

# Adult numeracy: Assessment and development



**Numeracy in the adult population** is a key skill that supports the lives of all citizens and contributes to the development of jobs markets, economies and societies around the globe. Adult numeracy is, therefore, included in the United Nations Sustainable Development Goals (SDGs) as a separate target area in indicator 4.6.1 (UN, 2020). Unfortunately, the importance of numeracy is often overlooked by policy-makers both in terms of *numeracy education* (for adults and in schools) and *monitoring of skill levels* by credible direct assessment.

For many decades, UNESCO considered numeracy as part of basic skills, sometimes described as ‘arithmetic’ or ‘computation’ within literacy. Most countries lacked data on the numeracy skills and practices of their citizens. However,

increasing evidence suggests that numeracy should be analysed and prioritized as a separate dimension and target. Building adult numeracy skills is key for citizens’ well-being and active participation in modern society. It contributes to significant economic and social outcomes (Tout, 2020).

Insufficient data on adult skills in general, and on numeracy in particular, remains a serious challenge (Gal, 2016). SDG target 4.6 calls on countries to ‘ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy’ by 2030. Indicator 4.6.1, which tracks this target, measures 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’ (UN, 2020). The target age group is 15 years and older.

### Numeracy and its domains

Conceptual frameworks and cumulative findings demonstrate the importance of foundational numeracy for twenty-first century citizens, communities and economies. It can be described in five separate domains (see Gal et al., 2020, for definitions and references):

- **Civic numeracy** relates to citizens’ ability to understand and react critically to quantitative and statistical information regarding important societal, economic and environmental issues, and how data and statistics serve public policy.
- **Digital numeracy** is becoming increasingly important in times of growing public exposure to ‘big data’, ‘open data’, and the use of algorithms in many digital environments, alongside digital literacy.
- **Financial and commercial numeracy** includes the computation and critical evaluation of information involving money, savings and related risks.
- **Health numeracy** is emerging as an independent field in medical and health sciences research and includes the comprehension of treatment options, risks and projections, alongside health literacy.
- **Workplace numeracy** encompasses a range of topics such as management, schedule optimization, resources and budgets along with comprehension of statistics and data on production, quality control and customer behaviour to compete in an evolving job market.

Tasks undertaken in all of the above contexts require a wide range of basic and advanced numeracy and critical-thinking skills, including many skills not subsumed in school mathematics.

Nowadays, numeracy is a rich, multi-faceted construct. A number of everyday tasks relate to numeracy domains (see box on previous page) and require diverse mathematical and statistical skills. The definition of numeracy agreed upon by Taskforce 4.6 correlates with the one used by the Organisation for Economic Co-operation and Development's Programme for the International Assessment of Adult Competencies (PIAAC) (Tout, 2020): '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'.

Recent changes in the world of work, such as jobs growth in the information and service sectors, mean that workers need adequate numeracy skills to adapt to a changing jobs market (Jonas, 2018). Numeracy competency is also linked to important aspects of individual well-being such as health and active citizenship (OECD, 2019). The importance of numeracy skills has been highlighted further during the COVID-19 pandemic. The public's ability to comprehend critically the large volumes of statistical information and projections circulated via media channels became vital to the success of national policies aimed at reducing infection levels and easing the social and economic consequences of the pandemic.

### Assessment and monitoring of adult numeracy and proficiency distributions in the context of SDG indicator 4.6.1

Direct assessment of SDG 4.6.1 faces many challenges. Only about 20% of the world's countries have access to data on literacy and numeracy based on direct measurements. Gal (2016) has reviewed different approaches to assessing adult numeracy at the international level along with case studies from several countries that have developed direct national numeracy assessments (Tout, 2020; Tout and Gal, 2015).

OECD's PIAAC provides an example of how countries can obtain and compare detailed information on adult numeracy levels and literacy skills. Between 2008 and 2019, the programme surveyed people aged between 16 and 64 in 39 countries and regions, including seven non-OECD middle-income countries. PIAAC uses a mix of computer-aided and printed assessments with large test item pools. It administers them to large national samples of adults tested at home under the oversight of an international consortium. PIAAC uses advanced psychometric methods to estimate national proficiency distributions across multiple numeracy and literacy skill levels, from rudimentary to advanced.

PIAAC's findings suggest that a large percentage of the adult population, 30% to 60% in middle-income countries and 10% to 40% in high-income countries, have low or very low levels of numeracy proficiency (OECD, 2019). Data collected in several countries through direct assessments conducted at different points in time also suggest that adult numeracy levels are decreasing over time, while literacy skills are improving (Jonas, 2018). They show a pronounced numeracy gender gap, i.e. women gradually fall behind men in numeracy levels, compared to a negligible gap in literacy levels (Borjonovi et al., 2018).

As Gal et al. (2020) argue, beyond PIAAC, only limited data exist on adult numeracy skills in middle-income and lower-income countries – the majority of the world's countries. UNESCO's past experience with the Literacy Assessment and Monitoring Programme (LAMP) used a more simplified methodology than PIAAC in terms of samples and item pools but based it on related principles. Between 2009 and 2011, LAMP results showed that substantial proportions of adults in four middle-income countries had very low numeracy skills.

### Case studies: National assessments of adult numeracy

While some countries have financial resources and technical knowledge to join large-scale assessment programmes, many countries face multiple challenges in terms of funding, technical expertise and diversity in national languages, among other factors. Still, several countries have developed and implemented national numeracy assessments that employ strategies other than PIAAC and LAMP and that estimate several numeracy skill levels. Here are two examples (Gal, 2016):

- **Kenya:** The 2006 National Adult Literacy Survey reached over 15,000 households in which persons aged 15 and above were given a background questionnaire and assessed directly on their reading, writing, and numeracy skills in 19 languages. All responses were constructed by participants openly. The numeracy section included 18 items selected from a pool of over 70 items developed by an expert panel.
- **Bangladesh:** National literacy surveys were conducted in 2008 and 2011. The 2011 survey conceptualized and operationalized the numeracy domain differently from Kenya's survey. More than 73,000 participants aged 11-45 years answered 12 open-ended questions covering several aspects of numeracy.

## Policy recommendations

Producing indicator 4.6.1 will require accurate data and direct (not proxy) measures of numeracy, distinct from literacy. Numeracy is often overlooked in adult learning and education (ALE) programmes, which tend to focus on ‘school-like’ math and do not address numeracy’s ‘functional and critical roles’ (Gal et al., 2020). Addressing those challenges would require countries to consider the following measures:

### **Adopt a long-range national strategy that focuses on adult numeracy and involves the use of direct numeracy measures (distinct from literacy):**

1. Ensure that policy-makers have access to suitable data on all adult numeracy levels. A national strategy should involve planning direct measurement of numeracy skills to evaluate the current status of SDG 4.6, support its ongoing monitoring and inform evidence-based national policy to improve adult numeracy.
2. Explore interventions and plan initiatives to improve adult numeracy, delivered via formal and non-formal channels. Adult numeracy teaching, learning and outreach approaches differ from those applicable to children.
3. Plan major advocacy efforts to support the strategy adopted for direct numeracy measurement of adults and for improving numeracy skills. Promote increased and dedicated attention to sustainable funding from the national budget and engage with donors and key stakeholders (e.g. industrial, agricultural, health or financial institutions interested in improving adult skills) for mobilizing extra-budgetary funding.

### **Invest in developing national capacity to measure and improve adult numeracy skills:**

1. Establish a steering committee to guide national efforts. Such a body should include experts familiar with adult numeracy – which differs from school mathematics – and its application in various areas such as adult education, health education, financial literacy and workplace numeracy.
2. Compile recent documents on conceptual frameworks published by international and national bodies that describe adult numeracy and its contexts (e.g. health numeracy, financial numeracy, civic numeracy, digital numeracy, workplace numeracy). Review assessment schemes and sample items used to test adult numeracy in such contexts. These should employ authentic ‘real-world’ tasks that differ from those used to assess the mathematical knowledge of school-age children.

3. Organize policy learning events where a broad range of policy-makers, experts and related stakeholders can share experiences on the role of numeracy in key areas of life and its measurement. Engage in international cooperation to collaborate with other countries and pool knowledge, technical expertise and resources.
4. Involve specialists in designing tests for measuring functional competencies in real-world contexts rather than school-like assessments. Train local experts to assess core adult competencies. Plan funding for long-term institutional development or graduate-level training in the assessment of adult skills.

### **Develop a creative and scalable monitoring approach to fit demographic and linguistic diversity:**

1. Adopt a practical, credible and sustainable assessment approach that can provide data in short intervals so decision-makers learn to trust and use it for setting policy and monitoring trends over time.
2. Adopt direct assessment methods in local languages (Gal et al., 2018). Additionally:
  - Develop a simple local assessment tool for adult numeracy proficiency, combining a text-based numeracy test with a short oral assessment by interview to better assess the functional numeracy of people with low or no reading skills.
  - Design the test to inform targeted interventions that measure and report on the population percentages at several levels of numeracy proficiency (e.g. very low, basic, high).
  - Administer the test to a nationally representative sample, either as part of a special national numeracy survey or as a short module attached to an ongoing national survey.
  - Encourage local innovation to improve or simplify data collection. Assign skill-related tasks via mobile phones, tablets or the internet.
3. If direct assessment is not feasible in the short term, use a set of self-evaluation questions related to numeracy skill levels and practices in functional contexts as a crude proxy (Fagerlin et al., 2007). Self-evaluation is less informative but may help to monitor motivational needs and factors related to actual numeracy until direct assessment for SDG indicator 4.6.1 is possible.

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