could assist families who need help (with food or other essentials) and require or encourage students to repeat a grade level.

Throughout the pandemic, schools undertook activities to support student health and wellbeing. Table 6.14 shows the proportion of students attending schools where the principal reported these activities. The most common activity was for schools to check-in with students and contact families; 79% and 73% of students attended schools where the principal reported these activities respectively. Students in Senegal, Côte d'Ivoire and Burundi were most likely to attend schools that checked-in with students. Students in Zambia, Côte d'Ivoire and Senegal were most likely to attend schools that contacted families. While home visits were a less frequent activity to support students' health and wellbeing, they were not uncommon. Twenty-three per cent of students across the MILO countries attended schools that reported home visits.

TABLE 6.14 Principals' reports of activities to support student health and wellbeing

Student health and wellbeing activities	Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Check in with students	75	83	84	49	85	74	79
Specific support to students	43	56	53	41	61	69	55
Contact families	58	68	80	57	78	84	73
Provide support from counsellors	25	42	40	42	29	68	41
Home visits	19	18	38	23	23	45	23

ASSESSMENT AND MONITORING DURING THE COVID-19 DISRUPTION

The need to assess learning is heightened following an emergency, as there is more risk of unequal learning progress outside of normal schooling (Reimers & Schleicher, 2020). Classroom and school assessments of student learning during and after emergencies are crucial for guiding education response and recovery, helping identify learning progress, learning loss and learner needs (INEE, 2010; Reimers & Schleicher, 2020). The information garnered from assessments can structure activities and programs to progress learning as the most acute phase of an emergency subsides (Belisle et al., 2016).

Chapter 5 reported that most countries rescheduled assessments and adjusted their content (see Table 5.7). Principals reported on teachers' assessments of student learning during the disruption, feedback to students during the disruption and what impact they expected the pandemic would have on achievement on key groups of students. As shown in Table 6.15, these methods varied substantially across the MILO countries. Most principals reported that each type of assessment, other than online tests, was expected, with around half of students attending schools where the assessments were both expected and required.

The majority of students in Burundi, where schools did not close, attended schools where the principal reported that teachers were expected and required to undertake each of the assessment methods listed, with the exception of online tests. Students in Zambia were also likely to attend a school where the principal reported that the assessment methods were expected and required, again with the exception of online tests. Students in Kenya and Burkina Faso were less likely to attend a school where the principal reported that the assessments were expected and required.

Consistent with Table 6.15 which showed that schools in Burundi and Zambia were mostly likely to expect and require teacher assessment of students, Table 6.16 shows that students in Burundi and Zambia were most likely to attend schools where feedback to students was expected and required, particularly around student schoolwork. Eighty per cent of students in Senegal and 73% in Côte d'Ivoire attended schools where the principal reported that feedback on student schoolwork was expected, but for 27% of these students in Senegal and 23% in Côte d'Ivoire it was not required.

TABLE 6.15 Principals' reports of teachers' assessments of student learning during the disruption

Teacher assessment	Expectation	Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Formative or diagnostic	Expected AND required	38	83	49	31	53	75	51
	Expected NOT required	26	7	21	23	24	8	22
Summative	Expected AND required	42	83	53	36	49	77	51
	Expected NOT required	28	7	16	17	26	7	16
National/ regional testing	Expected AND required	44	78	42	29	53	65	49
	Expected NOT required	25	6	24	10	20	9	15
Evaluation of student work	Expected AND required	41	83	37	37	47	67	44
	Expected NOT required	27	7	27	18	29	10	22
Online tests	Expected AND required	5	32	8	23	6	21	15
	Expected NOT required	6	6	16	14	20	8	11
Paper-based tests	Expected AND required	39	82	47	29	52	68	49
	Expected NOT required	20	4	20	22	27	7	20
Performance and practical	Expected AND required	32	77	40	32	47	71	43
	Expected NOT required	27	9	23	15	28	7	19
Keep progress records	Expected AND required	37	86	54	48	49	84	51
	Expected NOT required	30	5	24	13	30	2	19

TABLE 6.16 Principals' reports of expectations for feedback to students

Teacher feedback	Expectation	Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Student schoolwork	Expected AND required	42	84	50	47	53	80	51
	Expected NOT required	23	7	23	14	27	3	19
Informal to parents/ guardians	Expected AND required	33	63	38	36	33	68	37
	Expected NOT required	29	15	31	22	37	12	25
Formal report to parents/ guardians	Expected AND required	32	69	44	43	35	74	43
	Expected NOT required	30	13	28	13	32	9	20

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CHAPTER 7

Student contexts of teaching and learning during COVID-19

HIGHLIGHTS

The same students who were assessed using the Assessment for Minimum Proficiency Levels (AMPL) completed the MILO Student Questionnaire. The COVID-19 disruption impacted students' access to education in addition to their health and wellbeing across the MILO countries.

- Students in Kenya and Senegal were most likely to have reliable internet access and access to digital devices. Across the other four countries most students did not have access to the internet or digital devices (Table 7.1).
- Across all six MILO countries, students were most likely to report that their family had to be more careful with money. Students in Kenya and Senegal experienced more family difficulties during the COVID-19 disruption than students in other countries (Table 7.2).
- Students in all MILO countries reported higher anxiety levels during the COVID-19 disruption compared to before the pandemic (Table 7.3).
- In 2021, the relationship between anxiety and learning outcomes varied by country. Students in Kenya and Senegal who reported higher levels

of anxiety tended to have higher proficiency in reading and mathematics. Students in Zambia who reported higher levels of anxiety tended to show lower proficiency in both reading and mathematics. Students in Burkina Faso who reported higher levels of anxiety tended to show higher proficiency in reading only (Figure 7.1).

- At least half of the students in the five countries that experienced school closures (Burkina Faso, Côte d'Ivoire, Kenya, Senegal and Zambia) reported that they experienced difficulties when they returned to school (Table 7.4).

Support given to students from their families, schools and teachers was examined in relation to reading and mathematics proficiency in 2021.

- Compared to students in other MILO countries, students in Kenya and Senegal were most likely to report that they received support for school-related tasks from their family (Table 7.5).
- Students in Burundi, Côte d'Ivoire, Kenya, Senegal and Zambia who received more support from their families tended to be more proficient in reading and mathematics compared to those who received less support (Figure 7.2).
- Students in Kenya and Senegal were most likely to report that they frequently received support from their school during the COVID-19 disruption (Table 7.6).
- Students in Côte d'Ivoire, Senegal and Zambia who received more support from their school tended to be more proficient in reading and mathematics (Figure 7.3).
- Students in Kenya were more likely to report that they received support from their teachers, whereas students in Côte d'Ivoire were least likely to report receiving support from their teachers (Table 7.7).
- Students in Kenya who received more support from their teachers tended to show greater proficiency in reading and mathematics (Figure 7.4).

The home background of students, including family wealth, and parental literacy and education, was particularly relevant for students who experienced school closures during the COVID-19 disruption.

- Students with lower family wealth tended to have lower proficiency in both reading and mathematics than those students with higher levels of family wealth (Figure 7.5).
- Students that had two parents that could read and write had higher proficiency in reading and mathematics, compared to those students for whom neither parent could read or write (Figure 7.6).
- Around half the students in Burkina Faso, Burundi and Côte d'Ivoire reported that their parents' highest level of education attained was below the level of primary school. In Kenya, Senegal and Zambia students were more likely to have parents whose highest level of education attained was at least the completion of primary or secondary school (Table 7.9).
- Students whose parents' highest level of education attained was post-secondary level or above had higher proficiency in mathematics and reading compared to those students whose highest parental education was below primary school level (Figure 7.7).
- Students in Côte d'Ivoire, Burkina Faso and Zambia who spoke the language of assessment at home, had higher proficiency in reading and mathematics compared to students in their country who spoke another language at home (Figure 7.8).

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INTRODUCTION

The second goal of the MILO project was to *identify the impact of different distance learning mechanisms put in place to remediate the learning disruption generated by COVID-19*. A key component of the MILO contextual framework is the need to collect information on student characteristics and the home environment as key themes in order to understand the impact of the COVID-19 disruption to student learning.

This chapter examines students' home environment and student characteristics, specifically those factors that enabled or inhibited learning during the pandemic and focuses primarily on findings from the MILO Student Questionnaire. This chapter also looks at the support available to students during the disruption and examines its various impacts on students. In addition, the chapter explores student performance in AMPL reading and AMPL mathematics by sub-groups of students based on home background characteristics and those students who may be considered vulnerable.

Effect size

This chapter uses effect sizes to measure differences in reading and mathematics proficiency between groups across countries. An effect size is a measure of the strength of the relationship between two variables using a standardised difference (OECD, 2009b). Using effect sizes makes comparisons between countries with considerably different learning outcomes easier to interpret. The Programme for International Student Assessment (PISA) effect size methodology has been adopted to calculate effect size in this study (OECD, 2009b). We have used effect-size benchmarks suggested by Hattie (2008), with 0.2 a small effect, 0.4 a medium effect and 0.6 a large effect on outcomes.

THE IMPACT OF THE COVID-19 DISRUPTION ON STUDENTS

Digital platforms provide learning opportunities during school closures (UNESCO, 2020a). When students cannot attend school, technologies allow a relative degree of continuation of regular classwork. However, it is important that any remote learning approach that uses technology is suited to the technological capabilities of families. Otherwise, students may not be able to access materials due to infrastructure or connectivity restraints, which may amplify inequalities among students (Munoz-Najar et al., 2021).

Students were asked about using technology during the COVID-19 disruption. Table 7.1 shows the proportions of students who had access to the internet and the proportions of students who used digital devices for their schoolwork. Students in Kenya and Senegal were most likely to have reliable internet access (26% and 18% respectively), while most students in the other MILO countries did not

have access to the internet. Consistently, around half of the student populations in Kenya and Senegal had some access to digital devices but students in the other MILO countries had very low access.

Family support was vital for students during the pandemic, despite many families experiencing difficult circumstances. Parents had to juggle child-minding (due to school and childcare closures) and their own working responsibilities, others had financial concerns due to losing their jobs, while others involved in healthcare may have had to live away from their families to reduce the risk of exposing them to COVID-19 (Fisher et al., 2020).

In the MILO project, students were asked whether their families had experienced any of a number of difficulties through the COVID-19 disruption. Table 7.2 shows the proportions of students who reported each difficulty. Students in Kenya and Senegal experienced more family difficulties than students in other countries and students in all countries were most likely to report that their families had to be more careful with money.

TABLE 7.1 Students' access to the internet and digital devices in MILO countries

		Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Internet access	Yes, worked well	1	4	3	26	18	7	6
	Yes, did not work well	2	4	3	17	11	4	4
	No access	91	97	94	58	70	89	90
Digital device	Laptop/desktop/tablet	2	4	6	10	17	4	5
	Smartphone	2	2	1	18	10	4	3
	Shared digital device	2	7	5	18	15	9	8
	School digital device	2	3	1	7	4	2	3
	No digital device	92	83	87	47	54	81	82

TABLE 7.2 Student reported family difficulties during COVID-19 disruption in MILO countries

	Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Parents/guardians lost their job(s)	30	9	10	59	42	22	26
Family had to be more careful with money	65	27	64	71	69	64	64
Parents/guardians had to work from home	54	13	29	59	53	34	44
Family had to move to a new location	16	6	8	19	18	13	14
Had to live away from parents/guardians	15	6	9	19	21	12	14
Missed meals usually got at school	42	8	21	27	27	16	24
Someone in household was very sick	17	7	9	23	19	16	16

Studies have shown that students in both South Africa and Ethiopia had high levels of anxiety, stress and depression during the pandemic (Woday Tadesse et al., 2021; Visser & Law-van Wyk, 2021). In response to the COVID-19 disruption, students may have felt anxious and worried about a range of issues. Students were asked whether they agreed or disagreed with a series of statements about how they felt during the COVID-19 disruption. Table 7.3 shows the proportions who agreed or strongly agreed with each statement.

Across the MILO countries, student worries and concerns were high. The most commonly reported concerns were that students were scared about what was happening due to COVID-19, were worried about catching COVID-19, were worried about how the disruption affected learning and were worried about changes in schooling. Students in Zambia and Côte d'Ivoire showed higher levels of worries or concerns due to the pandemic. They also experienced school closures of at least 13 weeks' duration (see Chapter 5), which were similar to the closures in Burkina Faso and Senegal. Students in Kenya experienced the longest school closures, while students in Burundi did not experience closures.

A student anxiety scale was derived from the items in Table 7.3. Figure 7.1 shows the effect size for the difference in reading and mathematics proficiency by student anxiety, comparing lower and higher levels of anxiety. A large effect was found in Kenya, with students with higher levels of anxiety displaying higher proficiency in both reading and mathematics. A small to medium effect was found in Senegal, again with higher reading and mathematics proficiency for those students with higher anxiety. A small effect was found for students in Burkina Faso, in relation to reading proficiency, with students with higher anxiety tending to have higher reading proficiency. Conversely, there was a small effect in reading and mathematics proficiency in Zambia, with students with lower levels of anxiety showing higher proficiency than those with higher levels of anxiety.

TABLE 7.3 Students' worries and concerns during COVID-19 disruption in MILO countries

	Burkina Faso (Student %)	**Burundi** (Student %)	**Côte d'Ivoire** (Student %)	**Kenya** (Student %)	**Senegal** (Student %)	**Zambia** (Student %)	**MILO Median** (Student %)
Worried about changes in schooling	79	71	85	73	79	87	79
Scared about what happening due to COVID-19	83	83	92	74	83	89	83
Worried how disruption affected learning	79	70	88	78	77	90	78
Worried about catching COVID-19	82	79	92	70	80	89	81
Difficult to concentrate on schoolwork	73	54	79	57	67	78	70
More lonely than usual	69	44	66	53	69	78	67
Upset about things would not normally bother	62	46	56	53	58	68	57
Felt angry more than usual	62	44	55	49	56	64	55

Students were asked about difficulties they experienced in returning to school after the COVID-19 disruption. Table 7.4 shows the proportions of students who agreed or strongly agreed that they experienced difficulties when they returned to regular lessons at school. The majority of students in Côte d'Ivoire reported difficulties in returning to regular lessons after the COVID-19 disruptions (between 61% and 89%). Students in Burundi were least likely to report difficulties returning to regular lessons as these students were unlikely to have experienced school closures (see Chapter 5). The majority of students in Burkina Faso, Côte d'Ivoire, Kenya, Senegal and Zambia reported experiencing difficulties in returning to regular lessons after the COVID-19 disruption.

Students in most of MILO countries, except for Burundi, were likely to report that they were more worried than before the disruption. Students in Côte d'Ivoire were most likely to report that they were not as interested in schoolwork and found it difficult to focus on schoolwork.

FIGURE 7.1 Reading and mathematics proficiency by student anxiety scale

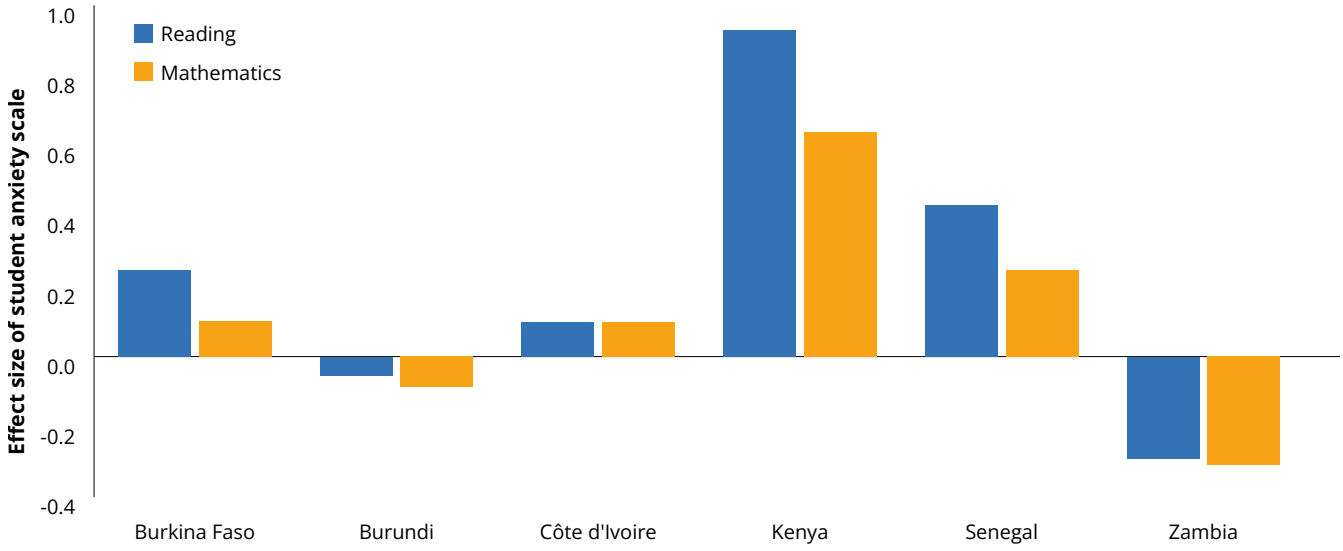


TABLE 7.4 Student reported difficulties in returning to regular lessons after COVID-19 disruption across MILO countries

	Burkina Faso (Student %)	**Burundi** (Student %)	**Côte d'Ivoire** (Student %)	**Kenya** (Student %)	**Senegal** (Student %)	**Zambia** (Student %)	**MILO Median** (Student %)
Not as interested in schoolwork	52	18	89	41	51	37	46
Found it difficult to focus on schoolwork	65	20	88	50	51	46	51
Did not talk to classmates as much	53	20	61	48	52	49	51
Worked more slowly on schoolwork	58	17	81	41	48	47	47
More worried than before	65	27	82	57	60	57	59
Any concerns	**91**	**40**	**93**	**87**	**90**	**81**	**88**

SUPPORT PROVIDED TO STUDENTS

Family support

Parents' involvement in their child's learning has been shown to positively impact academic achievement (Borgonovi, & Montt, 2012; Pacific Community Educational Quality and Assessment Programme, 2019; UNICEF & SEAMEO, 2020). In particular, there is a positive relationship between a parent's literacy activities with their children and their children's achievement in literacy (Hemmerechts et al., 2017). During school closures, students were more reliant on support from their families.

In the MILO Student Questionnaire, students were asked about support they received from their families during the disruption. Table 7.5 shows the proportion of students who reported sometimes or often receiving specific support from their family. Students in Kenya and Senegal were most likely to report that they sometimes or often received each of the types of support from their families.

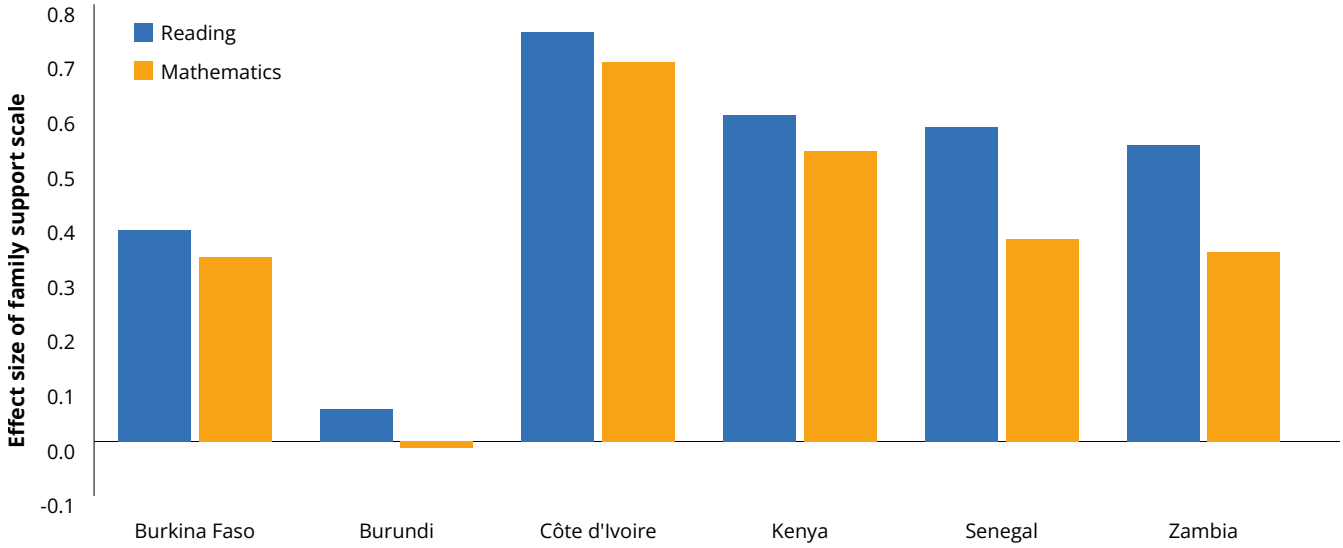
Students mostly reported that they received help with mathematics, reading and writing. The least reported type of support was receiving help to use digital devices to access or do schoolwork (likely this was due to a lack of access – see Table 7.1).

A family support scale was derived from the items in Table 7.5. Figure 7.2 presents the effect size for reading and mathematics proficiency by family support, comparing students who received less support to those who received higher levels of support. Students who received higher levels of support tended to display higher proficiency in reading and mathematics. A large effect was found in Côte d'Ivoire and a medium to large effect was found in Kenya for reading and mathematics proficiency, while in Senegal and Zambia there was a medium effect for reading and a small effect for mathematics proficiency. There was a small effect in Burkina Faso for both reading and mathematics proficiency. These results reinforce the notion that parental involvement positively impacts student achievement.

TABLE 7.5 Student reported frequency of familial support (sometimes or often) during COVID-19 disruption across MILO countries

	Burkina Faso (Student %)	**Burundi** (Student %)	**Côte d'Ivoire** (Student %)	**Kenya** (Student %)	**Senegal** (Student %)	**Zambia** (Student %)	**MILO Median** (Student %)
Help with reading and writing	50	26	44	85	76	65	57
Help with mathematics	55	29	46	86	78	64	59
Ask what student was learning	48	31	38	84	72	59	53
Help create a learning timetable	36	26	27	70	61	37	36
Help access learning materials	41	32	29	73	60	43	42
Check student is completing schoolwork	47	35	41	79	72	49	48
Explain new topics to you	35	27	28	69	60	39	37
Help use digital device for schoolwork	18	9	11	49	44	23	20

FIGURE 7.2 Reading and mathematics proficiency by family support scale



Support provided to students

Students were asked about support they received from someone at their school during the COVID-19 disruption. Table 7.6 shows the proportion of students who reported sometimes or often receiving specific support from someone at their school. Students in Kenya and Senegal were most likely to report that they frequently received support from their schools. Students in Burundi were least likely to receive support from their schools.

The most commonly reported method of support was that schools gave helpful tips to students about studying on their own, followed-up on checking students completed schoolwork and asked to see completed schoolwork. Students were least likely to report that their schools taught lessons on the internet or prepared schoolwork with online access – again mostly because access to the internet was low (see Table 7.1).

A school support scale was derived from the items in Table 7.6. Figure 7.3 shows the effect size for reading and mathematics proficiency comparing students with low levels of support from schools to those with higher levels of support. There was a small effect in Senegal and Zambia, with students who received more support from their schools tending to have higher proficiency in reading and mathematics than students who received less support.

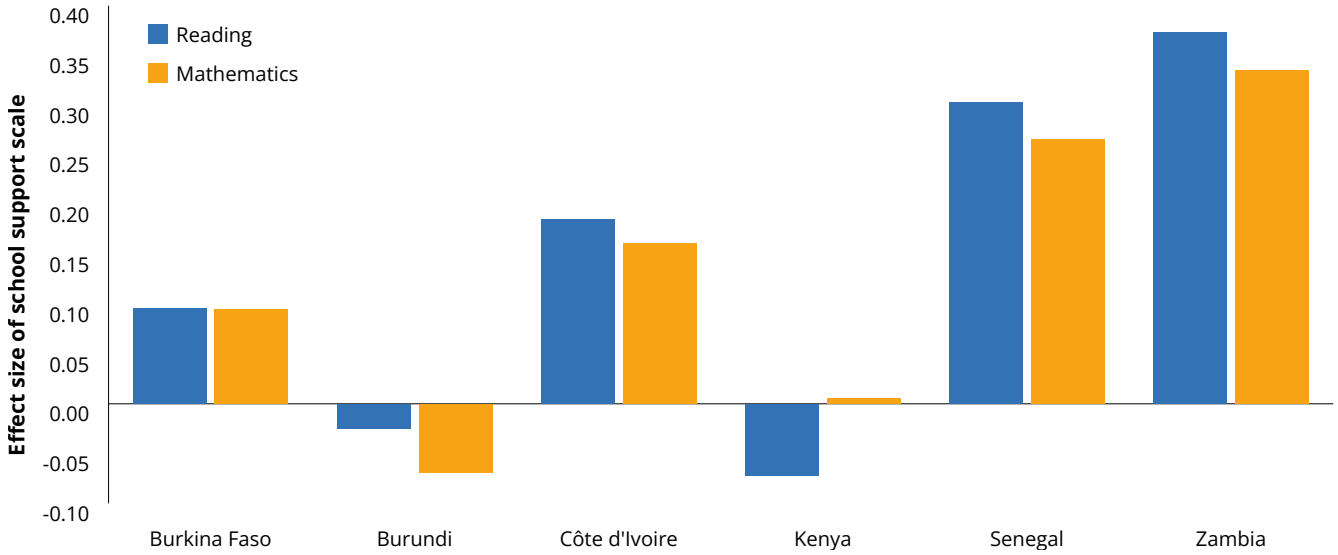
Students were also asked about support they received specifically from their teacher during the COVID-19 disruption. Table 7.7 shows the proportion of students who agreed or strongly agreed that they received support from their teacher. Students in Kenya were more likely to report that they received support from their teachers, whereas students in Côte d'Ivoire were least likely to report receiving support from their teachers.

Across all six MILO countries, students were most likely to report that their teachers encouraged them to learn and showed interest in their learning. Students were least likely to report that their teachers made special efforts to keep in contact.

TABLE 7.6 Student reported frequency of school support (sometimes or often) during COVID-19 disruption across MILO countries

	Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Send paper-based materials to home	17	5	7	50	27	14	15
Prepared paper-based materials for pick-up	17	8	5	42	23	14	15
Prepared schoolwork be accessed online	12	4	4	43	20	9	10
Taught lessons on the internet	11	4	4	43	20	9	10
Contacted student by SMS or social media	13	5	7	37	23	10	11
Asked student to watch shows on TV	39	9	52	55	56	21	46
Asked student to listen to shows on radio	52	24	41	58	50	25	45
Gave helpful tips about studying on own	59	31	44	75	62	38	51
Asked how student was feeling	43	29	34	64	50	28	38
Checked student completing schoolwork	37	40	22	68	48	22	38
Asked to see completed schoolwork	32	37	19	69	45	23	35

FIGURE 7.3 Reading and mathematics proficiency by school support scale

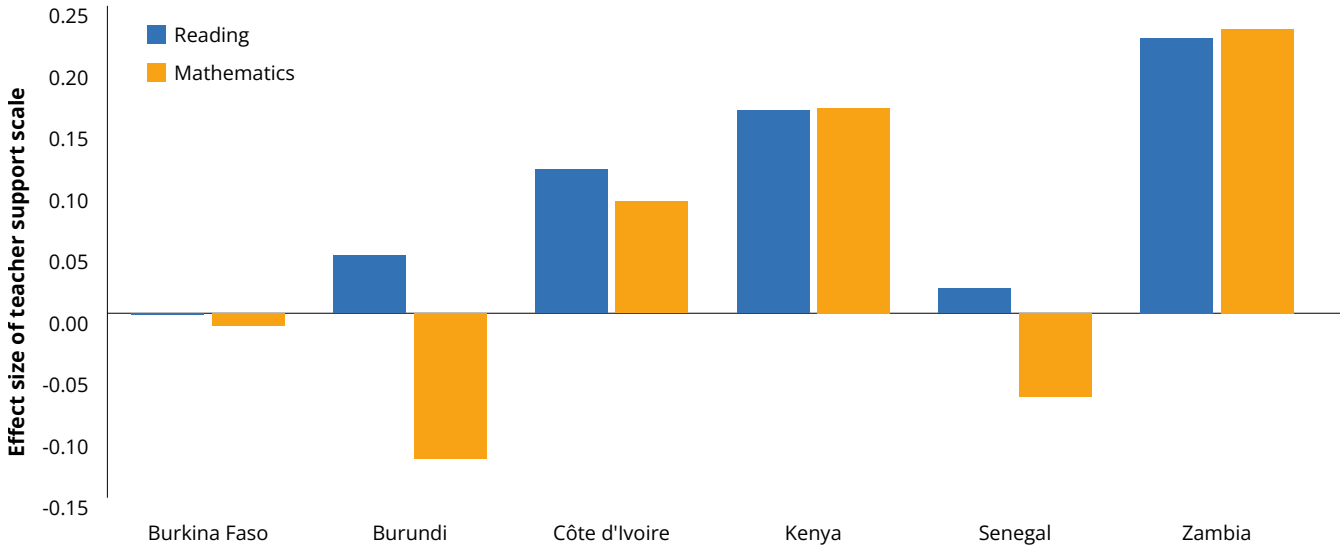


A teacher support scale was derived from the items in Table 7.7. Figure 7.4 shows the effect size for reading and mathematics proficiency comparing students with low and high levels of teacher support. There was a small effect in Zambia; students with higher levels of teacher support displayed higher proficiency in reading and mathematics.

TABLE 7.7 Student reported strongly agree or agree they received teacher support across MILO countries

	Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Teacher(s) available when needed help	39	51	26	61	49	40	44
Teacher(s) clear how best to contact	35	31	27	53	47	38	36
Teacher(s) gave feedback could understand	37	46	25	58	46	38	42
Teacher(s) special effort to keep in contact	30	39	23	50	41	35	37
Teacher(s) interest in student's learning	45	50	30	68	53	47	48
Teacher(s) encouraged student to learn	48	53	35	78	62	51	52
Teacher(s) adapted schoolwork meet needs	36	37	27	44	47	38	38

FIGURE 7.4 Reading and mathematics proficiency by teacher support scale



STUDENTS FACING DISADVANTAGE

Disadvantaged students have been shown to be more vulnerable to learning loss during emergencies in education, such as the COVID-19 disruption (Tarricone et al., 2021). The MILO contextual framework emphasises the importance of collecting information to identify vulnerable students (where it is appropriate to do so). In the Student Questionnaire, items were included to capture components of socio-economic status (SES), to record students who speak a minority language mainly at home and those who have a disability requiring additional support. SES is considered to be a construct comprised of three components: economic, social and cultural. These components are typically indicated by household wealth, parents' education and parents' occupation.

Socio-economic status[13] is broadly understood as 'the relative position of individuals or groups in a hierarchical social structure, based on the possession of some valued social, economic and cultural resources, values and attributes.' (Osses et al., forthcoming). There is a large body of evidence showing the association between children's SES and educational outcomes (see for example Broer et al., 2019; Sirin, 2005). This is particularly the case during emergencies in education, as children with low-SES characteristics have fewer family, economic and cultural resources to buffer them against the effects of emergencies, such as when schools need to close (Cullinane & Montacute, 2020; Di Pietro et al., 2020). In addition, emergencies such as COVID-19 can further reduce already low household incomes, which can force children to enter paid work with the threat of not returning to school, even after the emergency has subsided (Bekalo et al., 2003; Desai, 2020; Smitha, 2014; Wagner & Warren, 2020).

In MILO it was not feasible to capture meaningful data on parental occupation because of the age of the target population. Therefore, information about two out of the three SES components was collected. Family wealth – an economic indicator of SES – was measured by enquiring about home possessions, the construction material of household walls and the main source of household lighting. Parental education – an often-used cultural indicator of SES – is included in MILO with indicators of parental literacy and the highest level of education attained, using International Standard Classification of Education Indicators (UNESCO, 2012).

Disadvantaged students have been shown to be more vulnerable to learning loss during emergencies in education, such as the COVID-19 disruption.

Indicators associated with family wealth were aggregated into an index that reflects the economic context of students' homes for each country. Figure 7.5 shows the effect size for reading and mathematics proficiency by the country-specific index of family wealth, by comparing the wealthiest quarter of students to the least wealthy quarter.

There was a medium to large effect in reading and mathematics proficiency across most countries, students from higher wealth backgrounds showed higher levels of proficiency in reading and mathematics compared to those from low wealth backgrounds. There was a small effect on mathematics proficiency in Burundi and Kenya.

For younger-age students, home learning requires parents to either relay instructions from the school or take on the teaching responsibilities with guidance from the school (Obiakor & Adeniran, 2020). However, if the child comes from a home where neither parent is literate, or where parents have low literacy skills, then their parents' ability to assist with schoolwork is limited.

FIGURE 7.5 Reading and mathematics proficiency by family wealth

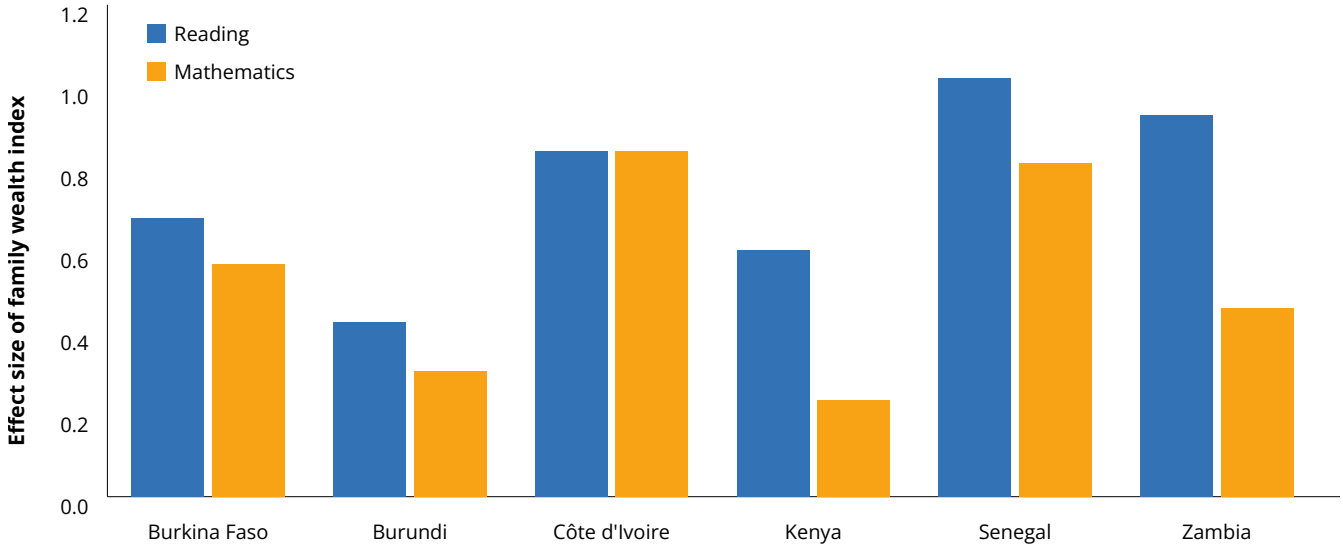


TABLE 7.8 Student reported parental literacy across MILO countries

		Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Mother	Can't read or write	53	20	49	7	31	10	25
	Either read or write	8	8	4	8	13	5	8
	Can read and write	38	72	47	85	56	85	64
Father	Can't read or write	40	16	28	6	17	10	16
	Either read or write	7	6	3	7	8	5	6
	Can read and write	54	79	68	87	75	85	77
Neither parent can read or write		33	9	24	3	12	3	10
Some parental literacy		36	26	33	15	39	15	30
Both can read and write		31	65	43	81	50	82	57

In the MILO project, students were asked about their parents' literacy in terms of whether their mother and father could read and write. This was asked regardless of whether or not the student lived with both parents. Almost three quarters of students lived with both parents (72%). Sixteen per cent lived with one parent and 12% lived with neither parent. Around five per cent of students didn't report their mother's or father's literacy, with some answering for one parent but not the other.

Table 7.8 shows the proportions of students in MILO countries who reported that their mother and father could read and write. Students were more likely to report that their fathers could read and write compared to their mothers. Around half of students in Burkina Faso and Côte d'Ivoire (53% and 49% respectively) reported that their mothers could neither read nor write. Most students reported that their fathers could both read and write, which ranged from more than half in Burkina Faso (54%)

through to a substantial majority of students in Kenya and Zambia (87% and 85% respectively).

Eighty-one per cent of students in Zambia and 82% in Kenya reported that both their parents could read and write compared to 50% in Senegal, 43% in Côte d'Ivoire (43%) and 38% in Burkina Faso.

Figure 7.6 examines the effect size for reading and mathematics proficiency by parental literacy. There was a large effect in Burkina Faso, Côte d'Ivoire, Kenya and Senegal in reading proficiency by parental literacy; students who reported that both their parents could read and write displayed higher reading proficiency than those who reported that neither parent could read nor write. There was a large effect in mathematics proficiency in Côte d'Ivoire and a medium effect in Burkina Faso, Kenya and Senegal; students whose parents could both read and write showed higher mathematics proficiency than those who reported their parents could not.

Students of parents with poorer literacy are likely to have lower levels of achievement (Wagner & Spratt, 1988). This suggests that these students are further at risk, given the large periods of time they were forced to be absent from school without parents with the appropriate literacy skills to support their learning needs.

Students were also asked about their mother's and father's highest formal education. Table 7.9 shows the proportions of students in MILO countries who reported the highest level of education attained by each parent as well as the highest level of education attained by either parent. Students were more likely to report that their mothers did not complete primary education compared to their fathers in all MILO countries.

Around half the students in Burkina Faso, Burundi and Côte d'Ivoire reported that their highest parental education was below primary school level (53%, 48% and 45% respectively). In Kenya, Senegal and Zambia, the highest level of educational attainment was more likely to be completion of primary or secondary schooling (44%, 50% and 60% respectively). Less than ten per cent of students in Senegal, Côte d'Ivoire, Burundi and Burkina Faso reported that their highest parental education was university level or higher.

FIGURE 7.6 Reading and mathematics proficiency by parental literacy

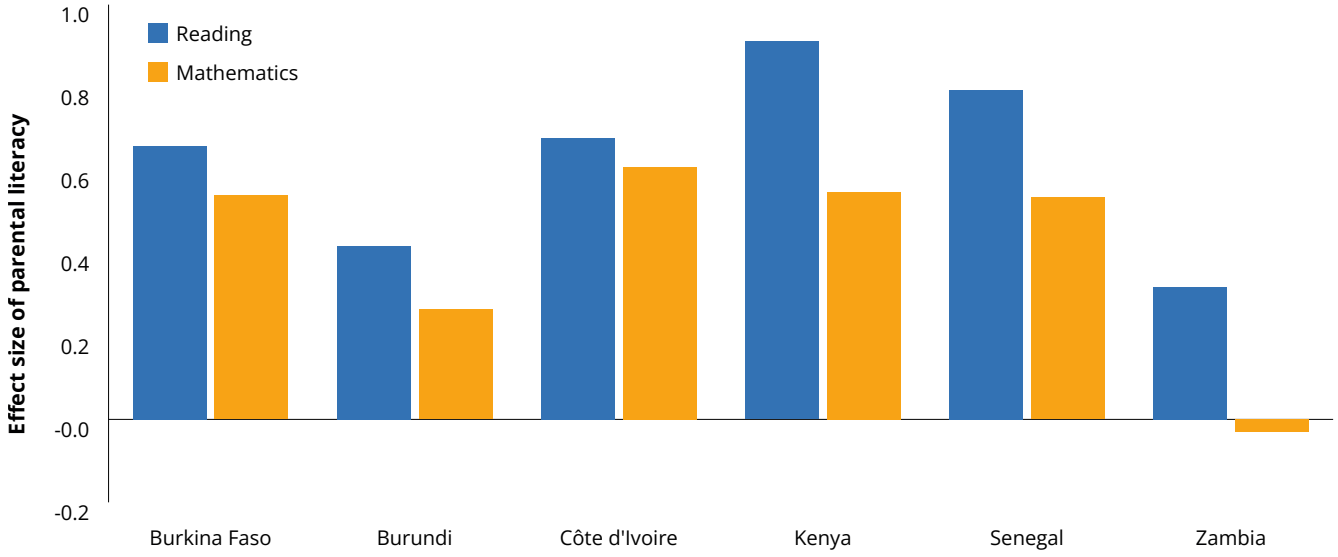


TABLE 7.9 Student reported parental education across MILO countries

		Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Mother	Did not complete primary	67	63	68	12	45	18	54
	Completed primary or secondary	26	29	25	51	43	62	36
	Post-secondary, non-university	3	3	4	20	5	12	4
	University or higher	4	5	3	16	7	8	6
Father	Did not complete primary	60	57	50	9	34	13	42
	Completed primary or secondary	32	35	38	47	45	59	42
	Post-secondary, non-university	3	3	5	23	9	17	7
	University or higher	5	6	7	21	12	12	9
Highest parental education (either mother or father)	Did not complete primary	53	48	45	5	26	8	36
	Completed primary or secondary	36	39	40	44	50	60	42
	Post-secondary, non-university	14	6	17	31	22	33	20
	University or higher	4	4	6	24	9	18	8

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Figure 7.7 presents the effect size for reading and mathematics proficiency by parents' highest level of education attained. There was a medium to large effect across all MILO countries; students whose parents' highest level of education attained was post-secondary level or higher showed higher proficiency in reading compared to those students whose highest parental education was below primary school. There was a large effect in mathematics achievement in Côte d'Ivoire, and a medium effect in Kenya and Senegal.

Students were asked what language they spoke at home. Table 7.10 shows the proportion of students who spoke the language of the assessment (French or English) or another language. Across all MILO countries, the majority of students spoke a language other than the language of the assessment at home. Around one-quarter of students in Côte d'Ivoire spoke the language of assessment (23%), compared to between one and six per cent across the other MILO countries (Burkina Faso, Burundi, Kenya, Senegal and Zambia).

Figure 7.8 shows the effect size for reading and mathematics proficiency where the language spoken at home matched the language of the assessment compared to those who spoke a different language. The was a large effect on reading and mathematics proficiency in Côte d'Ivoire and a medium to large effect in Zambia; students who spoke the language of the assessment showed higher proficiency in reading and mathematics than those who spoke another language at home. Further, there was a medium effect in reading proficiency in Burkina Faso and Senegal; students who spoke the language of assessment showed higher proficiency than those who spoke a different language. Results showing a positive relationship between speaking the language of assessment and academic achievement are consistent with other studies of developing countries (Pacific Community Educational Quality and Assessment Programme, 2019; UNICEF & SEAMEO, 2020).

FIGURE 7.7 Reading and mathematics proficiency by highest parental education

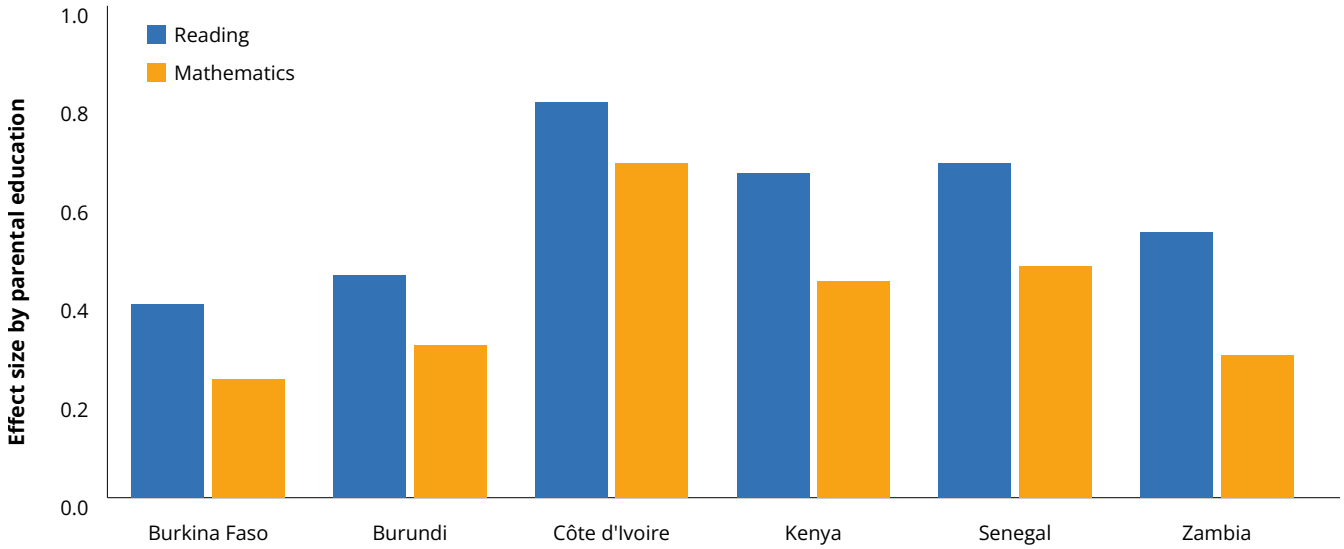
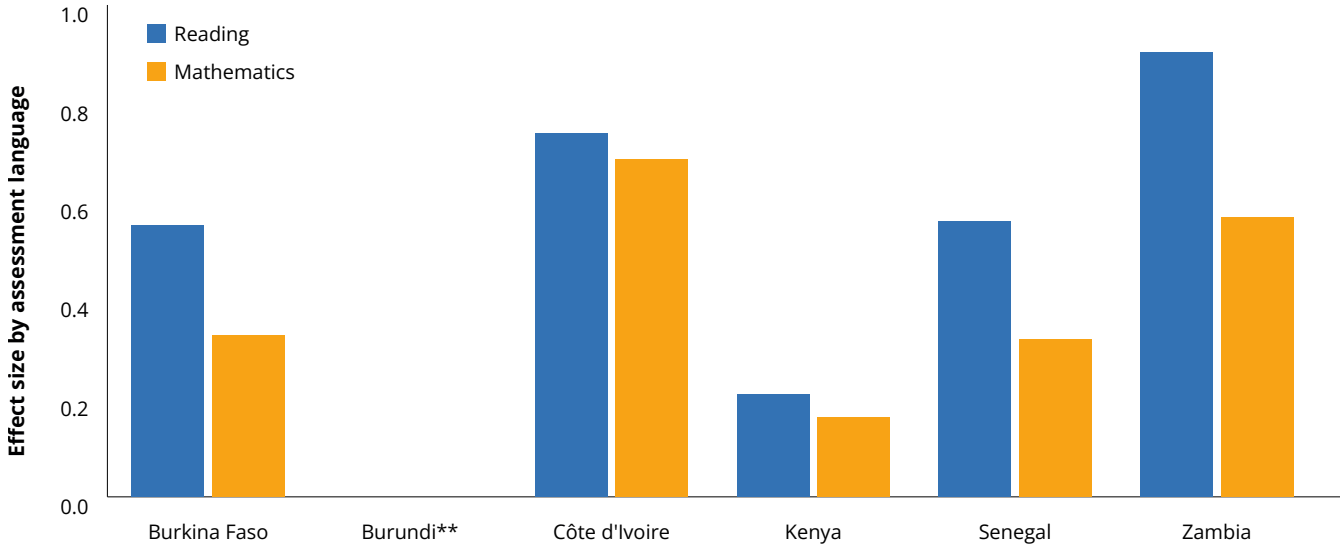


TABLE 7.10 Language spoken at home across MILO countries

	Burkina Faso (Student %)	Burundi (Student %)	Côte d'Ivoire (Student %)	Kenya (Student %)	Senegal (Student %)	Zambia (Student %)	MILO Median (Student %)
Language of assessment	6	1	23	3	3	5	4
Other language	94	99	77	97	97	95	96

FIGURE 7.8 Reading and mathematics proficiency by language spoken at home



** Burundi's results are not included due to small sample size

The International Network of Education in Emergencies has highlighted that children with disability (or special needs) are particularly vulnerable during emergencies (INEE, 2020). Children with disability often experience barriers accessing information, as well as increased isolation and exclusion from decision-making. Further, the additional support that might usually be provided to children with disability is often interrupted during an emergency (Dickinson et al., 2020; Good, 2015). Although, children with disability are vulnerable during emergencies across all education systems, risks are heightened in low-income countries, which have fewer resources to cater to them (Wagner & Warren, 2020). For example, parents of children with disability in Uganda reported struggles with home education and learning due to lack of access to accessible learning materials and learning support (Mbazzi et al., 2021).

Children with disability often experience barriers accessing information, as well as increased isolation and exclusion from decision-making.

In the MILO project, students were asked whether they received support from their schools or teachers during the COVID-19 disruption in relation to their disability. Table 7.11 shows that the majority of students across the MILO countries[14] reported that they did not have a disability. Support received varied across the countries, with up to six per cent reporting that they received extra support and up to seven percent reporting they received less support (than other students).

Figure 7.9 shows the effect size for reading and mathematics proficiency, comparing students with a disability to those with no disability. There was a medium effect in Senegal; students with a disability showed lower proficiency in reading and mathematics compared to those with no disability. Conversely, there was a small effect in Zambia, with students with a disability showing higher proficiency in reading and mathematics compared to those without a disability. It should be noted that disabilities range from those that have minimal impact on a child's academic outcomes without support to those requiring major levels of support and intervention.

TABLE 7.11 Students receiving support for a disability

	Burkina Faso (Student %)	**Burundi** (Student %)	**Côte d'Ivoire** (Student %)	**Kenya** (Student %)	**Senegal** (Student %)	**Zambia** (Student %)	**MILO Median** (Student %)
No disability	85	91	89	N/A	81	89	89
Received extra support	4	3	2	N/A	6	3	3
Received the same level of support	6	3	3	N/A	6	3	3
Received less support	5	3	6	N/A	7	5	5

FIGURE 7.9 Reading and mathematics proficiency by student disability

** Kenya's results are not included due to data validation issues

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CHAPTER 8

Discussion of findings

INTRODUCTION

This chapter discusses the main findings presented in Chapters 4 to 7 and how they align to the goals of the MILO project. The discussion also analyses how the findings relate to the conceptual framework and the corresponding themes of the contextual questionnaires. It also shows how the MILO findings fit within the broader research on the impact of the COVID-19 disruption on global learning outcomes. The chapter then presents the implications of the findings for policy and practice.

The chapter then outlines possibilities for using the Assessments for Minimum Proficiency Levels (AMPL) in other contexts, for the purpose of reporting against SDG 4.1.1 and potentially providing statistical alignment of national and cross-national assessment programmes. The report closes by noting some limitations to the MILO study and pointing out opportunities for future research and development.

THE IMPACT OF COVID-19 ON LEARNING OUTCOMES

The first overarching goal of the MILO project was to evaluate the impact of COVID-19 on learning outcomes and measure any learning loss by reporting against Sustainable Development Goal (SDG) indicator 4.1.1b. Chapters 2 and 3 of this report describe how MILO achieved this evaluation by designing Assessments for Minimum Proficiency Levels (AMPL) to estimate reading and mathematics proficiency at the end of primary schooling. The AMPL results were reported as the proportion of students who reached the Minimum Proficiency Levels (MPLs) for SDG 4.1.1b.

As presented in Chapter 4, there was no learning loss observed for the end of primary school population[15] in any of the MILO countries in either reading or mathematics. Burkina Faso experienced an improvement over time for students in mathematics; a higher proportion of students met the MPL in 2021

than did so in 2019. At the sub-group level, there was evidence of learning loss in mathematics for boys in Kenya, with the proportion who achieved the MPL dropping between 2019 and 2021.

Before the implications of these findings can be explored, it is useful to compare the performance of populations over time and whether their demographic characteristics are comparable. The gender, age, socioeconomic status (SES) and proportion of students living in an urban setting can all influence achievement in reading and mathematics at the primary school level (Pacific Community Educational Quality and Assessment Programme, 2019; UNICEF & SEAMEO, 2020). Changes in the proportions of students within each of these demographic characteristics mean that changes in achievement can be expected. For instance, given the strong association between SES and achievement in developing countries (Çiftçi & Cin, 2017; UNICEF & SEAMEO, 2020), we would expect an increase in the SES profile of the population over time to accompany an increase in achievement over time. This is particularly relevant for the MILO project as research suggests that African students from disadvantaged backgrounds are more at risk of dropping out of school due to the COVID-19 pandemic (Mthalane et al., 2021).

There are difficulties in linking population differences with differences in learning outcomes when comparing the background characteristics of students between the pre-pandemic assessment and the AMPL. For instance, the increase in the proportion of students in Burkina Faso who achieved the MPL for mathematics in 2021 is not accounted for by differences in wealth between the Grade 6 populations of 2019 and 2021, given that students from the earlier population come from homes that are estimated to be comparably wealthier. Similarly, the learning loss measured for Kenyan boys in mathematics cannot be explained by wealth differences between the populations at the two points in time. The boys from the Kenyan population in 2021 (who were less likely to meet the MPL compared to those from the historical assessment) were estimated to be comparably wealthier.[16]

UNDERSTANDING THE IMPACT OF COVID-19 ON LEARNING OUTCOMES

There are many reasons that could explain why students at the end of primary school were able to maintain learning outcomes in reading and mathematics after the onset of the COVID-19 pandemic, at least until mid-2021.

Learning gains that may have otherwise been achieved since the previous assessment may have been suppressed by the pandemic

For most MILO countries, the time between the historical assessment and AMPL spanned 2–3 years, with schools open as normal for much of that time. It is feasible to expect that if not for the COVID-19 disruption, there may have been a learning gain over that period of time. Indeed, there were gains over time in reading performance for PASEC countries between the 2014 and 2019 assessments (Nestour, 2021). With educational reforms and improvements to curriculum, it is reasonable to expect that there may have been more students who met the MPL than there were several years ago. This expected gain, however, may have been offset by pandemic disruptions. The effect of the pandemic may have been to nullify any gain in learning outcomes that would have been expected given historical trajectories.

Students already on track to achieving the MPLs may have been less impacted by the COVID-19 disruption

Another finding from PASEC 2019 was that the higher performing students had higher achievement in reading than they did in 2014, whereas the same increase was not observed for lower performing students (Nestour, 2021). Inequities between schools increased over this period. These findings raise the question as to whether students who were already on track to meet the MPL were not as impacted by the pandemic disruption as those who were not. Results from Chapter 7 suggest that disadvantaged students (from households with fewer resources or who had parents with lower levels of literacy

and education), were more likely to have poorer achievement in reading and mathematics. Those who had books at home, ICT devices and parents who could act as 'home learning teachers' would be expected to be better equipped to withstand the lack of face-to-face schooling.

Low proportions of students who met the MPLs in historical assessments make decline difficult to observe

The MILO study highlights an alarmingly low proportion of students from the historical assessments who met the MPLs in either reading or mathematics. For instance, of the five countries with historical assessment data for reading, fewer than 15% of students achieved the MPL in the historical population, including two countries where less than 2% achieved this level. For mathematics, four of the six MILO countries had fewer than 18% of students that achieved the MPL in the historical population, including two countries where less than 8% achieved this level. At such low levels, obtaining statistically significant reductions in the proportion of students meeting the MPLs becomes much more difficult, compared to countries where a more substantial proportion of students met the MPLs. In many of the MILO countries, it may have been that the proportion of students who met the MPLs were already at a floor, and any disruption may not substantially impact this floor effect.

One might expect that the COVID-19 disruption may have resulted in those students not meeting the MPLs (who were disproportionately more likely to be those facing some sort of disadvantage) falling further behind in their learning compared to their peers. The AMPL was designed as an efficient tool to measure the proportion of students meeting the MPLs. Therefore, the AMPL does not measure the proficiency levels of students below the MPLs. As discussed later in this chapter, there are opportunities in the future for the AMPL to be used to complement existing national or regional assessments to measure and describe the broad range of abilities that children at the end of primary schooling may exhibit in reading and mathematics, in addition to reporting against SDG 4.1.1b.

Students may already have recovered from any learning loss by the time they undertook the assessment

With the exception of Zambia, the AMPLs were not administered during the main period(s) of disruption and instead students were assessed after they had returned to school. The timeframe for the return to school after the greatest periods of disruption was many months to a year (as detailed in Chapter 5). Data from Chapter 6 show that many students attended schools where academic progress was monitored during and post the disruption. It is feasible that students whose learning was disrupted during this period would have recovered, to some extent, by the time the AMPL was administered. If AMPL had been administered immediately after students returned to school, learning loss may have been evident. Likewise, the disruption caused by the pandemic was not isolated to the period before the AMPL. The MILO countries, much like the rest of the world, experienced additional pandemic disruption after data collection, and, as of late 2021, the disruptions appear likely to continue.

Mitigation strategies may have lessened the impact on reading and mathematics outcomes compared to other academic and non-academic areas

The AMPL assessed minimum proficiency in reading and mathematics. While these are fundamental subjects, they do not encompass the range of skills that students would be expected to learn at primary school. For instance, science, creative arts and physical education are more difficult to incorporate into teaching and learning programs during a period of disruption.

Additionally, the development of social-emotional skills is a fundamental element of primary schooling that is difficult to integrate into teaching and learning programs during periods of disruption. This is particularly true of the MILO countries, which have minimal digital technologies infrastructure (see Chapter 7). Indeed, social-emotional skills are vital for childhood development, and have strong links with academic performance (OECD, 2020) and childhood behaviours (Durlak et al., 2011). Chapter 5 details

that four of the MILO countries had policies for collecting data on student achievement. Yet as observed in Table 5.9, no country indicated that they had policies for collecting information to monitor the impact of the pandemic on students' emotional health. Certainly the results in Chapter 7 highlight that the majority of students were worried about COVID-19 and the impact it would have on their schooling and felt anxious generally.

Families, schools and educational systems were able to offset much of the impact of the disruption

The second overarching goal of the MILO project was to identify the impact of different distance learning mechanisms established to remediate the learning disruption. Indeed, findings point to a substantive response by systems, schools and families in response to the pandemic.

The five countries that experienced school closures had national policies and plans to direct teaching and learning at schools during the pandemic. These plans included providing extra support to groups of disadvantaged students, changing school organisation, minimising academic disruption and offering support services to staff. Assessment and monitoring practices were implemented and various support measures were put in place to encourage students to return to school once the disruption had concluded.

Although school principals reported there were a number of barriers to remote learning (including lack of digital infrastructure), systems were put in place to continue learning. These included providing students with a range of non-digital learning materials such as handouts, suggesting TV/radio shows, engaging the broader community, enabling communication between students and staff, requiring staff to provide feedback to students and making provisions for disadvantaged students.

Parents were crucial in providing support during the pandemic. Students who reported that they received greater support from their parents performed better on the AMPL than students who did not. This was reinforced by the findings that showed an association between academic achievement and having literate parents. Likewise students who reported receiving greater support from their teachers and schools tended to have higher levels of achievement. It is likely that without the mechanisms put in place during the pandemic by those important to students' learning – their families and community, their teachers, their schools, their educational systems – the impact of the pandemic on learning outcomes may have been far greater.

OTHER RESEARCH ON THE EFFECT OF COVID-19 ON LEARNING OUTCOMES

Besides the MILO project, there have been a range of other studies that have sought to investigate the impact of the pandemic on learning outcomes. Most of these were conducted in high income country contexts and present complex findings. Often, evidence from these studies suggests that school closures resulting from COVID-19 have had a negative impact on student learning. Although simulation and speculative studies forecast dramatic declines in student learning (Azevedo et al., 2021; Kaffenberger, 2021), the actual impacts on learning outcomes appear to be more modest and mixed.

Mixed evidence on learning gains and losses

Thorn and Vincent-Lancrin (2021b), reviewed the evidence about the impact of the first wave of COVID-19 school closures that occurred from March to June 2020 for the OECD. This report drew on evidence from Australia, England, Flanders, France, Germany, Italy, Netherlands and the United States. It concluded that:

> there is ... conflicting evidence from standardised tests regarding students' learning progress during school closures compared to progress in 'normal' conditions ... differences observed between the performance of students tested in 2020 or in early 2021 with students in the same year of school in previous years range from small increases to large falls. ... At the very least, the available evidence suggests that it should not be automatically assumed that the school closures ... had a large negative impact on student progress and achievement. (Thorn & Vincent-Lancrin, 2021b, p. 94)

In an earlier review, based on a sub-set of studies presented in their OECD report, with data collected in mid-to-late 2020, they found that 'for most (though by no means for all) children, missing 8–18 weeks of face-to-face schooling appears not to have had dramatic consequences for either their academic or broader development' (Thorn & Vincent-Lancrin, 2021a, p. 383).

Studies that have focused on individual countries have also found mixed results regarding the impact of the pandemic on learning outcomes. For instance, in comparing results from mid-2021 to mid-2019, Blainey and Hannay (2021) found that although mathematics achievement in Grades 2 and 6 declined in England, reading results remained relatively static.

Some studies found that learning declined in primary school but not secondary school. For instance, in California, Pier et al. (2021) found that while there was a learning loss when comparing results in mathematics and literacy from late 2020 with late 2019 in the early to mid-school years, there was actually learning gain in the mid-to-late school years. Similarly, in Switzerland, there were declines in mathematics and literacy in upper primary school, while students in lower secondary school were 'largely unaffected' (Tomasik et al., 2021, p. 566). This was based on comparisons of achievement results taken eight weeks prior to school closures to eight weeks into closures.

However, some studies found the opposite pattern and showed that primary students fared better than secondary students. An Italian study found that while primary school learning outcomes in mathematics remained stable, with slight improvements in literacy, there were learning losses in the later years (INVALSI, 2021). This was based on large-scale assessments that took place at the end of the 2021 school year in June, involving over 1.1 million students. In Denmark, a study found that reading assessments conducted in mid-2021 (three months after schools reopened) showed that students in lower and upper primary school experienced learning gains compared to expected test trajectories, whereas there was learning loss for lower secondary students (Birkelund & Karlson, 2021). The French DEPP study, which Thorn and Vincent-Lancrin (2021a) describe as the most robust available, found negligible gains and losses for students in early primary school, but a significant gain in late primary school in both literacy and mathematics (DEPP, 2021). This was based on national assessments conducted in late 2020 and early 2021, which were compared to results from pre-pandemic years.

One of the few studies in a low- or middle-income country was conducted via a household survey in the Indian region of Karnataka in March 2021. It measured various abilities in arithmetic and reading in children aged 5 to 16 years. Although overall reading and mathematics abilities declined, there were improvements in some sub-skills. For example, more Grade 6 students in the 2020–21 cohort were able to do subtraction than those in the 2018–19 cohort (ASER, 2021).

Neutral impact on learning outcomes

Some studies have found neutral impacts across grades and learning domains. An English study on reading found there was no statistically significant change between 2018–19 cohorts and 2020–21 cohorts in both primary and secondary grades after COVID-19 school closures (GL Assessment, 2021). In Australia, preliminary results from national standardised assessments, which are conducted in Grades 3, 5, 7 and 9, indicated slight gains across all assessed grade levels in literacy and mathematics between the 2019 and 2021 cohorts, albeit the gains were not statistically significant (ACARA, 2021). Moreover, the results were similar between states that experienced extensive school closures and those with minimal or no school closures. Hence, it appears that in some countries, student learning is particularly resilient.

Learning loss and recovery

Some studies found learning losses especially in mathematics. For example, in the Netherlands, Engzell et al. (2020) found loss in mathematics and literacy in both lower secondary and upper secondary, equivalent to a fifth of a school year. In this study, data were collected via national assessments in 2020, just prior to and just after school closures, and then compared to the trajectory of the three preceding years. At the primary school level, a UK study found that students typically lost the equivalent of over two months progress in reading and over three months in mathematics (Renaissance Learning, Education Policy Institute, 2021). This was estimated based on comparing results in assessments from 2019 to 2021. These results highlight that 'learning loss' may be more accurately described as reduced learning gain (Thorn & Vincent-Lancrin, 2021b).

Two African studies found learning loss. In rural Kenya, in comparison to the 'maths age' benchmark used, students in primary and lower secondary school in late 2020 to early 2021, were on average more than 3.5 months behind (Whizz Education, 2021). However, this was based on a small sample of only 965 students who were active in a private tutor program. When reading achievement was measured in South Africa, learning losses were also observed, where students in the two grades measured (Grades 2 and 4) appeared to be more than half a year behind pre-COVID cohorts (Ardington et al., 2021).

Findings that indicate definitive learning loss are, on further examination, often more complex. An early study on the impact of learning was conducted in Sao Paulo, Brazil, where it was shown that children in Grade 6 had declined by about 72%. However, the bulk of the data were based on comparing schools that were still closed in the final quarter of 2020 to the same period in 2019. When analysis was conducted on a smaller subset of schools that had partially opened for optional in-person activities for, at most, 5 weeks, the effect was significantly reduced (Lichand et al., 2021). If results significantly improved even under highly curtailed school attendance, it suggests that they would continue to improve when returning to full-time school for months, as occurred with the MILO countries.

This is reinforced by other studies that showed learning recovery based on time back at school. In an English study, attainment in reading in Grades 2 and 6 was similar to pre-pandemic cohorts when assessed towards the middle of 2021, despite the indications from assessments held earlier in the year that students were two to three months behind (Blainey & Hannay, 2021). Similarly, after recording declines in oral reading fluency in May 2020, an American study across 111 districts showed that these learning rates almost returned to their pre-COVID-19 levels by the latter half of 2020 (Domingue et al., 2021).

While on average school closures tend to result in learning loss, early research suggests that this can be mitigated or even prevented. For example, when schools were shut down in Botswana in response to COVID-19, a low-tech intervention was trialled, where students were sent a weekly text message, or a text message and a weekly phone call. Students who received the intervention did almost 50% better than students in the control group (Angrist et al., 2020).

Unequal learning outcomes

Most studies that analysed the differential impact of school closures on learning found that students from disadvantaged backgrounds were on average more negatively impacted, albeit, often not in all year levels and learning domains. For instance, in the Dutch study referred to earlier (Engzell et al., 2020), it was estimated that learning loss was 60% greater for students whose parents had low education. Studies conducted in England consistently found gaps in achievement widening. For instance, Blainey and Hannay (2021) found the gap in mathematics and literacy achievement between disadvantaged students and their peers increased in most grades, particularly in mathematics, with disadvantaged students in Grade 6 as much as 7 months behind their peers.

In the United States, some studies have found that high-poverty schools were disproportionally impacted by school closures (Curriculum Associates, 2020; Lewis et al., 2021). Similarly, there was evidence of greater learning loss in American counties with relatively high unemployment (Kogan & Lavertu, 2021). The Whizz Education study (2021) in rural Kenya also used geography as a proxy for SES, and found that a greater proportion of students from 'hardship' areas than other areas experienced learning loss. However, in Switzerland (Tomasik et al., 2021) and Denmark (Birkelund & Karlson, 2021), studies found little evidence of achievement gaps widening on the basis of SES (acknowledging that the variance in SES in these countries would be much smaller than in developing countries).

In the United States, there were mixed results about unequal learning outcomes, which are largely explained by studies focusing on different regions. One study found that gaps in achievement widened in primary and middle school, but not high school, when results from late 2020 were compared with late 2019 (Pier et al., 2021). Similarly, in France it was found that achievement gaps widened farthest in early primary school, as described in the DEPP study (2021). While in the INVALSI Italian study (2021) described earlier, the opposite was found, that learning gaps declined in primary school, but increased in secondary school.

Finally, it is interesting that some studies have found that even across similar contexts within a system, differences in the impact of the pandemic on learning outcomes have been observed. For example, for the learning outcomes of Grade 3 and 4 students in the Australian state of New South Wales, there was an increase in learning gaps based on SES in Grade 3 students but not in Grade 4 (Gore et al., 2021).

IMPLICATIONS FOR POLICY AND PRACTICE

Since early 2020, the pandemic has required countries to adapt their approaches to teaching and learning. Encouragingly, in the six MILO countries, schools, teachers, parents and students showed great resilience during the pandemic. Learning loss was not observed in the target population as a whole in any country in either reading or mathematics. However, the MILO results have shown that there is still some way to go to support all students to reach the MPLs for SDG 4.1.1b. Importantly, there is also a need to continue to support the wellbeing of everyone in the school community.

Each MILO country had a unique mix of educational responses to the pandemic. The pandemic has provided countries with opportunities to learn about the policies and practices that are necessary to prepare for future education in emergencies. It is essential that the policy and practice responses are tailored to the specific needs and priorities of each country and include all learners.

The MILO results have highlighted the need to continue work to build education systems that are adaptable, equitable and of high quality. The recommendations presented are intended to focus on system strengthening in the short-term as countries continue to face the pandemic, in the medium-term as countries move into the recovery phase, and in the long-term as countries continue to work towards meeting SDG 4.1.1b and as they prepare for other possible education disruption.

Prepare to provide effective remote teaching and learning for future disruptions

Countries continue to face high COVID-19 case numbers and Africa continues to have low vaccination rates (World Health Organization, 2021). Disruptions to face-to-face teaching continue to be a possibility for countries in 2022. To mitigate the impact of school closures on learning loss, it is important that all learners have opportunities to access high-quality remote learning. Preparing for the delivery of remote learning is important for any emergency disruptions that could cause school closures.

In the MILO countries, there was limited access to remote learning options during school closures. While closures affected students nationwide in most countries (see Figure 5.1), only around a quarter of students attended schools where the principals reported offering remote learning programs to all students (see Table 6.4). Many students lacked access to the internet and to digital devices (see Table 7.1) and only a limited proportion of students attended schools where the principals reported they had access to live virtual lessons or digital materials (see Table 6.11). Due to the resources available and accessibility issues, understandably many students attended schools where principals reported suggesting educational TV or radio as a resource for students (see Table 6.11).

The pandemic presented a situation whereby there was a sudden need to provide remote learning to large numbers of students. Countries need to identify how remote teaching can be expanded so it reaches the greatest population of students to ensure that all students have access to learning support.

Any remote teaching needs to be appropriate for the local context, considering issues such as availability, accessibility and affordability (Dabrowski et al., 2020). Remote teaching using radio and TV can play an important role in reaching a wider group of learners. However, these technologies do not always provide opportunities for two-way dialogue and feedback between teachers and students or between students and their peers. More interactive remote teaching technologies, such as live remote lessons, can enable more opportunities for teacher–student connection and feedback.[17] However, internet access and access to digital devices is limited in many countries, and when digital learning solutions are provided this can further exacerbate inequalities among students (Munoz-Najar et al., 2021). While long-term investments in ICT infrastructure and in the provision of digital devices to teachers and students will be beneficial (Tarricone et al., 2021),[18] this is not always an option for low-income countries, conflict- affected areas or for geographically isolated communities. Therefore, policies and planning for remote learning must consider the needs of the local context, be fit for purpose and, importantly, consider the support that is required for teachers, learners and parents.

In addition to the accessibility of remote learning, effective pedagogy and effective education programs is central to both remote and classroom-based learning (Dabrowski et al., 2020). In the MILO project, principals reported a range of barriers to providing remote instruction, which included a lack of learning materials and a lack of teaching experience (see Table 6.6). Support for teachers to use and develop effective pedagogical practices and resources is an important priority in preparing for future educational disruptions.

Many of the MILO countries had national plans or policies at the system level around supporting remote student instruction in order to minimise academic disruptions (see Table 5.4). However,

many students attended schools where their principals reported that there was no planning for the transition planning to remote learning; curriculum plans were not adapted; (see Table 6.7) and there was not additional staff professional development to minimise the impact of the pandemic on teaching and learning (see Table 6.12). Ensuring the implementation of national priorities around supporting teachers and students in transitioning to remote learning will be important.

Continue to emphasise supporting the wellbeing of the school community

The pandemic has had wide-ranging impacts on people's physical and emotional health, income and job security, social support, and access to education. Within the six MILO countries there was evidence that the health and wellbeing of students, teachers and principals had been affected by the pandemic and that there were additional pressures on parents and families. As countries continue to face the effects of the pandemic and as they move into the recovery phase, there is a need for policies and resources to focus on supporting the wellbeing of the school community.

In the MILO countries, many principals expressed concerns about the wellbeing of their students and were almost universally concerned about their staff's and their own ability to cope (see Table 6.10). Students faced a range of family difficulties during the pandemic (see Table 7.2), and students across most of the MILO countries were likely to report that they were more worried than before the disruption (see Table 7.4).

The MILO countries had a number of strategies already in place to support the health and wellbeing of the school community. For example, countries often had national plans or policies around support for staff wellbeing, such as providing access to formal support networks (see Table 5.5). Principals reported undertaking a number of activities to support student health and wellbeing, such as checking-in with students, contacting families, providing counselling and home visits (see Table 6.14). Many of the MILO countries used a range of modes of communication with families during the pandemic (see Table 5.6). Given the high levels of anxiety and stress experienced by students, teachers and principals, and the additional pressures on families, it is important that countries continue to place a strong emphasis on supporting and promoting the wellbeing of the school community.

All countries experienced concerns about the wellbeing of the school community and had implemented various support mechanisms. However, none of the countries collected data to monitor the impact of the pandemic on students' emotional health and only one country collected data to monitor the impact on teachers' emotional health (see Table 5.9). The recently developed

Education in Emergencies framework (Tarricone et al., 2021) includes the policy recommendation that, in addition to collecting data on learning outcomes, data on health and wellbeing are collected in order to target support. Based on the findings in the MILO project, it is recommended that countries explore ways to effectively and appropriately measure the wellbeing of school staff and students in order to understand what support is needed and to monitor wellbeing over time.

Ensure that there are effective systems in place to continue to monitor learning outcomes

The dramatic social and economic impacts of the COVID-19 pandemic have brought the need for continued and regular monitoring of learning outcomes to the urgent attention of educational policymakers, practitioners and communities. There are global widespread concerns about the impact of the pandemic on learning outcomes. Ensuring that there are effective monitoring systems in place will allow countries to objectively investigate the impact of the pandemic on learning outcomes and measure learning outcomes during the recovery phase. These systems will also enable countries to identify whether there are particular groups of students who are more adversely affected and target support where it is most needed.

In order to measure the impact of the pandemic on learning outcomes, and to measure recovery from the pandemic, countries need to compare learning outcomes before, during and after the pandemic. In order to monitor learning outcomes at the system level, it is important that high-quality data on student learning outcomes are collected along with their associated contextual data, which enables the populations to be compared over time (as discussed above). Monitoring programs may include national, regional or international assessments.

The MILO project has provided a set of tools and methods to the six participating countries that will allow the continued measurement of the impact of the pandemic for the population as a whole and also for sub-groups of learners. For example, the MILO results showed that in some countries there were groups of learners who may require additional support such as those with low family wealth, with parents who have low literacy or low levels of education, students that speak a different language at home than the language of instruction, or students with disability (see Figures 7.5 -7.9). Should countries choose to continue to use the AMPL, this will enable them to continue to measure progress towards SDG 4.1.1b.

The dramatic social and economic impacts of the COVID-19 pandemic have brought the need for continued and regular monitoring of learning outcomes to the urgent attention of educational policymakers, practitioners and communities.

In addition to collecting system-level information, classroom-level and school-level assessments measuring a range of domains can provide crucial feedback to students, parents, teachers and schools. In the MILO project, principals overwhelmingly reported they expected that the pandemic would have a negative impact on academic outcomes for all students (see Table 6.3) Gathering regular data on student outcomes will assist principals and teachers to identify where support should be targeted. This will enable countries to monitor a range of learning domains in addition to reading and mathematics, which can be used to inform teaching and learning.

FUTURE IMPLICATIONS FOR MEASURING SDG 4.1.1

As of late 2021 the COVID-19 pandemic continues to cause educational disruption. How long this continues and the severity of the disruptions are of course unknown. Beyond 2021, there is an opportunity to include other countries and other languages into investigations of the impact

of COVID-19, using the MILO tools and methods. The MILO study has successfully shown that the inclusion of the AMPL alongside an historical assessment of reading or mathematics can facilitate a link that allows the estimation of prior and current proportions of students meeting the SDG 4.1.1b MPLs. The closer the historical assessment is aligned to the reading and mathematics constructs defined in the Global Proficiency Framework (GPF), the more valid the link. In addition, the more technically robust the historical assessments, the more reliable the link. These methods can be used to estimate the impact of the pandemic.

The development of the AMPL has been a significant move forward in measuring SDG 4.1.1 regardless of the pandemic context. If suitable historical data does not exist for a country, the AMPL can still be used to establish a baseline for pandemic recovery.

The AMPL-b is a robust and efficient tool that measures the proportion of students who meet SDG 4.1.1b. Beyond 2021, the AMPL-b are resources provided by the UIS that can be used by countries and assessment programs to monitor progress against SDG 4.1.1b. The AMPL-b can be implemented by countries, regions or systems to suit their reporting needs. The AMPL-b can be used as a standalone assessment to efficiently report against SDG 4.1.1b. They can also be integrated into existing national or regional assessments to measure and describe the broad range of abilities that children at the end of primary schooling may exhibit in reading and mathematics, in addition to reporting against SDG 4.1.1b. This could be done for example, by rotating the AMPL-b forms within existing assessments, as was done in the MILO project.

The development of the AMPL has the potential to statistically align national and cross-national assessment programs to a single set of global standards. The AMPL-b strongly aligns to the GPF for reading and mathematics (USAID et al., 2020a, 2020b). The global standards are articulated in SDG 4.1.1, and are elaborated by the definitions of the Minimum Proficiency Levels (ACER-GEM, 2019, 2020). Incorporating the AMPL into national or regional assessments will facilitate reporting against these globally defined benchmarks. The AMPL can translated into other languages.

Currently, the AMPL-b covers the end of primary schooling outcomes, SDG 4.1.1b. However, the same methods could be applied if further assessments are developed to measure learning outcomes at the end of lower secondary to address SDG 4.1.1c (AMPL-c) or the end of lower primary, SDG 4.1.1a (AMPL-a).

LIMITATIONS OF THE STUDY AND OPPORTUNITIES FOR FURTHER RESEARCH

As noted above, the AMPL-b are targeted to estimate the proportions of students meeting or exceeding the MPLs in reading and mathematics at the end of primary. This targeted approach was efficient but limits what can be explored in shifts in outcomes below these benchmarks. As discussed above, the AMPL can be used to complement existing national or regional assessments that provide more detailed information about students below the MPLs. In addition, in the future consideration can be given to including items within the AMPL that better align with the likely range of proficiency in the target populations.

The standard-setting process used in the MILO was rigorous and fit for purpose. However, it would be useful to replicate this exercise in other contexts or devise similar exercises to validate the findings.

What the MILO study has reinforced, is that the educational policy and practice responses to the pandemic were many and varied. The MILO datasets are rich in contextual information and these data are linked to estimates of learning outcomes. Deeper analysis using the MILO datasets is possible to further explore the different responses to the pandemic and the relationship to learning outcomes. In future applications of the AMPL, the collection of detailed and high-quality contextual information from multiple sources will be essential to understanding the factors influencing learning outcomes.

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APPENDIX A

The standard setting process used to determine the MPL cut-points

INTRODUCTION

To enable robust and valid reporting of student achievement against the Minimum Proficiency Levels (MPLs) for SDG 4.1.1b, a standard setting exercise was undertaken. The standard setting exercise established cut-scores that corresponded to the end of primary MPLs for reading and mathematics. An overview of the standard setting design, method and results is provided.

STANDARD SETTING DESIGN

A modified Yes/No Angoff method (Angoff, 1971; Impara & Plake, 1997) was used to determine a single MPL cut-score for mathematics and a single MPL cut-score for reading for each AMPL. The Angoff method is based on the concept of the borderline or minimally competent student–target student.

Competence and the target student

The minimally competent student can be conceptualised as the student possessing the minimum level of knowledge and skills necessary to perform at a level 'on the borderline' between performance at the MPL and below the MPL. The borderline, target student thus belongs to the group of students that just meet the MPL requirements.

Rating the AMPL items

The Yes/No Angoff method requires participants to independently decide whether the target student is likely to answer a test item correctly. The response probability (RP) is the probability of a person of a certain ability level to respond correctly. In a standard setting exercise the RP is commonly set at 0.67 and this was the RP used in the MILO standard setting exercise.

Determining the final cut-scores

AMPL cut-scores were determined through rigorous implementation of the standard setting exercise and were then finalised following an educational impact review involving international educational community stakeholders involved in SDG 4.1.1 reporting activities who were invited to participate by the UIS.

Implementation approach

Owing to the travel restrictions caused by the pandemic, all standard setting activities were conducted as remote online sessions.

METHOD

Participants

The national project managers from each of the MILO countries nominated reading and mathematics subject matter experts and expert practitioners with experience teaching at the end of primary to participate in the training and the judgement sessions in reading and mathematics.

The breakdown of the participants across domain and language is provided in Table A.1.

TABLE A.1 Number of participants across AMPL domain and language

Domain	Language	Number of participants
Reading	English	10
Reading	French	6
Mathematics	English	7
Mathematics	French	8

Materials

During the training phases, participants had access to the original AMPL tests. During the judgment and consensus sessions the participants had access to digital versions of each item, through ACER's online standard setting system. The online system also provided information about the item keys and reading items were displayed with the relevant stimulus material.

MPL descriptions were developed independently from the AMPL, and therefore, the standard setting participants were provided with training in the MPLs and also had access to the end of primary MPL unpacking paper (ACER-GEM, 2019).

Design

The standard setting exercise consisted of training, individual judgment and consensus building sessions. Following the setting of draft cut-points in the above exercises, a standard setting impact review session was conducted. A summary of each of these steps is provided in Table A.2.

TABLE A.2 Standard setting steps and participants

Step	Summary	Participants
Training session	The standard setting participants were trained on the standard setting method and the online system used to conduct the standard setting activities.	Participants nominated from the MILO participating countries
Judgement session	Participants worked individually to analyse the AMPL items and rate each item in relation to performance by the target student.	Participants nominated from the MILO participating countries
Consensus session	Each language by domain group convened for a virtual session to attempt to find consensus on the cut-point. These sessions were facilitated by ACER and participants could update and change their responses in the online system during the consensus session.	Participants nominated from the MILO participating countries
Impact review	The outcomes of the consensus group sessions were analysed. The percentage of students at and above the MPL were calculated using the AMPL preliminary raw data (number of correct responses in a test). The standard setting method and procedure was described and outcomes of individual and consensus sessions were presented. The provisional AMPL impact data was then shared. The procedure and draft cut-scores were endorsed by the participants.	MILO country representatives and international educational community stakeholders involved in SDG 4.1.1 reporting activities invited by the UIS
Cut scores finalised	The cut scores were finalised	ACER presented the final cut scores to the UIS

RESULTS

The participants' judgments were extracted from the online system and analysed for completeness of responses. The data for one participant in the reading group were incomplete and these data were removed from the subsequent analyses. There was no systematic difference in cut-score placement between the two language-based groups of participants for reading or for mathematics. Therefore, judgements from the two language groups were merged and all subsequent analyses used these combined data.

The summary statistics for the draft proposed cut-scores were calculated after the consensus sessions for the two domains. In order to determine the confidence interval for median and mean statistics, a non-parametric Monte Carlo bootstrap procedure was implemented to extract the lower and upper boundaries of the 95% confidence interval.

Table A.3 provides the 95% confidence interval boundaries, rounded to the nearest integer, for the median cut-scores for the two domains.

Table A.4 provides lower and upper boundaries for the mean cut-scores in reading and mathematics.

The 95% confidence interval around the mean cut-score for reading was relatively similar to that around the median. The width of the confidence interval around the mean cut-score in mathematics was smaller relative to that around the median. These outcomes indicated that using the mean cut-score statistics would provide a more stable option for calculating the position of the final cut-score. Using the mean cut-score was supported by participants during the impact review session. The mean provides a solution that uses maximum available information from the judgment sessions and solution that is in line with other international assessment reporting.

TABLE A.3 Cut-score confidence intervals: Median

Domain	N	Median	95% CI lower	95% CI upper
Reading	15	21	19	22
Mathematics	15	14	10	17

TABLE A.4 Cut-score confidence intervals: Mean

Domain	N	Mean	95% CI lower	95% CI upper
Reading	15	22	20.4	23.0
Mathematics	15	16	13.4	18.1

THE FINAL CUT-SCORES

The psychometric analyses of the complete AMPL data set found that one mathematics item and two reading items functioned differently across the two languages used in the AMPL. In order to enable the direct translation of the proposed standards' cut-scores, the decision was thus made to remove judgements for these three items from the standard setting data set. Table A.5 provides a summary of the cut-scores after removing the three items with poor psychometric properties, including the 95% confidence interval, rounded to the nearest integer.

Upon further inspection of the final impact of the proposed cut scores using the complete and weighted AMPL data, the decision was made to use the lower boundary of the 95% confidence interval for the final reading cut scores. Thus, the final reading cut score was set at 20 score points (see Table A.6). The cut points were applied to the AMPL scales and are shown in Table A.6 (for further information see Appendix B). The final cut-score statistics were used to calculate the proportions of students at and above the MPL standards.

TABLE A.5 Cut-score confidence intervals after item deletion: Mean

Domain	N	Mean	95% CI lower	95% CI upper
Reading	15	21	20	23
Mathematics	15	15	13	18

TABLE A.6 Final MPL cut-scores

Domain	Cut-score	AMPL scale score
Reading	20	0.91528
Mathematics	15	-0.06137

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APPENDIX B

Technical descriptions of data analyses used to link with past national assessment results

The reading and mathematics items in the Assessments for Minimum Proficiency Levels (AMPL) were scaled using item response theory (IRT) scaling methodology. The Mixed Coefficients Multinomial Logit Model (MCMLM) as described by Adams et al. (1997) was used to scale the AMPL data. Psychometric analysis included item level analysis (item calibration at national and international level) and proficiency level generation.

The items were used to derive a one-dimensional AMPL proficiency scale for each of the two domains. This appendix outlines the procedures implemented to create the AMPL cognitive scale and provides a description of the associated processes of differential item functioning (DIF) analysis, item calibration, horizontal equating and the creation of plausible values (PVs).

THE SCALING MODEL

Test items were scaled with the one-parameter model (Rasch, 1960). In the case of dichotomous items, the model predicts the probability of selecting a correct response (value of one) instead of an incorrect response (value of zero), and is modelled as:

$$P_i(\theta_n) = \frac{\exp(\theta_n - \delta_i)}{1 + \exp(\theta_n - \delta_i)}$$

where $P_i(\theta_n)$ is the probability of person n scoring 1 on item i, θ_n is the estimated ability of person n, and δ_i is the estimated location of the difficulty of item i on this scale. For each item, item responses are modelled as a function of the latent trait θ_n.

For items with more than two (k) categories, the more general Rasch partial credit model (Masters & Wright, 1997) was applied, which takes the form of:

$$P_{x_i}(\theta_n) = \frac{\exp \sum_{k=0}^{x} (\theta_n - \delta_i + \tau_{ik})}{\sum_{h=0}^{m_i} \exp \sum_{k=0}^{h} (\theta_n - \delta_i + \tau_{ik})}$$

$$x_i = 0, 1, K, m_i$$

where $P_i(\theta_n)$ denotes the probability of person n scoring x on item i, θ_n denotes the person's ability, the item parameter δ_i gives the location of the difficulty of the item on the latent continuum, and τ_{ik} denotes an additional step parameter for each step k between adjacent categories.

The analysis of item characteristics and the estimation of model parameters were carried out with ACER ConQuest® Version 5 software (Adams et al., 2021).

SCALING COGNITIVE ITEMS

Preliminary item calibrations were first conducted separately by country and then by test language for each of the two domains. A series of item reviews were carried out to ensure the consistency of item parameters across countries to measure the same underlying construct (or latent trait).

The model fit of cognitive test items was assessed using a range of item statistics. The weighted mean-square statistic (infit) (MNSQ: Wu, 1997), which is a residual-based fit statistic, was used as a global indicator of item fit. Infit statistics were reviewed both for item and step parameters.

In addition to this, item characteristic curves (ICCs) were also used to review item fit. ICCs provide a graphical representation of item fit across the range of student abilities for each item.

Item-rest correlations were examined. Each item category has a point-biserial index, which is a comparison of the aggregate score between students selecting that category and all other students. For dichotomous items, such as multiple-choice items, the item-rest correlation is the same as the point-biserial index of the key. As a rule of thumb, the item-rest correlation should be higher than 0.20 (Ebel & Frisbie, 1986), suggesting the item discriminates relatively well between high and low performing students.

After examining the item and test level statistics and excluding some poor performing items, the mathematics test contained 26 items for French-based assessments and 29 items for English-based assessments. The reading assessments contained 28 items for French-based assessments and 27 items for English-based assessments.

DIFFERENTIAL ITEM FUNCTIONING

The quality of the items was also explored by assessing differential item functioning (DIF) by gender for each country and domain. DIF occurs when groups of students with the same ability have different probabilities of responding correctly to an item. For example, if a group of boys with the same average ability as a group of girls have a higher probability of success for a particular item, that item shows DIF in favour of boys. This constitutes a violation of the model, which assumes that the probability is only a function of ability (and item difficulty) and not of any other variable. Substantial item DIF (e.g. < -0.3 or > 0.3)[19] with respect to gender may result in bias of performance estimates across gender groups.

The gender DIF estimates range between -0.084 and 0.246 for AMPL Mathematics and between -0.063 and 0.104 for AMPL Reading. No instances of substantial gender DIF were encountered so no items were removed for this reason.

ITEM CALIBRATION

Missing student responses, likely caused by issues with test length ('not reached' items),[20] were omitted from the calibration of item parameters but were treated as incorrect for the scaling of student responses. All other missing responses were included as incorrect responses for the calibration of items (except for the ones that were not administered).

Item parameters were calibrated using all countries' sampled data of students identified as respondents,[21] taking student grades into account. Student grade dummies were created to reflect different target student populations across the MILO participating countries, ranging from Grades 5 to 7. The student sample weights were rescaled so that each country had the same sum of weights to ensure that each country was equally represented in the sample (senate weighting). The items were calibrated separately for each domain with the item mean set to zero. After removing items with unsatisfactory scaling characteristics, a total of 29 Mathematics items and 29 Reading items were used across both languages for international scaling.

Table B.1 and Table B.2 show the item thresholds on the AMPL scales with a response probability of 0.50 in logits. For example, a student with an ability estimate equal to the difficulty estimate of an item would have a 0.5 probability of answering the item correctly. It also shows the respective percentages of correct responses (facility) for domain sample (giving equal weight to each country). The item-rest correlation, the weighted fit statistics and the flag for gender DIF are included in the last three columns.

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TABLE B.1 Item thresholds in logits – Assessments for Minimum Proficiency Levels (AMPL) Reading (excluding Burundi)

Item	Max Score	Threshold 1	Facility*	Item-rest correlation	Weighted Fit (MNSQ)	Gender DIF
R_MR001	1	-1.45	72%	0.52	0.83	No
R_MR002	1	-1.18	68%	0.56	0.80	No
R_MR003	1	-1.10	67%	0.55	0.83	No
R_MR024	1	0.99	28%	0.49	0.91	No
R_MR025	1	-0.39	53%	0.46	0.96	No
R_MR033	1	0.58	32%	0.24	1.12	No
R_MR034	1	1.36	26%	0.34	1.12	No
R_MR035	1	0.57	35%	0.42	1.01	No
R_MR041	1	0.83	30%	0.34	1.08	No
R_MR042	1	1.07	26%	0.35	1.05	No
R_MR043	1	-1.19	68%	0.42	0.96	No
R_MR044	1	-0.64	58%	0.35	1.08	No
R_MR056	1	-1.35	71%	0.55	0.80	No
R_MR058	1	-0.54	56%	0.59	0.82	No
R_MR059	1	-0.16	49%	0.38	1.06	No
R_MR069	1	-0.34	52%	0.42	1.00	No
R_MR087	1	0.65	34%	0.48	0.93	No
R_MR089	1	0.59	35%	0.51	0.92	No
R_MR090	1	0.16	42%	0.45	0.99	No
R_MR201	1	0.02	45%	0.38	1.06	No
R_MR202	1	0.58	35%	0.44	0.98	No
R_MR203	1	-0.10	47%	0.32	1.13	No
R_MR204	1	0.83	30%	0.21	1.22	No
R_PF449	1	-1.60	75%	0.36	1.00	No
R_PF455	1	0.38	38%	0.53	0.90	No
R_PF456	1	0.69	32%	0.32	1.10	No
R_PF458	1	1.13	23%	0.29	1.03	No
R_PF487	1	-0.76	60%	0.35	1.08	No
R_PF489	1	0.35	39%	0.37	1.07	No

*Note: Facility, percentages of correct responses, was computed with countries equally weighted.

TEST RELIABILITY

The ConQuest® separation reliability estimate[22] of the test, as obtained from the scaling model, was approximately between 0.83 and 0.86 for AMPL Reading and AMPL Mathematics. Separation reliability values above 0.8 are considered to indicate appropriate reliability.

TABLE B.2 Item thresholds in logits – Assessments for Minimum Proficiency Levels (AMPL) Mathematics

Item	Max Score	Threshold 1	Threshold 2	Facility*	Item-rest correlation	Weighted Fit (MNSQ)	Gender DIF
M_MM004	1	-1.89		74%	0.45	0.88	No
M_MM011	1	-0.33		43%	0.41	0.95	No
M_MM016	1	-0.05		38%	0.34	1.02	No
M_MM019	1	0.22		33%	0.44	0.93	No
M_MM022	1	-0.63		50%	0.38	1.00	No
M_MM029	1	0.09		35%	0.23	1.11	No
M_MM030	2	-0.22	0.85	34%	0.34	1.48	No
M_MM060	1	-1.10		59%	0.38	1.00	No
M_MM075	1	1.06		19%	0.14	1.11	No
M_MM089	1	0.28		31%	0.20	1.15	No
M_MM090	1	0.82		22%	0.34	0.99	No
M_MM101	1	0.59		31%	0.31	1.13	No
M_MM104	1	0.61		31%	0.33	1.11	No
M_MM125	1	-0.85		53%	0.48	0.90	No
M_MM175	1	1.19		18%	0.24	1.06	No
M_MM191	1	1.17		18%	0.28	1.03	No
M_MM197	1	1.21		17%	0.27	1.03	No
M_MM206	1	2.48		6%	0.25	0.97	No
M_MM208	1	-0.74		52%	0.50	0.89	No
M_MM209	2	-1.06	1.10	37%	0.25	1.26	No
M_PM422	1	-1.59		69%	0.49	0.87	No
M_PM445	1	-0.44		45%	0.51	0.87	No
M_PM449	1	0.30		31%	0.26	1.10	No
M_PM454	1	0.41		29%	0.44	0.92	No
M_PM459	1	-0.83		54%	0.49	0.89	No
M_PM462	1	-1.40		65%	0.50	0.86	No
M_PM468	1	-0.57		48%	0.49	0.91	No
M_PM469	1	-0.08		38%	0.50	0.90	No
M_PM942	1	-0.28		43%	0.36	1.00	No

*Note: Facility, percentages of correct responses, was computed with countries equally weighted.

POPULATION MODEL AND CONDITIONING

Plausible values methodology was used to generate estimates of students' Reading and Mathematics proficiency. Using item parameters anchored at their estimated values from the calibration process, a set of five plausible values were randomly drawn from the marginal posterior of the latent distribution (Mislevy, 1991; Mislevy & Sheehan, 1987; von Davier et al., 2009). Here, 'not reached' items were included as incorrect responses, just like other (embedded) missing responses. Estimations were based on the conditional item response model and the population model, which included a regression equation including background and survey variables used for conditioning (Adams & Wu, 2002). The ACER ConQuest software (Adams et al., 2021) was used to draw the plausible values.

A two-dimensional conditioning model[23] was built for each country. Some variables were used as direct regressors in the conditioning model for drawing plausible values. These included dummy variables of explicit sampling strata of country, the school mean performance variable adjusted for the student's own performance (WLE[24]), school type, school location and student gender. Most of the other student background variables such as student age and responses to questions in the Student Questionnaire were re-coded into dummy variables which were transformed into components by a principal component analysis (PCA). The principal components were estimated for each country separately. Subsequently, the components that explained 99 per cent of the variance in all the original variables were included as regressors in the conditioning model.

HORIZONTAL EQUATING

LINK data from the 2021 national or regional assessments were calibrated separately for each national country sample. The calibration outcomes were used to review item statistics and detect any problematic items. After item review, four Mathematics items for Zambia and one Mathematics item for PASEC were excluded.

The same item treatments of item exclusion were applied to calibrations on the historical data. The historical data for Zambia and Kenya were calibrated separately and student plausible values were generated. The PASEC 2019 data did not require re-calibration as the PASEC scale was already established in 2014. PASEC 2019 item parameters and student plausible values on the historic scale were available.

Using item parameters anchored at their estimated values from the calibration process on the historical data, the conditioning model was applied and generated a set of five plausible values for both 2021 LINK data by country.

To equate the 2021 PASEC LINK data to the historic PASEC scale, the following equating shift was added to the plausible values for each domain.

PASEC Mathematics = 0.075; PASEC Reading = 0.114

Equating the 2021 PASEC LINK data also required further adjustments of test correction constants as the test included a reduced set of items and had a shorter test time.

Burundi:

$PV_{PASEC\_link\_adj} = 0.9158 * (PV_{PASEC\_link\_his} - 0.5734) + 0.4379$

Burkina Faso:

$PV_{PASEC\_link\_adj} = 0.9396 * (PV_{PASEC\_link\_his} - 0.5170) + 0.4499$

Côte d'Ivoire:

$PV_{PASEC\_link\_adj} = 0.9027 * (PV_{PASEC\_link\_his} + 0.6808) - 0.5101$

Senegal:

$PV_{PASEC\_link\_adj} = 0.9833 * (PV_{PASEC\_link\_his} - 0.5204) + 0.5571$

Where $PV_{PASEC\_link\_ad}$ is the 2021 PASEC LINK PV adjusted by the test correction constants, $PV_{PASEC\_link\_his}$ is the 2021 PASEC LINK PV on historic PASEC scale.

TABLE B.3 Mean and standard deviations of Assessments for Minimum Proficiency Levels (AMPL) and LINK scales by domain

Country	MATHEMATICS				READING			
	AMPL		LINK data		AMPL		LINK data	
	MEAN (MN_{AMPL})	STANDARD DEVIATION (SD_{AMPL})	MEAN (MN_{LINK})	STANDARD DEVIATION (SD_{LINK})	MEAN (MN_{AMPL})	STANDARD DEVIATION (SD_{AMPL})	MEAN (MN_{LINK})	STANDARD DEVIATION (SD_{LINK})
Burkina Faso	-0.479	0.626	0.725	0.895	-0.154	0.817	1.237	1.057
Burundi	-0.748	0.639	0.34	0.729	-0.917	0.516	0.201	0.721
Côte d'Ivoire	-1.536	1.14	-0.435	0.811	-0.787	1.395	0.407	1.479
Kenya	0.472	0.833	-0.218	1.008	0.902	1.224		
Senegal	-0.387	0.764	0.509	0.913	-0.123	0.934	1.216	1.04
Zambia	-1.305	0.511	-0.69	0.647	-0.898	0.7	-0.669	0.828

1. $PV_{LINK\_AMPL} = ((PV_{LINK} - MN_{LINK}) / SD_{LINK}) * SD_{AMPL} + MN_{AMPL}$
2. $PV_{LINK\_AMPL} = ((PV_{PASEC\_link\_adj} - MN_{LINK}) / SD_{LINK}) * SD_{AMPL} + MN_{AMPL}$

Common person equating by country was conducted to place the 2021 LINK results on AMPL scales. The LINK PVs were adjusted for each country using the weighted means and the weighted standard deviations. The equating quality was then examined. Table B.3 provides the mean and standard deviations of the AMPL and LINK scales by domain. The values are reported in logits.

Where PV_{LINK_AMPL} is the adjusted 2021 LINK PV on the AMPL scale, PV_{LINK} is the 2021 LINK PV of Kenya or Zambia, $PV_{PASEC\_link\_adj}$ is the 2021 PASEC LINK PV described in the previous paragraph.

The same transformations were then applied to all historic plausible values by country in order to place them onto the AMPL scales.

MPL CUT-POINTS

The proficiency cuts were determined by the standard setting as described in Appendix A. The cut points below were derived from the WLE equivalence tables. They corresponded to raw scores of reading (0.91528) and mathematics (-0.06137) which were 20 and 15 items correct, respectively. The cuts were applied to both the AMPL and the adjusted historic plausible values for each domain.

SAMPLING VARIANCE AND MEASUREMENT VARIANCE

Unbiased standard errors include both sampling variance and measurement variance. The sampling variance on population estimates from cluster samples is obtained by utilising the application of replication techniques (Gonzalez & Foy, 2000; Wolter, 1985). The other component of the standard error, the measurement variance, can be derived from the variance between the five plausible values of AMPL. The sampling variances of population statistics in AMPL were estimated using the jackknife repeated replication technique (JRR). Specialist software, the SPSS® Replicates add-in, was used to run tailored SPSS® macros for statistics estimations.[25]

APPENDIX C

Supplementary tables

TABLE C.1 GPF reading domains, constructs and sub-constructs, with constructs included in the AMPL for reading highlighted

Domain	Construct	Sub-construct
Comprehension of spoken or signed language	Retrieve information at word level	Comprehend spoken and signed language at the word or phrase level
		Recognize the meaning of common grade-level words in a short, grade-level continuous text read to or signed for the learner
	Retrieve information at sentence or text level	Retrieve explicit information in a short grade-level continuous text read to or signed for the learner
	Interpret information at sentence or text level	Interpret information in a short grade-level continuous text read to or signed for the learner
Decoding	Precision	Identify symbol-sound/fingerspelling and/or symbol-morpheme correspondences
		Decode isolated words
	Fluency	Speak aloud or sign a grade-level continuous text at pace and with accuracy
Reading comprehension	Retrieve information	Recognize the meaning of common grade-level words
		Retrieve explicit information in a grade-level continuous text by direct- or close-word matching
		Retrieve explicit information in a grade-level continuous text by synonymous matching
	Interpret information	Identify the meaning of unknown words and expressions in a grade-level continuous text
		Make simple inferences in a grade-level continuous text
		Identify the main and secondary ideas in a grade-level continuous text
	Reflect on information	Identify the purpose and audience of a text
		Give an overall evaluation of a text, and justify that evaluation
		Evaluate the status of claims made in a text
		Evaluate the effectiveness of a text

Source: Global Proficiency Framework (USAID et al., 2020a, p.6)

TABLE C.2 GPF mathematics constructs and sub-constructs, with sub-constructs relevant to upper primary marked with an 'x' and sub-constructs included in the AMPL assessment highlighted

Domain	Construct	Sub-construct	Grade 4	Grade 5	Grade 6
Number and operations	Whole numbers	Identify, count in and identify the relative magnitude of whole numbers	x	x	x
		Represent whole numbers in equivalent ways	x	x	x
		Solve operations using whole numbers	x	x	x
		Solve real-world problems involving whole numbers	x	x	x
	Fractions	Identify and represent fractions using objects, pictures and symbols and identify relative magnitude	x	x	x
		Solve operations using fractions	x	x	x
		Solve real-world problems involving fractions	x	x	x
	Decimals	Identify and represent decimals using objects, pictures and symbols and identify relative magnitude		x	x
		Represent decimals in equivalent ways (including fractions and percentages)		x	x
		Solve operations using decimals		x	x
		Solve real-world problems involving decimals			x
	Integers	Identify and represent integers using objects, pictures or symbols and identify relative magnitude			
		Solve operations using integers			
		Solve real-world problems involving integers			
	Exponents and roots	Identify and represent quantities using exponents and roots and identify the relative magnitude			
		Solve operations involving exponents and roots			
	Operations across number	Solve operations involving integers, fractions, decimals, percentages, and exponents			
Measurement	Length, weight, capacity, volume, area and perimeter	Use non-standard and standard units to measure, compare, and order	x	x	x
		Solve problems involving measurement	x	x	x
	Time	Tell time	x	x	x
		Solve problems involving time	x	x	x
	Currency	Use different currency units to create amounts			

Domain	Construct	Sub-construct	Grade 4	Grade 5	Grade 6
Geometry	Spatial visualizations	Compose and decompose shapes and figures	x	x	x
	Properties of shapes and figures	Recognize and describe shapes and figures	x	x	x
	Position and direction	Describe the position and direction of objects in space	x	x	x
Statistics and probability	Data Management	Retrieve and interpret data presented in displays	x	x	x
		Calculate and interpret central tendency			
	Chance and probability	Describe the likelihood of events in different ways		x	x
		Identify permutations and combinations			
Algebra	Patterns	Recognize, describe, extend and generate patterns	x	x	x
	Expressions	Evaluate, model and compute with expressions			
	Relations and functions	Solve problems involving variation (ratio, proportion, and percentage)			
		Demonstrate an understanding of equivalency	x	x	x
		Solve equations and inequalities			
		Interpret and evaluate functions			

Source: Global Proficiency Framework (USAID et al., 2020b, p. 6-7)

TABLE C.3 Proportions of students who met or exceeded SDG-aligned MPLs for reading with standard errors

	STUDENTS WHO REACHED OR EXCEEDED MPL IN 2021 AMPL: READING (%)			STUDENTS WHO REACHED OR EXCEEDED MPL IN HISTORICAL ASSESSMENT: READING (%)		
Country	All	Boys	Girls	All	Boys	Girls
Burkina Faso	9.0 (1.50)	9.3 (1.85)	8.8 (1.50)	5.8 (0.91)	5.6 (1.00)	5.9 (0.98)
Burundi	**0.1 (0.09)**	**0.1 (0.15)**	**0.1 (0.09)**	**0.3 (0.21)**	**0.3 (0.18)**	**0.4 (0.28)**
Côte d'Ivoire	10.8 (1.33)	9.9 (1.38)	11.7 (1.76)	10.4 (1.59)	9.9 (1.70)	10.9 (1.71)
Kenya	46.7 (2.33)	44.9 (2.45)	48.4 (2.56)			
Senegal	13.3 (1.81)	11.6 (1.75)	14.6 (2.22)	14.7 (2.31)	14.1 (2.31)	15.2 (2.65)
Zambia	2.3 (0.81)	2.4 (1.01)	2.2 (0.72)	1.8 (0.41)	**1.5 (0.42)**	2.1 (0.53)

Standard errors (SE) are reported in brackets.
Statistics in bold are from fewer than 30 students and/or 5 schools.

TABLE C.4 Proportions of students who met or exceeded SDG-aligned MPLs for mathematics with standard errors

Country	STUDENTS WHO REACHED OR EXCEEDED MPL IN 2021 AMPL: MATHEMATICS (%)			STUDENTS WHO REACHED OR EXCEEDED MPL IN HISTORICAL ASSESSMENT: MATHEMATICS (%)		
	All	Boys	Girls	All	Boys	Girls
Burkina Faso	23.7 (1.83)	25.8 (2.23)	22.1 (1.95)	17.9 (1.52)	18.8 (1.70)	17.1 (1.58)
Burundi	13.5 (1.83)	16.5 (2.23)	11.1 (1.91)	17.0 (1.73)	22.0 (2.06)	12.9 (1.66)
Côte d'Ivoire	8.9 (1.24)	8.8 (1.29)	9.1 (1.64)	7.6 (1.27)	8.2 (1.38)	6.9 (1.37)
Kenya	74.1 (1.90)	73.5 (2.08)	74.6 (2.06)	79.7 (3.18)	82.8 (4.06)	78.4 (3.26)
Senegal	34.0 (2.33)	34.1 (2.64)	33.9 (2.55)	34.6 (2.87)	34.6 (3.10)	34.7 (3.07)
Zambia	2.1 (0.78)	**2.0 (0.90)**	2.1 (0.77)	3.5 (0.56)	3.7 (0.61)	3.4 (0.68)

Standard errors (SE) are reported in brackets.
Statistics in bold are from fewer than 30 students and/or 5 schools.

TABLE C.5 Standard error of difference in 2021 AMPL between boys and girls meeting the MPL in reading and mathematics, by country

Country	PROPORTION OF BOYS MEETING MPL – PROPORTION OF GIRLS MEETING MPL	
	Reading	Mathematics
Burkina Faso	0.5 (1.47)	3.8 (1.96)
Burundi	0.1 (0.17)	5.3^ (1.85)
Côte d'Ivoire	-1.8 (1.69)	-0.2 (1.57)
Kenya	-3.5 (1.84)	-1.2 (1.64)
Senegal	-3.0 (1.77)	0.2 (2.26)
Zambia	0.2 (0.67)	-0.1 (0.61)

^ indicates statistical significance. A positive differnce in proportion indicates more boys than girls meeting the MPL.
Standard errors (SE) are reported in brackets.

TABLE C.6 Key contributors to the MILO project

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AMPL reading items (from the UIS's Global Item Bank)
ACER's GEM Centre
Brunei Darussalam Grade 4 reading assessment 2017
CONFEMEN's PASEC Grade 6 released items 2014
Education Quality and Accountability Office Canada Ontario Grade 3 reading assessment 2018
Ghana Grade 6 reading sample items 2013
Hong Kong Grade 6 reading assessment 2019
Jamaica Ministry of Education, Youth and Information Grade 4 language and arts sample items 2019 (Adapted: Playing with Words Thomas and Prescod)
The Dominica Grade 6 language assessment 2012
The Gambia Grade 5 English language assessment 2016

AMPL mathematics items (from the UIS's Global Item Bank)
ACER's GEM Centre
Alberta Government, Canada Grade 6 mathematics achievement test 2013
Australian Curriculum and Assessment Authority (ACARA) Year 5 National Assessment Program Literacy and Numeracy example items 2012
CONFEMEN's PASEC Grade 6 released items 2014
Examinations Council of Zambia Grade 7 composite examination 2017
Jamaica Ministry of Education, Youth and Information Grade 6 mathematics assessment 2019
Ministry of Education St Vincent and the Grenadines Grade 6 mathematics examination 2011
Ministry of Education, Science and Technology, Antigua and Barbuda Grade 6 mathematics assessment 2015
The West African Examinations Council, Gambia Grade 5 national assessment 2018

MILO contextual item sources
ACER
IEA (REDS/PIRLS)
OECD (Global Crisis Module/PISA)

Note: Within each category, names are listed alphabetically by surname

Endnotes

1 The proportion of children and young learners … at the end of primary … achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex (United Nations, 2015).

2 In 2016 for Zambia

3 Contextual data from the historical population for Zambia was not available in a format suitable for direct comparisons of populations. Some contextual data was not available from the Kenyan historical assessment.

4 The GPF advisory group on alignment was a working group comprised of psychometricians and subject matter experts who contributed to the development of the Global Proficiency Framework in 2020. The group was convened to formulate a set of alignment criteria to allow assessments to be compared to the GPF in order to determine their suitability for evaluating and reporting against SDG 4.1.1. The alignment criteria are outlined in detail in: USAID, UIS, UK Aid et al. (2020) *Policy Linking Toolkit for Measuring Global Learning Outcomes – Linking assessments to the Global Proficiency Framework.*

5 From SDG 4.1.1 Review Panel: March 2021.

6 These items were reproduced with permission from CONFEMEN.

7 For the purposes of AMPL, this item was classified as "Retrieve information" rather than "Decoding" as consistent with the GPF for reading (USAID et al, 2020a) which lists matching a given word to an illustration as an example of retrieving information.

8 The four French-speaking countries were Burkina Faso, Burundi, Côte D'Ivoire and Senegal.

9 These items are used with permission from CONFEMEN.

10 Zambia's historical assessment was conducted in 2016. All other countries' historical assessments were conducted in 2019.

11 Historical results are not reported for Kenya since the 2019 assessment of English in Kenya did not contain a sufficient number of reading comprehension item to align with the reading constructs within the GPF.

12 In the MILO project, students were the primary sampled unit. All results from the School Questionnaire are reported using student weights that are representative of the population. Therefore all results from school principals need to be interpreted in numbers of students.

13 There is no consensus among researchers and practitioners on which are the best indicators to operationalise SES. Typical children SES indicators are parents' occupation and education level, household income and home possessions. For a review of SES indicators used in educational research and other disciplines such as health, economics and sociology see Osses et al. (forthcoming).

14 Results for Kenya have been excluded based on data validation issues

15 The population chosen by countries to report against varied from Grade 5 to Grade 7.

16 A wealth index for Kenyan students was computed based on common items from the historical assessment and the AMPL. Comparisons for boys over time revealed higher scores on the wealth index in the 2021 population in comparison to the historical population.

17 For further information on different learning approaches and the benefits, considerations and enabling conditions, see for example Dabrowski et al. (2020).

18 For further recommendations relating to education in emergencies, see the Policy Monitoring tool developed for building resilient education systems (Tarricone et al., 2021).

19 Magnitude of item by gender interaction estimates from a facet model. See PISA 2006 Technical Report (OECD, 2009a).

20 'Not reached' items were defined as all consecutive missing values at the end of the test, except the first missing value of the missing series which was coded as 'embedded missing' i.e. coded the same as other items that were presented to the student but which did not receive a response. Omitting the 'not reached' items from the item calibration ensures the item difficulties not to be over-estimated.

21 The psychometric properties of the reading items administered in Burundi was unexpectedly inconsistent with those of the other countries. In particular, the response patterns in nearly all of the reading items was consistent with high rates of guessing and resulted in very low discrimination. It was therefore decided to exclude Burundi from the international reading item calibration. Burundi student reading proficiency estimations were subsequently based on the international calibration.

22 Expected a-posteriori/plausible value (EAP/PV) reliability (Adams, 2005).

23 A two-dimensional model with Quadrature estimation with 40 nodes was used.

24 So-called weighted likelihood estimates (WLEs) were used as ability estimates in this case (Warm, 1989).

25 Conceptual background and application of macros with examples are described in the PISA Data Analysis Manual SPSS®, 2nd edn (OECD, 2009b).

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