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# Definitions of adult functional literacy and numeracy for SDG indicator 4.6.1'

GAML6/WD/4

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## Executive summary

### Overview

This paper presents points for discussion with regard to the strategy to improve assessment of the literacy and numeracy skills of youth and adults, as associated with UN Sustainable Development Goal (SDG) indicator 4.6.1, which calls on countries to report the ‘proportion of population in a given age group achieving at least a fixed level of proficiency in functional (a) literacy and (b) numeracy skills, by sex’.

It comprises four parts and one annex: Part 1 outlines the definitions associated with literacy and numeracy in the context of SDG indicator 4.6.1; Part 2 looks at existing skills assessment surveys of youth and adult populations around the world; Part 3 addresses the implications of the new approach for ‘fixing’ the minimum proficiency levels (MPLs) which will be reported for Indicator 4.6.1; and Part 4 provides a broad sketch of a tentative strategy for 2030. Annex 1 lists the countries already carrying out direct assessment of adult skills.

### Recommendations

Recommendations in five key areas are given throughout this paper following relevant background information. In summary, they are as follows:

#### **Recommendation 1**

**Adopt a new approach to defining a ‘minimum fixed level of proficiency’** Define a minimum ‘fixed level of proficiency’ in functional literacy and numeracy for indicator 4.6.1 that is equivalent to proficiency levels found at the end of lower secondary education for young adults and investigate its implications and limitations for older adults.

#### **Recommendation 2**

**Align indicator 4.6.1 with indicator 4.1.1 (c).** Given that SDG indicator 4.1.1 (c) refers to the proficiency levels equivalent to ‘end of lower secondary’, aligning it to indicator 4.6.1 should be taken into consideration.

#### **Recommendation 3**

**Explore policy linking.** At present, indirect measurement tools are predominately used to assess adult literacy skills and there is limited use of direct assessment data. The policy linking method should therefore be considered as an option for monitoring indicator 4.6.1.

#### **Recommendation 4**

**Support trialing of mini-LAMP.** Given the advantages of mini-LAMP for countries with no prior experience in building and administering a direct assessment of adult competencies, the Taskforce encourages UIS to continue trialing the tool in order to obtain empirical data to assess its relevance for indicator 4.6.1.

#### **Recommendation 5**

**Research effective indirect measurement tools.** Based on the assumption that about one half of countries will not be able to produce data from direct assessments until 2030, alternative, cost-effective and more operational methods of estimating the baseline and monitoring the progress against SDG target 4.6 should be explored.

## Introduction

Despite efforts to address the issue in recent decades, illiteracy remains a major concern globally and, more specifically, in low-income countries. In 2016, the global literacy rate was 86 per cent, amounting to 750 million illiterate adults worldwide. In low-income countries, women's average literacy rate still trails that of men by some 16 percentage points, which corresponds to a gender parity index of 0.77. A combination of slower progress in educational access and adverse demographic trends means that, between 2000 and 2016, the number of adult illiterate women increased by 20 million in these low-income countries (UIS, 2019).

Accurate quantitative and qualitative data should be used to provide a more holistic understanding of the literacy needs of men and women in a community, to better inform policy and programme planning, and to allocate adequate funding. Three key issues require discussion: (1) the comparability of data across countries; (2) how best to define and describe 'adult proficiency' in literacy and numeracy; and (3) how data should be reported to track changes and guide policy effectively.

SDG target 4.6 reads: 'By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy.' The global indicator for SDG 4.6, and the only indicator for this target directly related to the measurement of learning outcomes, is indicator 4.6.1, which looks at 'the proportion of population in a given age group achieving at least a fixed level of proficiency in functional (a) literacy and (b) numeracy skills, by sex'.

Several measures focusing on adult and youth competencies in literacy and numeracy are available, but a number of issues remain. Notably, there is no widely agreed upon definition of 'fixed level of proficiency' that applies to adult and young people in all countries, which creates a challenge for measurement.

The main objective of this discussion paper is to open domains for reflection to try to resolve these difficulties.

## Definitions

### Literacy

As mentioned in the Education 2030 Framework for Action, 'literacy' is a learning continuum comprising different proficiency levels. The definition in itself has changed over time; notably, it has evolved from focusing on the capacity to read and write single words or a simple sentence to a much wider understanding, away from a dichotomous definition of a 'literate' or 'illiterate' person towards a more balanced one that is linked to the concept of lifelong learning. This is one of the most crucial changes to how literacy is considered and conceptualized. It suggests that literacy is no longer seen as a separate set of skills acquired within a short time-frame, but rather as a set of core competencies that implies continuous updating along one's lifespan (UNESCO, 2016).

For target 4.6, the definition of literacy is aligned with UNESCO's (UIL, 2018a), which designates it as

the ability to identify, understand, interpret, communicate and compute, using printed and written materials associated with varying contexts. It involves a continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community (UNESCO, 2005).

The key elements of this definition are explained below.

The ability to **identify** and **understand** a text encompasses comprehension of single words to discerning a longer piece of text.

**Interpreting** a text implies making a judgment on its relevance and on the trustworthiness of the content in order to acquire useful information. In the case of electronic texts, the issue of their credibility and authenticity is particularly important. Electronic texts can be accessed from a range of sources, the identity and credentials of which are not always clear.

**Communicate and compute** refers to the ability to convey and apply information and ideas from a text to address an immediate task or goal or to reinforce or change beliefs of others.

**Printed and written materials** includes visual displays, such as graphs or tables, in a variety of media (including computers and smartphones).

Literacy calls for a **continuum of learning** so that newly found skills are constantly updated and improved; this enables learners to cope with new tasks and adapt to a changing environment.

Literacy plays an important role in helping people **achieve goals, develop knowledge and potential, and participate fully in their community**. It provides the foundation for full and active engagement in many aspects of social life, such as at work, in exchanges with administrations (hospitals, authorities, etc.) or in virtual activities.

## Numeracy

The SDG target 4.6 definition of numeracy correlates to the one used by the Programme for the International Assessment of Adult Competencies (PIAAC) framework (UIL, 2018b), which was developed by the Organisation for Economic Co-operation and Development (OECD). It describes numeracy as a multi-faceted framework comprising two main elements: numeracy competency and numerate behaviour (OECD, 2012).

PIAAC defines numeracy as the 'ability to access, use, interpret and communicate mathematical information and ideas, in order to engage in and manage the mathematical demands of a range of situations in adult life' (ibid., p. 4).

This definition emphasizes the usefulness of numeracy skills for managing information and solving problems in everyday situations by responding to mathematical content, ideas or reasoning presented in various forms. Furthermore, by including the phrase 'to engage in', the PIAAC definition indicates that not only cognitive *skills*, but also cognitive *traits* (dispositions, habits of minds, attitudes, etc.) are necessary for effectively managing situations involving mathematical content.

Numeracy is a broad, multidimensional construct referring to a set of knowledge and skills that, together, influence a person's numeracy behaviour. For the development of numerate behaviour, it is necessary to ensure learners can confidently utilize numeracy skills in multiple:

- types of **contexts** (i.e. situations in which adults use numeracy-related behaviour);
- **responses** (i.e. types of responses expected depending on the nature of the mathematical demands);

- **contents** (i.e. the set of mathematical information and ideas that adults use and on the basis of which they must act);
- **representations** (i.e. the forms in which mathematical information is presented and contextualized);
- **cognitive and non-cognitive processes** (the types of cognitive operations and attitudes deployed when engaging in numeracy-related behaviour).<sup>1</sup>

**Contexts refers to** using numeracy to accomplish a task or reach an objective in specific contexts. PIAAC defines four types of contexts: everyday life, work related, society or community, and further learning contexts.

Learners also have to respond to everyday numeracy demands in a variety of ways. PIAAC clusters these responses in three interrelated groups: identify, locate or access; act upon or use; and interpret, evaluate/analyse and communicate.

Four main domains of **mathematical content/information and ideas** are covered by the PIAAC framework: quantity and numbers; dimension and shape; pattern, relationships and change; data and chance.

Mathematical information may be **represented** in a number of ways; for example, through pictures, symbols, formulas, and visual displays, including charts, graphs or maps.

Numerate behaviour depends not only on numeracy skills or mathematical knowledge, but also on enabling factors and processes. These **cognitive and non-cognitive processes** involve individual dispositions (beliefs, attitudes, habits of minds, etc.), prior experiences and practices with numeracy tasks, and acquisition of other skills or traits (problem-solving skills, literacy skills, critical thinking skills, etc.).

## Functionality

The global indicator for Target 4.6 refers to a 'level of proficiency' in functional literacy and numeracy skills. Here, 'functionality' is a level of literacy or numeracy proficiency that grants youth and adults with a reasonable probability of realizing their goals by coping with familiar and unfamiliar tasks in everyday life.

Indeed, effective uses of literacy and numeracy involve individuals having the proficiency level to cope with commonplace reading, writing and mathematical demands. Those who lack these skills risk making wrong decisions or adopting counterproductive behaviours that can adversely affect not just an individual's personal life, but for society as well. Many studies suggest that individuals who do not reach a certain level of proficiency in literacy and numeracy are more likely to be 'less employable, work less, earn less, [be] in poor health, more at risk of experiencing a workplace illness or accident and ... less socially engaged' (UIL, 2018a).

It should be noted that this dimension of 'functionality' is already embedded in the adopted definitions of numeracy and literacy. However, it must also be reflected in the descriptors of the levels of proficiency that will be used for reporting on indicator 4.6.1.

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<sup>1</sup> [http://www.oecd.org/skills/piaac/PIAAC%20Framework%202012--%20Revised%2028oct2013\\_ebook.pdf](http://www.oecd.org/skills/piaac/PIAAC%20Framework%202012--%20Revised%2028oct2013_ebook.pdf)

## Data collection

### Current situation

The global indicator for Target 4.6, which refers to a 'level of proficiency' in functional literacy and numeracy skills, aims to move attention from the conventional distinction between adults who do and do not possess basic literacy and numeracy skills (literate versus illiterate) to a range of adult proficiency levels in various contexts.

To this end, skills data based on self-reported assessments are now considered less relevant for policy-making and less accurate than direct literacy and numeracy assessment tests. However, direct assessments, especially when they are administered to a large sample of a national population, are incredibly costly and time consuming. It is therefore important to acknowledge that gathering data from each country through direct assessment to report on indicator 4.6.1 by 2030 will be a challenge.

The measurement tools that are required for direct assessment are currently only available in high-income countries. This means that, globally, only 93 countries have implemented a direct literacy assessment of some kind (see *Figure 1*). In the remaining countries, the majority of reporting is based on traditional literacy rates.

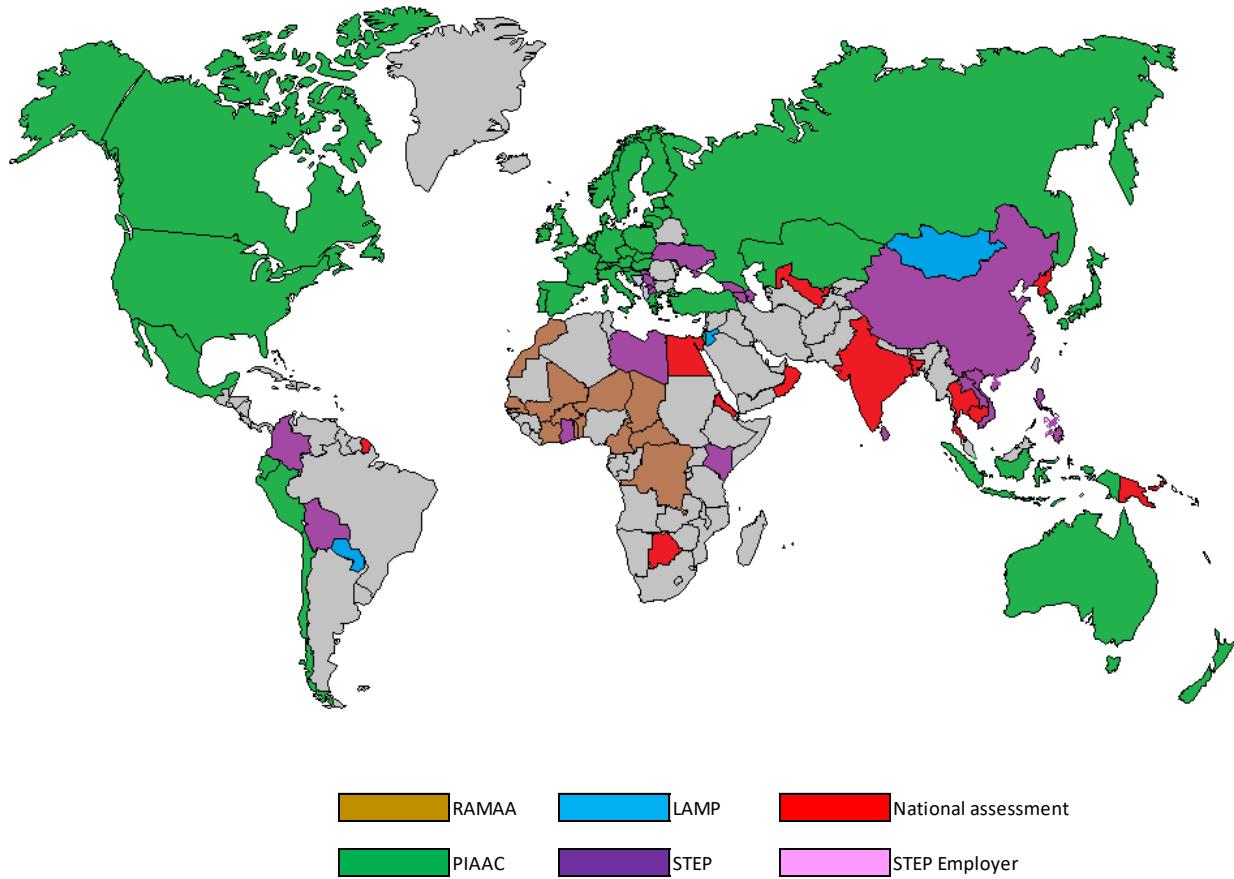
The majority of the surveys assessing adult skills are international initiatives coordinated by international organizations, such as the OECD, the World Bank and UNESCO (UNESCO Institute of Statistics, UNESCO Institute for Lifelong Learning). PIAAC, fielded in 41 countries, is by far the most comprehensive of these studies, and captures data on literacy, numeracy and problem-solving skills in technology-rich environments.

The World Bank's STEP (Skills towards Employment and Productivity) skills measurement survey shares the same conceptual framework and a common set of items with PIAAC. It focuses on adult literacy skills only and is currently administered in 17 countries. It should be noted that STEP does not always cover the entire population of a given country, but focuses instead on regional area(s) (as is the case with China). STEP is supplemented by the 'STEP Employer' survey, which focuses on adult employees and is implemented in two additional countries.

Another survey is the UNESCO Institute for Statistics' (UIS) Literacy Assessment and Monitoring Programme (LAMP), which employs a sample survey of adults to 'identify the full range of literacy – from the most basic reading and writing to the skills needed to participate fully in a learning society' (UIS, n.d.). LAMP operates in 10 countries and 13 languages. Four countries completed the main data collection, while six countries conducted a field test only.

The UNESCO Institute for Lifelong Learning (UIL) initiated RAMAA (Action Research: Measuring Literacy Programme Participants' Learning Outcomes) in 2011. Unlike PIAAC, STEP and LAMP, UIL's RAMAA does not survey the full adult population in the 12 participating African countries, but assesses literacy programme participants' literacy skills at the start, in the middle and at the end of the programme.

## **Figure 1. Mapping of existing direct assessments**



*Source:* UIL, 2019.

A number of national assessments applying methods and standards that are conceptually close to those used in the international assessments were also developed in the last 20 years; however, the majority of these assessments do not produce data that support comparison to other countries. Kenya and Bangladesh, whose national assessments are based on IALS (International Adult Literacy Survey) and ALL (Adult Literacy and Lifeskills Survey) – both precursors to PIAAC – are the exception. Therefore, aside from the countries that already participate in international programmes, only 11 additional countries carry out national assessments that could be used for reporting on indicator 4.6.1 (See *Figure 1* and *Annex A*).

One of the main trends in the implementation of direct assessments around the world is that, in some regions or continents, only a few countries took the plunge. In Central America, the Caribbean and the Middle East, very few countries developed or implemented such surveys. To a lesser extent, the situation is similar in the south and east of Africa, the west of Latin America, and in South-East Asia.

## Expected situation in 2030

Will the situation be substantially better by 2030? As mentioned earlier, direct assessment has a lengthy, costly and complex method of data collection on numeracy and literacy skills. It requires

strong mobilization and engagement from participating countries as well as capacities in various domains (e.g. survey methodology, statistics and psychometrics). The situation is therefore likely to improve at a very slow pace.

The results of the second cycle of PIAAC are expected at the end of 2023. Should a third cycle not be completed by 2030, only the results from the second round of the second cycle will be available, providing information on just a few additional countries by 2030.

In the case of STEP, where countries are not supposed to implement the assessment simultaneously, the programme will likely extend to new countries, depending on the availability of resources.

With regard to LAMP, UIS has developed an enhanced and shortened version – mini-LAMP – which is designed to assess literacy and/or numeracy in low- and middle-income countries. Here again, a handful of countries may be interested in this initiative and willing to implement it before 2030.

In brief, we can say that the number of countries providing data from a direct assessment may slightly increase between now and 2030. Nevertheless, more than half of the countries will not be able to meet this goal.

It is crucial to take stock of this situation for feeding the oncoming work of the most relevant mechanisms for reporting on Target 4.6 and for developing a reasonable and workable strategy for the next decade towards achieving it.

## Fixing minimum proficiency levels for indicator 4.6.1

### Minimum proficiency level (MPL)

SDG target 4.6 enjoins Member States to 'ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy'. The global indicator for Target 4.6, and the only indicator for this target directly related to the measurement of learning outcomes, is indicator 4.6.1, which measures 'the percentage of the population in a given age group achieving at least a fixed level of proficiency in functional (a) literacy and (b) numeracy skills, by sex'.

However, existing skills surveys conceptualize and measure literacy and numeracy proficiency on a continuum from low to high levels. The way this indicator is set will imply what proportion of the population in a country is described as 'lacking basic skills'. Thus, the indicator could be 'fixed' at any level of the proficiency continuum. It means that the decision regarding what level to actually set the 'fixed' proficiency level is a matter of judgment, considering multiple logics, and not based only on technical considerations.

In general, reporting frameworks of large-scale surveys of social or educational topics should be designed to respond to policy needs and provide useful information to stakeholders about the factors that influence the distribution of literacy and numeracy skills in the community and in the workplace. From this perspective, it can be argued that a decision on what level to set the 'fixed level of proficiency' for reporting on indicator 4.6.1 should relate to the potential of persons to participate effectively in a modern economy. For example, it should relate to the minimum competencies needed to engage in the workplace or benefit from training opportunities. After all, modern communities expect members to engage with at least some forms of mathematical information or reading information presented in various ways.

The minimum proficiency requirement therefore remains an absolutely fundamental issue since it varies significantly from country to country – across both developed and developing countries. In particular, what is considered 'low literacy' or 'low numeracy' fluctuates across different assessments and across cultures.

The way to address the challenge is to adopt a new approach.

### Definition and new approach

As already noted, indicator 4.6.1 measures the 'percentage of population in a given age group achieving at least a fixed level of proficiency in functional (a) literacy and (b) numeracy skills, by sex'. Despite the availability of several measures focusing on youth and adult competencies in literacy and numeracy, a number of issues remain. Most notably, there is no common definition of a 'fixed level of proficiency' for functional literacy and numeracy; this poses a challenge for global measurement and monitoring. The objective of the first phase of work done by the GAML Taskforce 4.6, therefore, was to formulate such a definition.

In the *Education 2030 Incheon Declaration and Framework for Action*, UNESCO Member States agreed that 'by 2030, all young people and adults across the world should have achieved relevant and recognized proficiency levels in functional literacy and numeracy skills that are equivalent to levels achieved at successful completion of basic education' (UNESCO, 2016, p. 47). In line with this international agreement, the 'fixed level of proficiency' in functional literacy and numeracy for the

population aged 15 years and older for reporting to indicator 4.6.1 can be interpreted as the proficiency levels equivalent to the end of lower secondary education.

This new approach offers multiple advantages; it:

- opens the possibility to align the methodology for fixing a minimum level of proficiency with the methodology followed for indicators 4.1.1 (a), (b), and (c);
- facilitates the linking of existing assessments by alleviating some statistical requirements needed for establishing equivalencies between scores, levels and proficiency levels;
- provides a more workable approach for linking results of direct assessments and indirect measurements.

It should be acknowledged that aligning MPLs with school-based indicators really only makes sense for young adults. A cut-off point that is pertinent for 15-year-old students in the context of indicator 4.1.1 (c) could also be appropriate for 15–24 year olds; however, a ‘standard’ set on the basis of expectations for today’s school students may not be very relevant for more senior adults who left the school system 30 years ago or more, or those who have had no schooling or who undertook primary level education only. This pertinence depending on the age of the target group meets the distinction implicitly drawn by the vocabulary used for defining Target 4.6, which differentiates between young and older adults.

**Recommendation:** Define a minimum ‘fixed level of proficiency’ in functional literacy and numeracy for indicator 4.6.1 that is equivalent to proficiency levels found at the end of lower secondary education for young adults, and investigate its implications and limitations for older adults.

## The strategy for defining indicator 4.1.1

Indicator 4.1.1 (c), which in general pertains to students in Grades 8–9, calls for a definition of proficiency that conforms to the end of lower secondary education. Taskforce 4.6 therefore compared national and cross-national assessments in order to define an MPL in four steps (UIS, 2018):

### Consensus on the number of performance levels

This first step consisted of reaching an agreement on how many levels of proficiency should be selected for reporting on indicator 4.1.1. After reviewing the assessments available, the decision was to set four proficiency levels.

### Definition of policy descriptors

Policy level descriptors that differentiate between ‘proficient’ students and those who achieve at a level below proficiency in mathematics and reading were then developed. These policy level descriptors reflect in very general terms the dividing line between proficient and non-proficient students; however, they do not delimit the sub-categories of each level, i.e. below basic/basic and proficient/advanced.

The policy level descriptors are a useful and important tool: they define what skills and knowledge students around the world should be expected to demonstrate at a certain educational level.

### **Definition of the minimum proficiency levels (MPLs)**

The policy descriptors were then used to develop 'proficiency descriptors', identifying what a student should be capable of in mathematics and reading at a given level of proficiency. These two main domains were then divided into four sub-categories of proficiency: below basic, basic, proficient, and advanced.

### **Linking**

The most critical step consisted of selecting the appropriate method for linking the results of the existing student assessments with the defined proficiency levels. After much consideration, Taskforce 4.6 considered the possibility of opting for a policy-linking method.

**Recommendation:** Given that SDG indicator 4.1.1 (c) refers to the proficiency levels equivalent to 'end of lower secondary', aligning it to indicator 4.6.1 should be taken into consideration.

**Table 1. Policy level descriptors for indicator 4.1.1**

<b>Performance level policy descriptors</b>		
	<b>Mathematics</b>	<b>Reading</b>
Proficient/ above proficiency	Students at this level possess a basic or better level of mathematical knowledge. They also demonstrate a basic or better level of competency with mathematical skills and abilities. These include the recall of mathematical facts, formulas and algorithms, the ability to solve application problems, and varying levels of aptitude in using problem-solving strategies and communicating mathematically.	Students at this level have developed the required competences for the described reading level. They have acquired the knowledge and skills necessary to decode written words, identify relevant information from written texts, understand their meaning and make inferences from their knowledge.
Below proficiency	Students at this level possess a limited level of mathematical knowledge and demonstrate a lack of competency with most mathematical skills and abilities. They tend to struggle with all but the most routine and straightforward aspects of mathematics.	Students at this level possess a limited level of reading knowledge and demonstrate a lack of competency with most reading skills and abilities. They tend to struggle with all but the most routine and straightforward aspects of reading

Source: UIS, 2018a, p. 7.

### **Implications for indicator 4.6.1**

In the context of indicator 4.6.1, there are three main difficulties with linking the results of the different programmes:

- **Linking the results of direct assessments of adult skills**

In PIAAC, respondents were given estimates of their literacy and numeracy proficiency on two continuous scales ranging from 0 to 500 points. To facilitate the interpretation of the scores obtained, the proficiency scales are divided into ‘proficiency levels’. Descriptors have been developed to summarize the types of tasks that adults who have obtained a given score on one proficiency scale are likely to be able to complete. They indicate what adults are able to do when they reach a certain level of proficiency. There are six levels of numeracy proficiency and six levels of literacy proficiency (Level 1–5, plus below Level 1). In the LAMP assessment, which was fielded by UIS in some middle-income countries, respondents were also given a score of their proficiency in literacy and numeracy and were classified into three groups of proficiency.

Without anchor items, it seems impossible to establish a system of correspondence between the proficiency levels of the PIAAC / STEP and LAMP programmes. Given the cost of organizing a field study to develop, test and use these anchor items, it is unlikely that a statistical method will be used to link these programmes.

- **Linking direct assessment with self-declared questionnaires**

One of the specificities of the adult skills data is that they come largely from declarative questionnaires. The challenge of linking the results of direct skills measurement surveys with the results of self-reported, often dichotomous, surveys is therefore not easy to solve. To a certain extent, the two measures are incommensurable. Without specific study dedicated to explore the gap between direct measures and self-reported measures of adult skills, the two measures should be present separately for reporting on Indicator 4.6.1.

- **Aligning adult minimum proficiency levels in literacy and numeracy with school-based standards**

Aligning an adult benchmark against school-based standards/levels is a major challenge, particularly in numeracy. There are indeed quite clear differences in what people see as numeracy for children at school (or even how it is described by the OECD’s PISA (Programme for International Student Assessment) survey for 15 year olds) and how it is viewed for adults. What ‘functional numeracy’ means will therefore need to be agreed on and defined before a minimum fixed level can be established. It is reasonable to think that a distinction will have to be made between young adults and other adults.

Nevertheless, during the first phase of the work of Taskforce 4.6, a tentative definition of a minimum of fixed proficiency level in functional numeracy provided a strong basis for future discussions. This probationary definition defines a ‘minimum proficiency level’ in numeracy as the ability to

carry out basic mathematical processes in common, concrete contexts where the mathematical content is explicit, with either little or no text and minimal distractors. Tasks usually require simple one-step processes, and may involve understanding of representations of numerical entities (e.g. positions on a number line up to 100); performing basic arithmetic operations in reference to written or visual representations of quantities; understanding simple proportions (e.g. fractions or percentages such as ‘1/2’ or ‘50%’); locating, identifying and using elements of simple graphical or spatial representations; and understanding basic information about everyday measurement systems such as regarding time, length or weight (UIL 2018).

A definition of a minimum fixed level of proficiency for literacy is still outstanding.

## Methodologies for linking

Linking is a technique that makes proficiency scores from one assessment comparable to another. The two main types of linking are statistical and non-statistical.

Both linking methods have their own advantages, depending on the context (see *Table 2*). Non-statistical linking is usually considered less accurate since it only provides tables that match up the corresponding scores on assessments that separate respondents between different groups of proficiency (benchmarks). Statistical linking is seen as being robust because it provides formulas or statistical operations for systematically converting each score from one assessment to another. Another difference between the two methods is that the linking procedure of non-statistical linking is based on judgments, whereas statistical linking is based on algorithms.

**Table 2. Linking methodologies and assessment features**

Linking methods	Assessment features			
	Constructs	Populations	Measurement	Inferences
Equating (statistical)	Same	Similar	Same	Same
Calibration (statistical)	Same	Similar	Similar	Same
Moderation (statistical)	Similar	Same	Similar	Similar
Projection (statistical)	Similar	Same	Different	Similar
Policy linking (non-statistical)	Similar	Similar	Different	Similar

Source: USAID, 2019, p. 9.

To summarize, statistical linking is considered more accurate, but has greater requirements (e.g. administering a range of items to the same test takers or administering common tests items to different test takers). Non-statistical linking is less accurate, but it is useful and acceptable when requirements of statistical linking are not met due to issues such as design, sampling or cost.

## PIAAC–PISA linking studies

Despite their different goals (PIAAC focuses on how adults develop, maintain and use their skills, while PISA seeks to identify how students can learn better), a statistical approach could be adopted for linking the results of the two surveys (Borgonovi et al., 2017).

Both PIAAC and PISA are large-scale assessments of competences, conducted by the OECD; thus, they have many similarities. Both studies focus on assessing literacy and numeracy; however, the two programmes use slightly different terms when referring to the skills measured. In PIAAC, the concept of 'literacy' is used instead of 'reading literacy', which is used by PISA – this despite the fact that the PIAAC assessment focuses, in practice, on reading literacy (*ibid.*). The concept of 'reading literacy' underlines, in both cases, the functional aspect and the situational nature of reading for a range of goals and contexts.

In the area of numeracy, there are fewer similarities between PIAAC and PISA (Gal et al., 2014). PISA promotes the concept of 'mathematical literacy', which is

an individuals' capacity to formulate, employ, and interpret mathematics in a variety of contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena. It assists individuals in recognizing the role that mathematics plays in the world and to make the well-founded judgments and decisions needed by constructive, engaged and reflective citizens (OECD, 2013).

And while both PIAAC and PISA define mathematical literacy as the ability to use mathematical information and ideas in different situations and contexts, and both stress the importance of communicating these ideas effectively, they have diverse test conditions. For example, with regard to the target populations, PIAAC's study canvasses 16–65 year olds, whereas PISA focuses on 15 year olds only. In addition, due to a lack of common items in PIAAC and PISA, the results from the two surveys cannot be compared directly or considered as being on the same scale.

However, some studies (Borgonovi et al., 2017; Lendetrae et al., 2018) have attempted to establish a statistical link between PIAAC and PISA using a sort of moderation analysis rather than a more stringent method, such as an equating analysis of implying administering common items in two different assessments. A specific sample design for PISA in Poland, for example, provided an opportunity to test this linking method. To a certain extent, the study showed that it is possible to link PIAAC proficiency levels to PISA scores, thereby opening the debate for further generalization of the results. There has therefore been a call for 'the creation of explicit and stronger synergies between PISA and PIAAC' during the next rounds (Borgonovi et al., 2017).

## Policy linking

The United States Agency for International Development (USAID) defines policy linking as 'a mutual understanding of social moderation' that is considered to be 'a practical and appropriate non-statistical method for linking ...assessments within and across countries' (USAID, 2019, p. 6).

In short, policy linking is a method wherein the same descriptors for levels of proficiency are used to link one assessment to another. To this end, the first step of policy linking is establishing performance level descriptors (PLDs) for each domain of assessment (literacy and numeracy). Both sets of PLDs will form a 'proficiency scale' that will reflect the levels of performance in literacy or in numeracy.

The second step of policy linking calls for the adoption of an internationally accepted approach for determining the cut-off or lowest scores in literacy and numeracy proficiency for each PLD. In doing so, passing scores can be assigned for the different assessments.

Given the difficulties in linking the results of current data sources on adult skills, the policy linking method could prove useful for monitoring progress of indicator 4.6.1.

**Recommendation:** At present, indirect measurement tools are predominately used to assess adult literacy skills and there is limited use of direct assessment data. The policy linking method should therefore be considered as an option for monitoring indicator 4.6.1.

## Strategy for 2030

Ideally, every country should use direct assessment for measuring learners' outcomes in order to provide data for SDG indicator 4.6.1. This measurement tool should conform to internationally agreed-upon quality standards and include:

- an extensive background questionnaire that identifies key population sub-groups, documents the determinants of skills differences, and explores the impact that skills differences have on individual outcomes;
- direct testing of adult literacy and numeracy, covering the full range of skills in the population;
- implementation of a probabilistic sampling plan to assess the quality of data, weight it, and provide an accurate picture of a given population of interest.

### Supporting the implementation of direct assessments

As previously mentioned, existing international surveys are costly and complex to implement and may not meet the needs and characteristics of many of low- and middle-income countries. Therefore, a set of options for assessment, depending on the resources and capacity in each country, should be made available.

In the long-term, the aim is still for each country to develop and/or field direct literacy assessment, with the following options:

- Joining an existing international survey (e.g. PIAAC, STEP);
- Requesting international agencies or a consortium of technical agencies for the development of a new assessment tool that is cost-effective and simple to administer to measure and monitor progress on SDG 4.6.1;
- Implementing surveys such as mini-LAMP;
- Developing new national literacy assessments.

GAML could play a major role in the two last options in particular.

In order to be implemented, however, these options still necessitate the drafting of technical and quality assurance guidelines. Countries will also need to develop capacity-building strategies before implementation.

### The benefits of implementing mini-LAMP

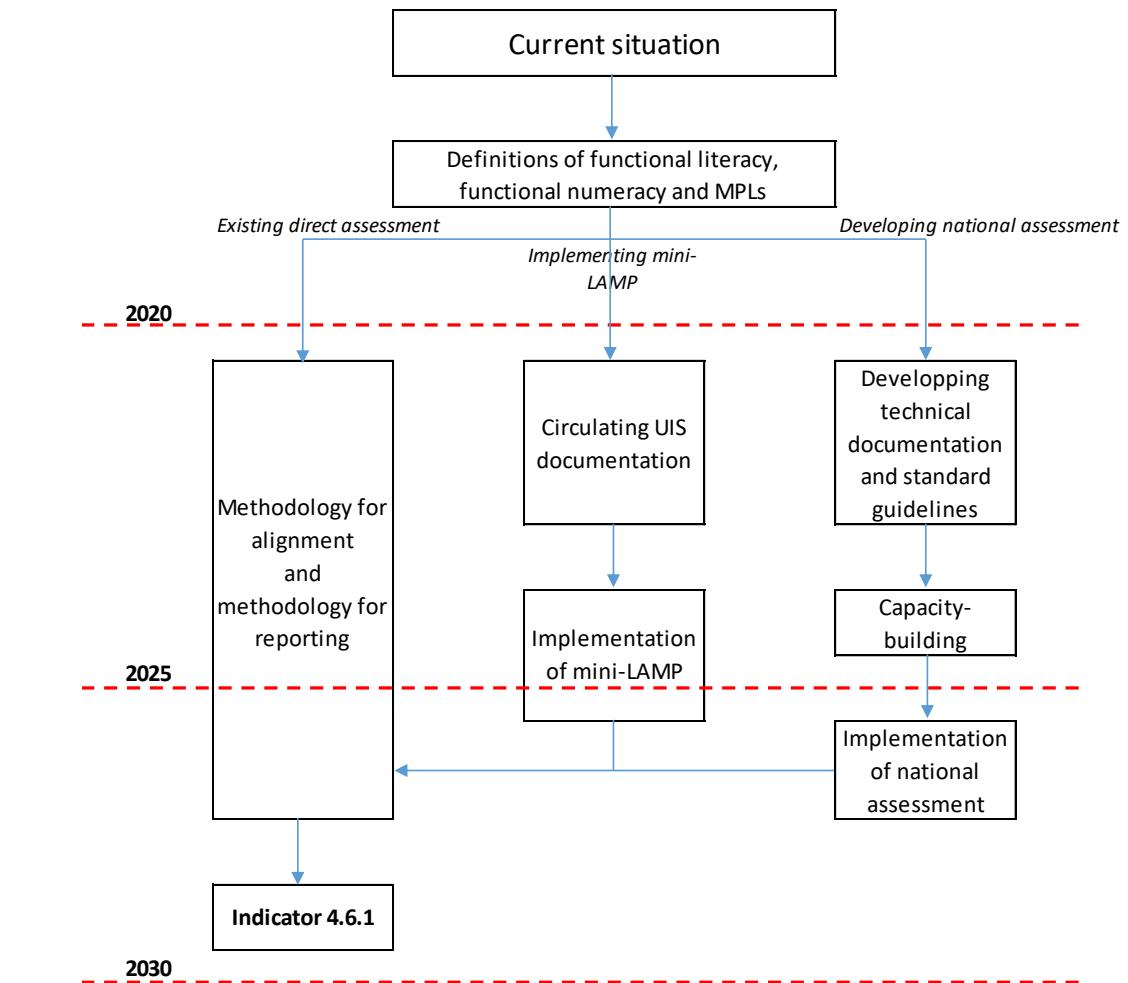
UIS's Literacy Assessment and Monitoring Programme (LAMP) was developed to help countries monitor and improve literacy skills distribution. It is designed to provide policy planners with the information they need to plan and implement literacy programmes. UIS recently developed a shortened version of LAMP – mini-LAMP – to help low- and middle-income countries measure more precisely the literacy and the numeracy skill levels of their populations without incurring an unsustainable financial burden (UIS, 2018b).

Mini-LAMP's instruments and methodologies yield data that can be compared across countries and cultures. It was developed together with a detailed package covering all the topics required for building an accurate assessment, including procedures for drafting cognitive items, translating the questionnaires or weighting the data. Given the resulting capacity development activities and knowledge exchange among the countries using mini-LAMP, it is clear that the programme provides participants with the opportunity to be fully engaged in the setting of their own surveys.

Encouraging countries to develop their own system for assessing adult skills in literacy and numeracy is another area for reflection. The work of Taskforce 4.6 would be hugely relevant here; for example, countries that do not yet have experience in developing assessment programmes could benefit from the documents developed by the Taskforce, including inventories of existing assessments and best practice case studies.

**Recommendation:** Given the advantages of mini-LAMP for countries with no prior experience in building and administering a direct assessment of adult competencies, the Taskforce noted the development of this instrument and encouraged the UIS to continue experimenting it to obtain empirical data to judge the relevance of this tool for indicator 4.6.1.

**Figure 2. Strategy for supporting the implementation and the use of direct assessments for reporting on Target 4.6.1 by 2030**



## Supporting investigations for indirect measurements

In the short-term and given the uncertainty of reaching the SDG 4 targets by 2030, it is important to look at intermediate and workable options for capturing data on youth and adult literacy and numeracy skills through indirect measurement and estimation. Furthermore, it is necessary to propose a strategy to improve the production of indicator 4.6.1 data for more than half of the world's countries, where no direct evaluation will be available before 2030. This could be done, for example, by:

- improving indirect estimates, based on previous direct assessment surveys;
- providing a set of self-reported items to be included in existing national surveys ;
- developing innovative, and cost-saving, indirect measurements.

### Indirect estimates

With indirect estimates, literacy and numeracy assessment is done *a priori*, based on the sociological structure (age, sex, level of education) of a population. Although much progress has been made to improve the quality of this model (through the refinement of explanatory categories, measurement of estimation errors, control of the quality of the models on external data), the fact remains that, by its very definition, it remains an arbitrary activity.

One possible way to improve the accuracy of indirect estimates is to take into account the direct assessment of a subset of the population of interest to improve the accuracy of indirect estimation models. For example, UIL's RAMAA programme assesses literacy and numeracy skills of literacy programmes' beneficiaries in 12 African countries, before and after their participation in training sessions. It would be promising to compare the socio-demographic characteristics of the beneficiaries of literacy programmes with those of the general population to estimate the proportion of adults attaining, at least, a minimum level in functional literacy and numeracy.

### Self-reported questionnaires

Another possible option would be to improve the self-reporting questionnaires that are often integrated into major national surveys (i.e. censuses, health surveys, etc.).

As already noted by UIS, 'today, the simple question, "Can you read and write?", is commonly used to produce statistics on literacy rates. In most countries, there are no other ways to measure literacy – just a self-reported question from a household survey or census. Answer "yes" and join the ranks of the so-called literates. Answer "no" and be considered illiterate' (UIS, 2018b).

A more comprehensive household sampling instrument, such as UNICEF's global Multiple Indicator Cluster Surveys (MICS), which covers a larger range of levels of proficiency, could be used instead. The MICS questionnaires are modular tools that can be customized to the needs of a country. They consist of three questionnaires: a household questionnaire, a questionnaire for women aged 15 to 49 years, and a questionnaire for children under the age of five (addressed to the mother or primary caretaker of the child), but cover similar topics. Each of the surveys includes questions on literacy. In addition, in the women's questionnaire (MICS3), the respondent is asked to read a simple sentence, such as 'The rains came late this year.'

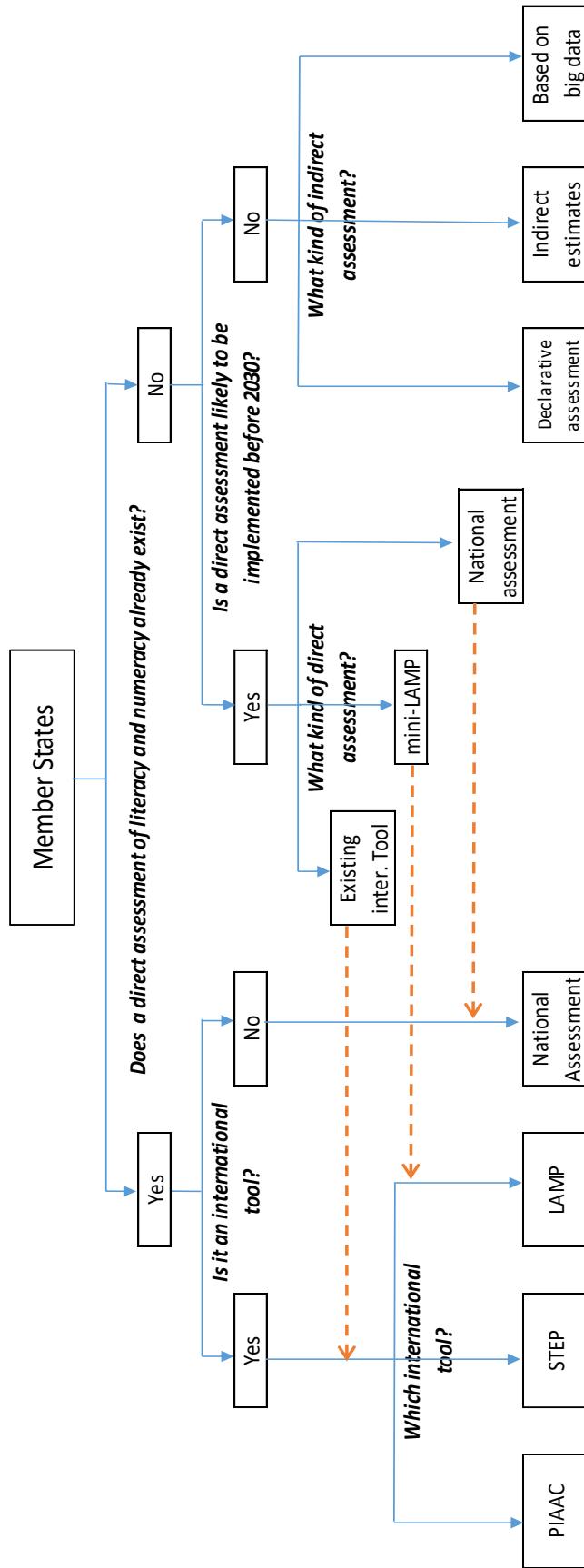
A document published by UIL (UIL 2018c) outlines several possible strategies to improve self-reported questionnaires and to adapt them more to the issues of the adult population and the issues of indicator 4.6.1.

### Big data

The different approaches that we have presented so far, despite their qualities, all have the same disadvantages: they are still relatively expensive for low-income countries. They also call for higher technical expertise at the national level and / or resources at the international level to be put into place. Finally, they do not cover certain at-risk populations, such as nomadic and pastoralist populations, who have much less access to education, health and social services and are often excluded from household surveys.

To limit the scope of these drawbacks, it might be an idea to deepen our knowledge on the potential of big data to make indirect measurements of the level of literacy and numeracy of adults. The metadata collected when using mobile phone services or the internet is a rich source of information on literacy and numeracy practices around the world. Therefore, such data could be an innovative means of measuring adult literacy practices, such as speed of writing or reading and reading themes, in order to gain an overview of adults' everyday reading, writing and math skills. Many issues still need to be addressed (legal aspects, data quality, coverage rates) in order to confidently use these data sources, but some studies (Sundsoy, 2016) have already shown that such a project could bring about very promising results.

**Recommendation:** Based on the assumption than about one half of the countries will not be able to produce data from direct assessments until 2030, supporting the investigation of alternative, cost-effective and more operational methods of estimating the baseline and monitoring the progress against SDG target 4.6 should be explored.

**Figure 3. Producing data on SDG target 4.6.1 by 2030**

Source: UIL, 2019.

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## Annex A: Countries with direct adult skills assessment

### Countries participating in PIAAC

**First cycle, round one:** Australia; Austria; Belgium (Flanders); Canada; Czechia; Kingdom of Denmark; England (UK); Estonia; Finland; France; Germany; Ireland; Italy; Japan; Republic of Korea; Netherlands; Northern Ireland (UK); Norway; Poland; Russian Federation; Slovakia Spain; Sweden; United States of America.

**First cycle, round two:** Chile; Greece; Indonesia; Israel; Lithuania; New Zealand; Singapore; Slovenia; Turkey.

**First cycle, round three:** Ecuador; Hungary; Kazakhstan; Mexico; Peru; United States.

**Second cycle:** Australia; Austria; Belgium (Flanders); Canada; Chile; Croatia; Czechia; Kingdom of Denmark; England (UK); Estonia; Finland; France; Germany; Hungary; Ireland; Israel; Italy; Japan; Republic of Korea; Latvia; Lithuania; Netherlands; New Zealand; Norway; Poland; Portugal; Russian Federation; Singapore; Slovakia; Spain; Sweden; Switzerland; United States.

### Countries participating in STEP

**STEP household survey:** Armenia; Azerbaijan; Bolivia; China (Yunnan); Colombia; Georgia; Ghana; Kenya; Kosovo; Lao PDR; Libya; North Macedonia; Philippines; Serbia; Sri Lanka; Ukraine; Viet Nam.

**STEP employer survey:** Albania; Armenia; Azerbaijan; Bosnia and Herzegovina; Georgia; Kenya; Kosovo; Serbia.

### Countries participating in LAMP

**Main survey:** Jordan; Mongolia; Palestine; Paraguay.

**Field test only:** Afghanistan; El Salvador; Lao PDR; Morocco; Niger; Viet Nam.

### Countries with national assessments<sup>2</sup>

Azerbaijan; Bangladesh; Botswana; Cambodia; Canada; Egypt; England (UK); Eritrea; France; Germany; India; Jordan; Kenya; Lao PDR; New Zealand; Oman; Papua New Guinea; Peru; Republic of Korea; Scotland (UK); Thailand; United States; Uzbekistan.

### Countries participating in RAMAA

**First cycle:** Burkina Faso; Mali; Morocco; Niger; Senegal.

**Second cycle:** Benin; Burkina Faso; Cameroon; Central African Republic; Chad; Democratic Republic of the Congo; Côte d'Ivoire; Mali; Morocco; Niger; Senegal; Togo.

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<sup>2</sup> review still ongoing