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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

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).