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Counting the Number of Children Not Learning

Methodology for a Global Composite Indicator for Education

UNESCO

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This paper draws on a technical paper written by Bilal Barakat for the UIS and on methodological work by UIS staff.

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P.O. Box 6128, Succursale Centre-Ville
Montreal, Quebec H3C 3J7 Canada

Tel: +1 514-343-6880
Email: uis.publications@unesco.org
http://www.uis.unesco.org

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Why a global composite indicator for education?

SDG 4 is the global education goal of the Sustainable Development Goals (SDG) agenda. The goal is to "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all". Its wording is much more ambitious than that of its predecessor (MDG 2 of the Millennium Development Goals (MDGs)) which aimed to "Achieve universal primary education". The new goal goes beyond the basic objective of putting kids in schools to asking whether children reach at least a minimum level of learning, and whether the benefits of a quality education are shared in an equitable manner.

The more ambitious SDG 4 goal is matched with an equally ambitious monitoring framework, which includes 11 global indicators, with an additional 32 thematic indicators under the umbrella of Education 2030, the post-2015 education agenda. The indicators are to be disaggregated where relevant and possible by gender, wealth, location, disability status and other vulnerable groups. As of June 2017, it was considered that around half of these 43 indicators required either further methodological developments, or significant work to increase data coverage, before they can be used for monitoring on a consistent basis.

The complexity of the education process requires comprehensive monitoring. However, the breadth of measurement included in the SDG 4 framework creates challenges. A long list of indicators may be difficult for the global education community to rally around and to communicate urgency. This may also impede attracting attention from outside of the education sector and successfully competing against other sectors for funding by national governments and international donors. Compared to infrastructure and health, education is not doing so well. The share of education in total development aid fell from 10.2% in 2010 to 8.2% in 2014, while the health sector's share has continued increasing over the past decade to reach 15%.[1] Education also continues to be underfunded in emergency situations, receiving less than 2% of total humanitarian funding in 2015.[2] And yet SDG 4 will only be achieved with the sufficient investment of resources.

Because of the challenges of SDG 4 having so many indicators, some members of the global education community, such as the International Commission on Financing Global Education Opportunities (the Education Commission) in its report, *The Learning Generation*, have called for the development and widespread dissemination of a simple, ***global composite indicator for education to serve as an advocacy tool***.[3] Such an indicator could play a similar role as the number of out-of-school children did under the MDG and Education for All (EFA) agendas, serving as a flagship indicator to complement the formal monitoring

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[1] UNESCO (2016). "Donors should dedicate 10% of their aid to education". World Education Blog, GEM Report. https://gemreportunesco.wordpress.com/2017/04/28/donors-should-dedicate-10-of-their-aid-to-education/

[2] UNESCO (2016). "Aid to education stagnates, jeopardising global targets". Policy Paper 25. http://unesdoc.unesco.org/images/0024/002448/244817E.pdf

[3] International Commission on Financing Global Education Opportunity (2016). *The Learning Generation: Investing in education for a changing world.* http://report.educationcommission.org/report/

framework. The aim would not be to reduce the scope of the SDG 4 agenda, which successfully embraces the breadth of education and goes beyond the more limited outlook of the MDG and EFA era. Instead, a composite indicator, used as a powerful advocacy tool, could increase attention and potentially funding to benefit all the areas of the SDG 4 agenda.

The UNESCO Institute for Statistics (UIS) has responded to the call for a global Composite Indicator for Education (CIE) by publishing global and regional estimates that ***bring together the quantity and quality*** dimensions of the education process to reflect the new SDG 4 agenda. This is necessary. Any indicator focusing solely on quantity, i.e. school participation, such as enrolment, out of school or completion rates (all of which are included in the Education 2030 monitoring framework), will hide the fact that some children, while in school, may not be learning even the basics. SDG Indicator 4.1.1. is the first and central learning indicator of the framework, but focusses on learning *in* schools. However, countries with low participation (and in many lower income countries, participation is still far from universal) may have skewed learning assessments results because of a selection effect that keeps poorer and more marginalized children – who tend to perform less well – out of school and therefore, outside of the range of measurement.[4]

Bringing together participation and learning has successful precedents. For example, the Education for All Global Monitoring Report 2012 did so by estimating the number of primary school-age children worldwide who either do not reach grade 4, or do not reach a basic proficiency level established by cross-national learning assessments. The resulting figure, "250 million children not learning", resonated with the global education community and beyond, and has been widely cited since then. A composite measure of educational quantity and quality was also created and tested for 11 African countries, using data on grade completion from the Demographic and Health Surveys (DHS) and results from the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SEACMEQ).[5] The impact of "250 million children not learning" is a strong indication that estimates such as this are valuable for advocacy. They are easy to understand and have a shock value that attracts much-needed attention to the unfinished business of ensuring access and quality education to all.

The new figures published by the UIS are indeed staggering. Globally, ***617 million children and adolescents are not reaching minimum proficiency***, either because they did not have access to school or dropped out before reaching the last grade of the primary or lower secondary cycle, or because they did reach the last grade but not a minimum proficiency level in reading or mathematics. This is equivalent to almost 6 out of 10 children and adolescents between the ages of 6 and 15.[6]

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[4] Spaull, N. and S. Taylor (2015). "Access to What? Creating a Composite Measure of Educational Quantity and Quality for 11 African Countries". *Comparative Education Review*, Vol. 59, No.1. The University of Chicago Press.

[5] Ibid.

[6] For more of the actual figures estimated, including regional estimates, please see UIS Fact Sheet No. 46 " More Than One-Half of Children and Adolescents Are Not Learning Worldwide", September 2017. http://uis.unesco.org/sites/default/files/documents/fs46-more-than-half-children-not-learning-en-2017.pdf

The purpose of this paper is to explain the rationale for and describe the methodology used for this new Composite Indicator for Education of "Children Not Learning" (CNL). The CIE is not meant to compete with or replace the SDG 4 monitoring framework, but to instead help drive it forward. To avoid overburdening countries with more data requirements, it uses the same underlying data as for other indicators in the SDG framework. Building on existing efforts to create such a composite indicator, it should be integrated into the global monitoring process of the UIS so that it can be updated regularly and widely disseminated.

The first estimates produced global and regional figures, as they are meant to give a snapshot of the current learning crisis. In the future and if a CIE is adopted by the global education community, country-level figures could also be produced using the same methodology. It is likely that in the short-term, not all countries will have the necessary data measurements, especially in terms of learning assessment data. Over the next few years, it will be important to focus on filling those gaps.

Criteria for choosing a composite indicator for education

Relevance

The most important criteria for a composite indicator is whether it is relevant to the current educational development agenda. In the new SDG framework, ensuring all children are *in* school remains crucial, but the new agenda explicitly goes beyond *participation* to include *quality* and *equity*. As such, a CIE should ideally be responsive to all three dimensions of *participation*, *quality* and *equity*. This criteria rules out one-dimensional indicators, such as the under-five mortality rate, as a model. Instead, the composite indicator should embed multiple key dimensions of the SDG 4 agenda.

The Children Not Learning indicator brings together participation and learning, but does not yet explicitly integrate equity beyond calculating gender parity indices for the indicator. It is becoming increasingly clear that in many settings, discrepancies between urban and rural populations, or between socio-economic groups, are now as large or larger as those between girls and boys. Due to considerations about data availability, administrative data were used for the participation component, which means that only the gender dimension could be calculated. However, calculating parity or other equity indices for other subgroups should be a goal for future developments of the CNL indicator.

The CIE should use the same data as that will be used to monitor SDG indicator 4.1.1, that focuses on learning in schools.[7] Results from learning assessments will be used to calculate the learning factor, and more specifically the minimum achievement that allows a person to fully function in society. However, this should not reinforce the notion that learning outcomes in reading and math are the *only* relevant aspects of education quality. For example, issues such as the quality of schools as spaces safe from violence should not be neglected.

Responsiveness

The CIE should be *responsive* to the above dimensions in the sense that relevant changes "on the ground" are reflected, and with little delay. An example of a measure that performs poorly in this respect is the Mean Years of Schooling (MYS) in the adult population. Even if non-entry and drop-out were eliminated tomorrow, such a radical improvement would only become noticeable in MYS years later, when a sufficient cohort of beneficiaries enters its calculation. Since such a delay occurs *in addition* to delays due to data collection and processing, the CIE must visibly respond to relevant policy interventions within at most 2 years to serve a useful purpose for guiding policy adjustments on the SDG timescale of 10 to 15 years. This suggests that a CIE should ideally be sensitive to current developments in SDG-related policy, while robust enough to resist random fluctuations and measurement error.

This requirement rules out any kind of indicators related to differences (or even differences-of-differences) rather than levels directly. For instance, measuring gender inequity by whether the enrolment of girls improves more rapidly than the enrolment of boys would likely show fairly erratic results from one year to the next.

Transparency

Because it is meant first and foremost as an advocacy tool, the construction, calculation and interpretation of a CIE should be easy to understand and communicate. A CIE should be as simple as possible, but as complex as necessary, meaning that the essential idea behind a CIE should be easy to communicate, even if its technical definition is more complicated. The Human Development Index (HDI), for example, falls into this category: it is likely that most of those who feel they understand what it measures would be unable to explain accurately how GDP, or indeed life expectancy, is actually defined and calculated.

Data requirements

Data requirements affect how simple a CIE can be. There is a trade-off between covering more dimensions and covering more countries. Learning outcomes data in particular are currently available for fewer countries than participation data. However, because the CIE is meant to be global, it is felt crucial to cover the largest possible share of countries and/or the world's population. The methodology chosen means that it was possible to produce regional and global estimates of the CIE on data already available. More precisely, the CIE relies on the same underlying data as indicators already part of the SDG 4 monitoring framework.

Decomposability

Decomposability in relation to a CIE concerns elements of an indicator rather than distinct subpopulations. The HDI, for example, can be decomposed into its economic, education and health components, and the Net Enrolment Ratio (NER) can be decomposed into enrolment rates at different grades. Both decompositions follow the way these indicators are calculated from the bottom up.

Slightly different is the case of decomposition in the style of the "typology" of out-of-school children (OOSC). This expresses OOSC at a given time as the sum of three types: those who have already dropped out of school, those who will never go to school, and those who have not yet been to school but will enter in the future. Compared to the previous examples, this is a top–down decomposition that does not reflect the way the aggregate figure is actually calculated. Nevertheless, for purposes of communication and interpretation, as well as in terms of policy implications, this type of decomposition can serve a useful purpose.

Since it builds on the OOSC methodology, the CNL indicator is derived from component indicators that are meaningful in their own right, and allow for decomposition into narrative types, i.e. the participation and learning component can be looked at separately.

From "out of school" to "children not learning"

In some ways, the number of out-of-school children (or its effective complement, the NER) became the *de facto* flagship indicator during the EFA and MDG era. The most visible change in the Education 2030 and SDG era is the stronger explicit focus on education quality. In practice, for monitoring purposes, this is increasingly interpreted in terms of learning outcomes. The most obvious way to extend the notion of OOSC to serve as a CIE for the new agenda is therefore to focus on reducing the number of children who are either not in school or not learning.

The **Children Not Learning (CNL) indicator** captures *the share (or number) of children not learning*, or more precisely *the proportion (or number) of children ultimately not meeting the learning goals for the primary cycle and/or the lower secondary cycle*. It adds the number of children who are in school, but are not reaching the minimum level of proficiency according to the TIMMS, PIRLS or PISA assessments,[8] to those who are not in school and assumed not to be reaching minimum proficiency.

The **assumption** is that for a child to achieve the minimum required proficiency level at the end of primary education, they first need to start school, progress to the last grade of the level and consequently attain at least the minimum level of proficiency in an appropriate learning assessment test.

This assumption is shown in Table 1, where the proportion of children not learning is A + C. The formula for children not learning is therefore: total – D = A + B + C. The formula assumes that there will likely be very few children in group B, i.e. not in school but nonetheless reaching minimum proficiency.

[8] Trends in International Mathematics and Science Study (TIMMS), Progress in International Reading Literacy Study (PIRLS) and Programme for International Student Assessment (PISA)

Table 1. Matrix of school participation and learning status

	Learning <minimum	*Learning minimum*
Not in school	A	B (~0)
In school	C	D

Note: This assumption does not imply that those who dropped out of primary school did not learn *anything*. The question is whether they should be expected to have reached the learning *goals* for primary school.

However, in settings where drop-out before reaching last grade of primary is significant, the proportion actually reaching primary school learning goals *even among primary school completers* tends to be relatively low. Accordingly, there is little reason to expect primary school drop-outs to have reached these learning goals by the time they have dropped out.

Where learning assessments are school-based, no observed learning measure is available for children not in school and their learning status must therefore be imputed in order to estimate CNL. It is reasonable to impute below-threshold learning to out-of-school children, or those dropping out before reaching last grade, who were not assessed, as this is likely to be accurate. If the above assumption is not true, in other words, if a significant number of children are not in school despite having met the learning goals, then the product formula will conservatively *overestimate* CNL.

Calculations

1. Primary age group CNL

The primary school-age population can be grouped into the following categories and subcategories in terms of school exposure:

- i. Children in school
  - a. In various grades of primary school
  - b. Already in lower secondary education. This group is assumed to have already achieved the minimum proficiency.
- ii. Out-of-school children
  - c. Attended school in the past and dropped out
  - d. Never attended and will not attend school in the future
  - e. Never attended but will attend school in the future.

The number of primary school-age children not learning (CNL) equals the total school-age population (SAP) minus the number of children who are expected to achieve the minimum proficiency level (CL).

$$CNL = SAP - CL$$

The estimated number and proportion of children of primary school age expected to achieve the minimum proficiency level in reading and mathematics at the end of primary education is assumed to be the sum of the groups below:

1. Students in primary school who are expected to reach the last grade and achieve at least the minimum proficiency at the end of primary education:

   $= \left(\sum_{1}^{last} E._{1}\,.AgI_{1}.Gn \times SR_{ntlast}\right) \times (Ind_{4.1.1})$ where:

   a. *E.1.Agl.1.Gn* is the number of primary-age children enrolled in grade n of primary school
   b. SR_{ntlast} is the survival rate from grade n to the last grade, or the probability of a student in grade n reaching the last grade of primary school
   c. $Ind_{4.1.1}$ is the proportion of students achieving minimum proficiency in the subject in question (reading or mathematics) by the end of the level.

2. Out-of-school children of primary school age who are expected to enrol in school, reach the last grade and achieve at least minimum proficiency at the end of primary education:

   $= OFST_{.1} \times Ple \times SR_{1tlast} \times Ind_{4.1.1}$ where:

   a. $OFST_{.1}$ is the number of out-of-school children of primary age
   b. Ple is the proportion of out-of-school children of primary age who are expected to enter primary school in the future
   c. SR_{1tlast} is the survival rate from the first to last grade or the probability of a student in grade 1 reaching last grade
   a. $Ind_{4.1.1}$ is the proportion of students in the last grade who achieve minimum proficiency in the subject in question (reading or mathematics) by the end of the level.

3. Primary-age children enrolled in secondary education who are assumed to have achieved at least minimum proficiency at the end of primary education.

Figure 1. Illustration of the methodology to estimate CNL of primary school age

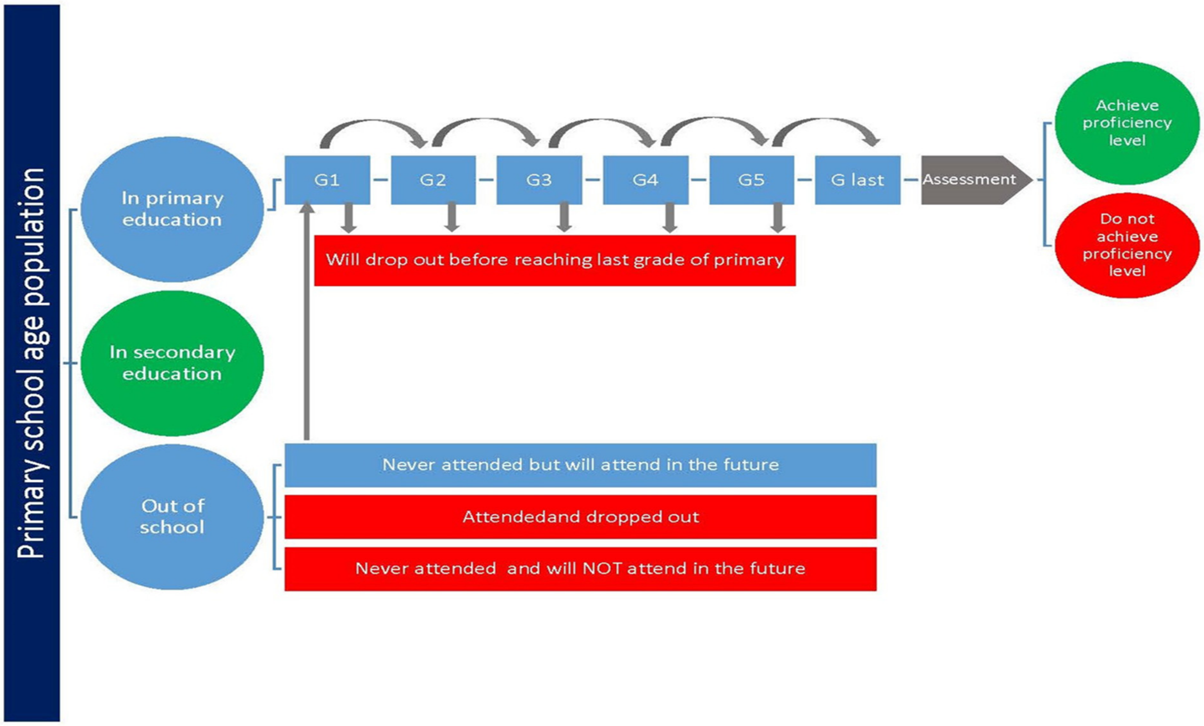


Table 2 illustrates the calculation of CNL for primary education for a country where:

- There are 1,850,739 children of primary school age (6–11 years old)
- 34% of children in the last grade achieve minimum proficiency in reading
- 397,682 are counted as "children learning", which include:
    - 351,686 currently attending primary *and* expected to reach the last grade (6) *and* achieving minimum proficiency in reading
    - 19,392 already in lower secondary education and assumed to have achieved minimum proficiency
    - 26, 605 who are currently out of school but expected to attend in the future *and* reach the last grade *and* achieve minimum proficiency
- 1,453,047 are counted as "children not learning", which include:
    - 727,498 who will reach last grade (either already in school, or out of school but expected to attend in the future) but will *not* reach minimum proficiency
    - 725,559 who are already out of school and are not expected to attend in the future, *or* are currently in school but are expected to drop out before reaching the last grade of primary school.

Table 2. Numerical example of children not learning calculations for primary education

	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6 (last)	Total reaching last grade	Reaching last grade AND achieving min. prof.	Not reaching last grade	Grand total
In primary education	343,810	311,578	276,313	226,964	166,639	125,136				
Survival rate to last grade	56%	65%	68%	78%	86%					
Will reach last grade	193,290	202,276	186,705	176,987	143,626	125,136	1,028,020	351,686	422,420	
In secondary education							19,392	19,392		
Out of school										
Expected to attend in the future	138,329						77,769	26,605	60,560	
Dropped out									120,522	
Never attended and will NOT attend in future									122,056	
					Proportion of children in last grade reaching min. prof.			34%		
					Children learning			397,682		397,682
					Children not learning		727,498		725,559	**1,453,057**
					Total primary school-age population (6–11)					**1,850,739**

2. Lower secondary school-age CNL

The lower secondary school-age population can be grouped into the following categories and subcategories, in terms of school exposure:

i. In school:
   a. In different grades of primary school
   b. In different grades of lower secondary school
   c. In upper secondary education. This group is assumed to have already achieved the minimum proficiency level for lower secondary education.

ii. Out of school

   There is not enough information about out-of-school adolescents of lower secondary school age and their school exposure. These adolescents are considered, for this particular study, as not having achieved the minimum proficiency level set for the end of lower secondary education.

Therefore, the estimate of the number and proportion of adolescents of lower secondary school age expected to achieve the minimum proficiency level in reading and mathematics at the end of lower secondary education is the sum of the groups below:

1. Students (of lower secondary age) in primary school who are expected to reach the last grade of primary, transit to lower secondary school, progress to the last grade of lower secondary education and achieve at least the minimum proficiency at the end of lower secondary education:

   $= \left(\sum_{1}^{last} E._{1}\,.\,AgI_{2}.\,Gn \times SR_{ntlast.1}\right) \times ETR \times SR_{ntlast.2}\,(Ind_{4.1.1})$ where:

   a. $E._{1}\,.\,AgI_{2}.\,Gn$ is the number of lower secondary-age adolescents enrolled in grade n of primary school
   b. $SR_{ntlast.1}$ is the survival rate from grade n to the last grade, or the probability of a student in grade n reaching the last grade of primary school
   c. *ETR* is the effective transition rate from primary to lower secondary education
   d. $SR_{ntlast.2}$ is the survival rate from grade n to the last grade, or the probability of a student in grade n reaching the last grade of lower secondary school
   e. $Ind_{4.1.1}$ is the proportion of students achieving minimum proficiency in the subject in question (reading or mathematics) by the end of the level.

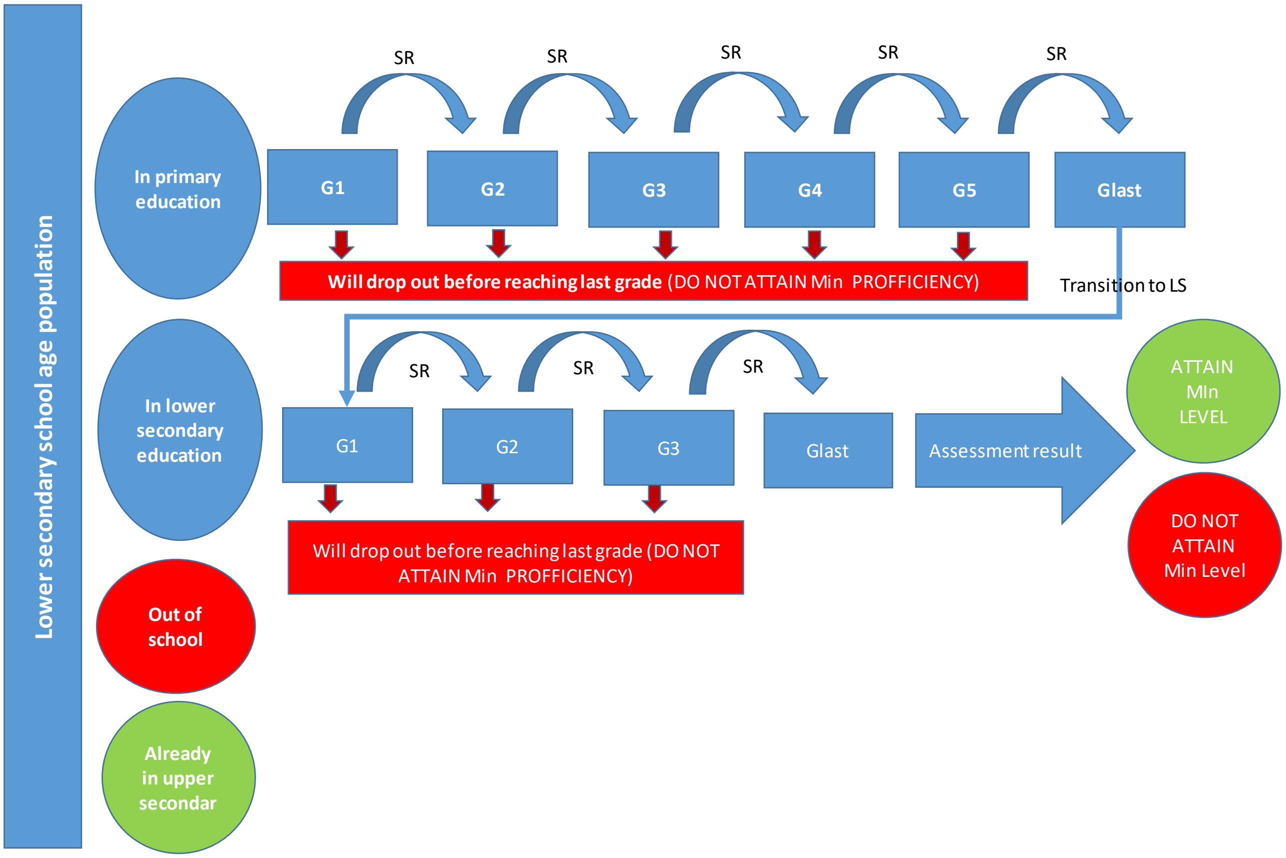
2. Students in lower secondary school who are expected to reach the last grade and achieve at least the minimum proficiency at the end of lower secondary education:

   $= \left(\sum_{1}^{last} E._{2}\,.\,AgI_{2}.\,Gn \times SR_{ntlast.2}\right) \times (Ind_{4.1.1})$ where:

   a. $E._{2}\,.\,AgI_{2}.\,Gn$ is the number of lower secondary school-age children enrolled in grade n of lower secondary school
   b. $SR_{ntlast.2}$ is the survival rate from grade n to the last grade, or the probability of a student in grade n reaching the last grade of lower secondary education
   c. $Ind_{4.1.1}$ is the proportion of students achieving minimum proficiency in the subject in question (reading or mathematics) by the end of the level.

3. Lower secondary-age adolescents enrolled in upper secondary education who are assumed to have achieved at least the minimum proficiency at the end of lower secondary education.

Figure 2. Illustration of the methodology of estimating CNL of lower secondary school age



Data sources and definitions

If a CIE is meant to serve as a rallying cry to communicate the urgency of the learning crisis, it is essential that it can be at least estimated using currently available data. In theory, the most direct way of assessing the learning proficiency of the school-age population would be through national sample-based surveys that would assess children in and out of school. However, this initiative would require considerable resources, and may not be a priority in many countries, especially those at a lower stage of development or income.

To measure **participation**, the choice is between household surveys and administrative data. The country coverage and regular collection of high-quality household survey data tends to be significantly lower than administrative data, as these surveys are rarely implemented more often than every 3 to 5 years. Secondly, they potentially suffer from a misalignment of the age measurement with the academic calendar.[9] On the

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[9] Barakat, B. (2016). "Sorry I Forgot Your Birthday!: Adjusting Apparent School Participation for Survey Timing When Age Is Measured in Whole Years". *International Journal of Educational Development* 49, pp. 300-313.

other hand, almost all countries around the world can provide administrative data, as they maintain a good registry of enrolment by grade and age, and this data is collected annually through the UIS formal education survey and the UNESCO-OECD-EUROSTAT (UOE) joint survey which together cover all of the world's countries. For this reason, administrative data was used in the calculation of the CNL, and more precisely enrolment by age and grade and repeaters by grade for the years 2014 and 2015. The main downside of administrative data is that they do not allow disaggregation by subgroups other than gender.

The **learning** component uses existing cross-national assessments data anchored to a common scale to allow for some degree of comparability.[10] The new full database includes results from TIMMS, PIRLS, PISA, LLECE, SEACMEQ and PASEC,[11] covering 160 countries together. For the first estimates of CNL however, only assessment data from 2006 or later was used, with actual data for 127 countries. When no cross-national learning assessment data were available, a number of estimates were made to produce the regional and global figures. For example, only a few countries in sub-Saharan Africa have administered cross-national assessments at the end of lower secondary education. Therefore, students from these countries were assumed to be achieving the same relative proficiency as students at the end of primary education. Furthermore, and in order to estimate meaningful regional aggregates, the proportion of students achieving minimum proficiency level at the end of primary education by subject were assumed to be equal to the proportion of students achieving the minimum proficiency level at the end of lower secondary education. This treatment was applied to countries with large regional weight such as China, Egypt and India. For other countries with missing data for the share of students achieving minimum proficiency, the respective regional averages of countries with available data were used.

The **minimum proficiency** levels are those used in some of these existing assessments. Several years will be required to resolve all of the methodological and political issues needed to report on SDG Indicator 4.1.1 on the same scale. For example, there is currently no global consensus on how to define minimum proficiency levels in reading and mathematics. The challenges are primarily due to the fact that learning assessment initiatives use different definitions of performance levels. In response, the new UIS database uses two different benchmarks to reflect the contexts of countries with different income levels. For the basic (1) proficiency level at primary, the level is the one defined as minimum by SEACMEQ for reading and mathematics. For the minimum (2) proficiency level, which is more difficult to attain than the basic one, the one defined by the International Association for Evaluation of Educational Achievement (IEA) for the PIRLS and TIMSS was used. At lower secondary level, the OECD's Programme for International Student Assessment (PISA) minimum benchmark was used for reading and mathematics. It should be noted that the headline

[10] For more details see Altinok, N. (2017). "Mind the Gap: Proposal for a Standardised Measure for SDG 4-Education 2030 Agenda", UIS Information Paper No. 46. Montreal: UNESCO Institute for Statistics (UIS).
[11] Trends in International Mathematics and Science Study (TIMMS), Progress in International Reading Literacy Study (PIRLS), Programme for International Student Assessment (PISA), Latin American Laboratory for Assessment of the Quality of Education (LLECE), Southern and Eastern Africa Consortium for Monitoring Educational Quality (SEACMEQ - previously SACMEQ) and Analysis Programme of the CONFEMEN Education Systems (PASEC).

figure of “617 million children and adolescents not learning” is based on the more difficult minimum proficiency benchmark for reading – for mathematics, the figure is 605 million.

Additional methodological considerations

The CNL is a measure of **stocks** rather than flows. Flows refer to a current event, such as the number of children dropping out of school, whereas stocks reflect the cumulative effect of flows, such as the number of children who dropped out of school at some point in the past. Stocks tend to be less responsive. However, focusing on flows exclusively risks overlooking vulnerable or disadvantaged populations, by neglecting the legacy of past inequities.

The CNL uses a **synthetic (or reconstructed) cohort** method. Cohort measures capture the cumulative experience of individuals. An example is the Mean Years of Schooling in a given age group. Because the behaviour in question is only measured retrospectively, a key disadvantage is that cohort measures are only available with a delay. For example, Mean Years of Schooling are typically calculated for young adults above the age of 15 or even higher. They are therefore sensitive to school entry rates some 10 years ago, not current school entry. In order to capture *current* dynamics, the device of a “synthetic cohort” can be employed. The CNL considers what the current 6–15 years old cohort *would* achieve in terms of learning if the current conditions remained constant in the future.

The CNL, like its close cousin the OOSC rate, does not represent an actual headcount of children not learning, but rather uses a **“persons-time”** approximation. The distinction matters because some children experience periods away from school without necessarily having dropped out entirely. Snapshot surveys will count those who happen to be enrolled and attending at the time of the survey as enrolled, and the others as being out of school. Consider, as an artificial example, a population consisting of four communities with different livelihoods and agricultural calendars, such that in each calendar quarter, children from a different community are away from school. Note that: a) the true share of children with OOS experience is 100 percent, and all are equally affected, b) the true share of OOS *childhood* is 25 percent, and c) the estimated OOSC figure based on a cross-sectional household survey is likewise 25 percent.

The CNL is a **“poverty rate” type of indicator**, rather than an asset one. Asset indicators measure how much of some good the average individual possesses. By contrast, poverty indicators measure how many individuals fall below a certain threshold. The CNL measures the share of students failing to reach minimal proficiency, rather than the average score on a learning assessment. This has communication advantages. Firstly, the target is unambiguous, namely zero poverty, whether this refers to income or premature death or premature school drop-out. Secondly, the zero target remains meaningful with respect to the absolute number of the poor. Indeed, calculations such as “x million children remain out of school in 2015” frequently serve as headline figures. By comparison, the absolute number of school years gained globally is of limited interest.

The CNL uses the **school-age population** (of primary and lower secondary education), which allows for variation in entry age and duration of school. Depending on countries' entry age and duration, the primary school-age group represents the age group 6 to 11 years while lower secondary education covers the group 12 to 15 years old. The reasoning is that children in these age groups are clearly required to be in school in order to satisfy SDG 4.

Other options

One important element about the CNL is that there is no credit given to increasing enrolment, until and unless the newly entered children achieve the minimum level of proficiency**.** On the one hand, it can be argued that the overall proportion of children learning intrinsically represents a composite measure of the quantity and quality of schooling.[12] On the other hand, it can be argued that non-participation enters the calculation of the CNL only as a proxy for non-learning (via the assumption that those not in school are not learning), not in its own right. The essential question is whether a "pure enrolment increase" is interpreted as "an increase in enrolment, all else being equal, including average learning in school", or as "an increase in enrolment, whether the additional students reach the learning goals or not". CNL is responsive to the former, but not the latter.

This is not merely a philosophical question, but has practical consequences. In particular, administrative data tend to be available at more frequent periods than learning outcomes. Suppose that there is in fact a trade-off between quantity and quality. This does not necessarily require learning at existing schools to suffer as enrolment increases; it is sufficient for expansion to be achieved by opening a large number of community schools with classes taught by "para-teachers", for example, where learning outcomes are below average. In this situation, the CNL indicator will initially show an increase, as a larger proportion of children in school is multiplied with the latest available learning factor. However, this apparent increase will diminish once the learning factor is corrected at the next assessment. In other words**, the CNL may be subject to fluctuations that are statistical artefacts.**

The CNL gives *no* credit to countries for the intermediate step of expanding or even universalizing enrolment *unless* those children also reach the learning goals. To address this possible shortcoming, and to explore other avenues for a CIE, three alternatives to the CNL are presented below.

[12] Ibid.

Years of Schooling Lost indicator

Rather than calculating how many children in or out of school do not reach minimum proficiency, the "Years of Schooling Lost" (YSL) indicator captures the notion of *the number of school years lost by each child to non-enrolment or lack of learning*, specifically:

$$\mathrm{YSL} = \left(\mathrm{OOS} + \mathrm{NER} \times \mathrm{NL}^{\text{last grade}} \times \frac{1}{2}\right) \times d_{\mathrm{P}}$$

where d_{P} is the duration of primary schooling in numbers of grades. Two extra factors are introduced here, compared to CNL. Firstly, a factor of 0.5 is applied to those in school, but not learning. Secondly, the entire expression is multiplied by the number of grades in the primary cycle.

Weighting partial progress

The factor of 0.5 differentiates between being in school but not meeting learning standards and not being in school at all. By contrast, the CNL indicator does not distinguish between these two states, and counts them equally (0). The rationale and practical consequence in terms of monitoring the progress of educational expansion is that with the 0.5 weight, partial progress is recognised, whereas CNL is "all or nothing".

Note that the definition of CNL actually corresponds to a weight of 1 in the same place, and that a weight of 0 simply yields the OOS rate. "Weights" can be generically understood as reflecting the relative influence on the overall CIE. It then becomes clear that *it is mathematically impossible to take into account more than one dimension without assigning weights – whether explicitly or implicitly*. In other words CNL and YSL do not differ in *whether* weights are assigned, only in what those weights are.

A consequence is that if a country's relative rank drops as we move from CNL to YSL, this is indicative of relatively high (within-group) inequality, as it means that children tend to be either in a school environment of sufficient quality to learn, or not at all. As a simple example, consider one country where these two groups each account for half the school-age population, and another where every child is in school, but not quite meeting learning standards. Under CNL, the first country has a score of 50% and the second of 0%, whereas under YSL, they are tied at 50%. The key property of the 0.5 weight is not the numerical value, but that it treats enrolment and learning *equally and symmetrically*, in the absence of a strong argument to prioritize one over the other. Otherwise, the difficult question arises of whether enrolling one more child is "more" or "less important" than ensuring that one more current student learns successfully.

Scaling to years of schooling

The effect of the scaling factor d_P is that the "worst case" benchmark is not an indicator value of 1 as it is for CNL (where it would mean: all children are not learning), but equal to the number of school years. In other words, the average loss captured by the indicator is not standardised to the unit of "per child, per year", but to "per child, over the course of primary schooling". This is similar to the difference in scaling between the

NER and the Expected Years of Schooling (EYS) indicator, which otherwise only differ in terms of population weighting. Caution must therefore be taken when directly comparing CNL and YSL figures side by side, since they are not on the same scale.

Table 3. Example calculation for years of schooling lost

Grade	% of school-age population by grade	NER (by grade)	Proportion in school not reaching minimum proficiency	YSL= (∑ a_g*((1 – b_g)+(b_g*c)/2)/100/(#grades)		
	a	b	c			
4	25	0.6	0.4	25*((1-0.6)+(0.6*0.4)/2)	13	
3	25	0.7	=	25*((1-0.7)+(0.7*0.4)/2)	11	
2	25	0.9	=	25*((1-0.9)+(0.9*0.4)/2)	7	
1	25	0.8	=	25*((1-0.8)+(0.8*0.4)/2)	9	
				∑	40	/ 25
				YSL	=	1.6

Together, these two adjustments mean that the resulting figure can be interpreted as an approximation to the average number of school years lost by each child, where school years without sufficient learning count as "half lost". The main advantage of YSL is that the problem of potential "phantom improvement" in CNL is attenuated, because half of the gains in enrolment do legitimately improve the YSL. However, its more visible use of weights than CNL may invite questions (even though CNL implicitly gives a weight of 0 to being in school without achieving minimum proficiency). More broadly, it is harder to communicate to the general public than the CNL – a headline of "2.3 years of schooling lost" is less striking and understandable than "One-quarter of children are not learning the basics". This is the mean reason why the CNL, rather than YSL, was chosen for the CIE estimates produced by UIS.

Quality-Equity-Adjusted-School-Years

The aim of Quality-Equity-Adjusted-School-Years (QEASYs) would be to mimic the DALY/QALY approach. Quality-Adjusted-Life-Years (QALYs) are widely used to compare the benefit of different health interventions, including at the individual level. Similarly, Disability-Adjusted-Life-Years (DALYs), specifically DALYs *lost* (relative to a benchmark life expectancy) , are used in the Global Burden of Disease study from a public health perspective. In both cases, life-years are weighted with health-related weights before being aggregated across the lifespan and individuals. Conceptually, one QALY/DALY is equivalent to one lost year of life in full health. For QEASYs, school years would be weighted by learning and equity experienced in that year, and compared to a "gold standard" of a full course of high-quality, equitable schooling.

In principle, the specific choice of indices to motivate the quality/learning and equity weights is entirely flexible, and similar measures as those listed further below as options for the EDI could be chosen. However, in practice the choice is likely to be dictated by data availability, since grade or age-specific information is required to take full advantage of the set-up.

An added subtle factor in the education context is the "counterfactual" to assess the cost of drop-out. Is the appropriate counterfactual the attendance of a full-value year, or in the potentially quality-compromised school year that is actually offered? In other words, is the poor quality of a school year missed a loss due to being out of school or due to low quality? In health, the specific counterfactual to death (healthy or disabled life-years?) is less relevant, because either way the loss is attributed to a given health condition. However, in education, the interest rests less on decomposing the lost years according to different "conditions", but more on attributing it to either "disability" (poor quality) or "death" (not-enrolment).

While age-weighting is controversial in the health context, the case for using it for QEASYs may be stronger. Giving a greater weight to lower ages, in other words, ages closer to school entry, could be justified on at least two grounds. Firstly, getting entrants into school now still provides an opportunity to subsequently improve quality, but gaining QEASYs among those already in school at the expense of access is less likely to give opportunities to catch up. Secondly, learning is partly cumulative, and some of the failure to learn as expected at higher grades results from gaps in earlier learning. As a result, improving learning at younger years likely has a larger, compound effect than improving learning at older ages.

The main advantages of QEASYs is that they are measured in standard units of one "equitable high-quality school year", and that the same indicator can be used to assess individual benefits of specific policy interventions (similarly to the "cost per QALY" approach to ranking the cost–benefit of health interventions). The main disadvantages are that they are require much data for age or grade-specific information, and that while their interpretation is intuitively accessible, the detailed calculation is relatively complex.

The Educational Development Index

The Human Development Index (HDI) provides the simplest template for combining multiple dimensions into a composite index. If the education CIE is to be defined by analogy with the HDI, a suitable name would be the Educational Development Index (EDI), in order to highlight the similarity and evoke appropriate expectations.

At the structural level, the EDI could be defined as the product of three component indicators for the dimensions of access, learning and equity. The benefit of an HDI-style indicator is precisely that the components can be defined independently, and each measured at the aggregate level, without requiring individual years of age. Each component indicator should be normalized to the range 0 to 1.

Note that the choice of NER for the participation component and the share reaching minimum proficiency (i.e. CNL) is a plausible option, and both are already scaled to the range of 0 to 1. However, this would result in an indicator whose only difference to the YSL as specified above would be in multiplying instead of adding these components. In this sense, the YSL can already be interpreted as an "HDI-style" indicator. For the purposes of specifying a clear, alternative option, it seems preferable therefore to consider a different combination of component indicators. In particular, as in the HDI, it is possible to combine multiple subcomponents per dimension. In this way, for example, both stock and flow dynamics can be captured.

An illustrative specification for the EDI that takes advantage of this opportunity to "cover all bases" could combine:

1. A participation component, consisting of the weighted average of:
    a. A survey-based rate of lower-secondary completion among 15- to 24-year-olds (weight 0.4)
    b. EYS (weight 0.4)
    c. A measure of access to early childhood education (weight 0.2)
2. A quality component, consisting of the average of:
    a. The average share reaching minimum proficiency in the final grade of primary and lower secondary (CNL)
    b. Two to three key input measures, such as the percentage of trained teachers, students per textbook and schools with utilities
3. An equity component, consisting of the average of:
    a. Primary/lower secondary GPI (disadvantaged gender in numerator)
    b. The distributional inequality index (such as, but not necessarily, Gini) of years of schooling among 15- to 24-year-olds

The above is intended as an example, not a proposal. For example, only SDG 4 target indicators could be used as EDI components.

The main advantages of the EDI are that it can combine stock and flow, poverty and asset, period and cohort perspectives, and that its flexibility allows replacing or adding individual components, for example if better quality data become available. Those familiar with public policy are also familiar with the HDI, and would likely understand the EDI in the same way. Nonetheless, a narrow range of index values encourages a misplaced focus on rankings instead of absolute performance. Also, there is no meaningful absolute number associated with the EDI that would characterize the size of a vulnerable population. The best way to get around this problem would be to set an arbitrary threshold and determine the number of school-age children worldwide exposed to an EDI of less than *x*.

Conclusion and next steps

The first estimates of the Children Not Learning composite indicator have produced shocking figures. Almost 6 out of 10 children and adolescents globally are not reaching a reading or mathematic level considered as minimum according to the PIRLS, TIMMS and PISA assessments. In sub-Saharan Africa, this figure is 9 out of 10. These figures show the value of such an indicator as a mobilizing and advocacy tool; they show the crisis in education is real and must urgently be addressed if the whole SDG agenda is to succeed.

The CNL indicator captures the key dimensions of the SDG 4 agenda: participation, learning, and although not fully explicitly, equity. The CNL is easy to understand for a non-statistician as it very simply does what it says, i.e. it counts the children not learning. Producing a CIE will not in itself place an additional burden on countries, as its subcomponents use the same underlying data as are used to produce indicators which are on the official list of the SDG 4 framework.

The CNL CIE is not meant to override the more detailed SDG and Education 2030 monitoring framework, which represents the breadth and complexity of the process underlying the achievement of SDG 4. It should be used as an advocacy tool, playing a similar role that the number of out-of-school children played under the previous MDG and EFA agendas.

Integrating equity more explicitly

The Children Not Learning indicator used to produce the figure of "617 million children and adolescents not learning" does not takes equity into account explicitly beyond gender parity. Nonetheless, **measuring learning by the share of children and adolescents reaching *minimum* proficiency implies that countries can only improve on that criterion by improving the learning among the disadvantaged poor performers**, rather than by focusing on average performance.

Nevertheless, it would be of interest to examine non-gender dimensions of inequality, such as urban vs rural, or wealth disparities, more directly by calculating the inequality *of* the indicator between different groups and producing parity indices for these other groups. It is arguably too limiting to define the equity measure *a priori* in terms of inequality between boys and girls. Indeed, the WIDE database suggests that in many, but not necessarily all countries, educational inequality by wealth exceeds gender inequality.

More methodological work is needed to explore how to show a CIE for different subgroups (e.g. rural vs urban, and by wealth quintile). One challenge relates to data sources. Since the CNL indicator uses administrative data for the participation component, disaggregation beyond gender is not currently possible. The use or integration of data from household surveys would be necessary to extend the calculation to other subgroups. However, these are not typically available for a large number of countries, and are not updated much more frequently than cross-national learning assessments. As a result, the indicator would be quite unresponsive. It is also difficult to match categories when using several data sources in a composite manner.

For example, population subgroups are not always defined in the same way between learning assessments and in household surveys.

Improving data on learning

The greatest challenge is around learning data. The feasibility and validity of a CIE including the learning dimension will be limited unless and until some key challenges around the measurement of learning at the global level are solved. The first issue relates to comparability. Although several cross-national learning assessments exist which test students from several countries on the same basis, the results cannot be compared *between* these assessments.

The second issue relates to coverage, as even bringing together all major regional and international assessments leaves out about one-quarter of the world's countries. Some important countries in terms of population, such as China, have only implemented PISA in a limited number of regions, and others have only done an assessment at the end of primary school. South and South-East Asia and sub-Saharan Africa are the least represented regions in learning assessments. As a group, low-income countries are the least represented.

As described in the methodology, initial figures produced for the CNL indicator rely significantly on estimates. To produce the global and regional estimates of the CNL, the UIS used the proportion of children not reaching minimum proficiency as estimated through an anchoring method for existing cross-national assessments.[13]

In the medium-term, data from selected national assessments as well as citizen-based assessments and household survey instruments could potentially be added, depending on methodological decisions taken in the context of reporting for 4.1.1.[14] If and when new methods to produce internationally comparable data on learning are developed, they would eventually replace the anchored assessment data. Even if and when such measures will be developed, they are unlikely to be updated more frequently than every three to five years.

These challenges are being tackled through the Global Alliance to Monitor Learning (GAML) and the Technical Cooperation Group on the Indicators for SDG 4 (TCG), and the objective should be for a CIE to use the same data that will be used to monitor SDG 4.1.1. Nonetheless, the initial regional and global figures published for the Children Not Learning composite indicator show there is a real crisis in learning, and the value of producing such an indicator.

[13] Altinok, N. (2017). "Mind the Gap: Proposal for a Standardised Measure for SDG 4-Education 2030 Agenda", UIS Information Paper No. 46. Montreal: UNESCO Institute for Statistics (UIS).

[14] These additional instruments include the Process Assessment of the Learner (PAL) assessments and the Multiple Indicator Cluster Survey (MICS) learning module. Household assessments also make it easier to include the learning of children who are "homeschooled".