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The cost of not assessing learning outcomes

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The UIS is based in Montreal, Canada.

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Introduction

Sustainable Development Goal[1] (SDG) 4 calls for the international community to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all". Education is a fundamental human right. As a catalyst for development, it is a key contributor to reducing inequality and scaling down poverty. Full access to quality education at all levels is an essential condition for accelerating progress towards the achievement of other SDGs.

Recently, the international community has gone a step further in monitoring education by attempting to measure learning. Currently there is no single approach or best way to monitor learning internationally. However, the rationale to come up with a viable approach to assess learning on a universal basis is growing stronger as the Education for All (EFA) and Millennium Development Goals (MDGs) come to a close and the international community advances towards the SDGs.

The focus on the quality of education has led to an emphasis on the measurement of learning outcomes at all levels. Input data, such as knowing how many children are enrolled in school or how many teachers are hired, are not enough. There is a need to know if children are learning in schools and to measure learning outcomes on a global scale to monitor progress. Five of the seven education targets in SDG 4 focus on learning outcomes (i.e. the effect of education on individual children, young people and adults).

This is a shift from previous global education targets, such as those in the MDGs, which solely focused on ensuring access to, participation and completion in formal primary education and on gender parity in primary, secondary and tertiary education. The Education 2030 targets highlight that enrolment and participation (e.g. in early childhood development programmes, formal schooling or adult education programmes) are the means to attain results and learning outcomes at every stage.

This includes a range of topics, such as school readiness for young children; academic competencies for children in primary and secondary education; functional literacy and numeracy skills; and skills for work, global citizenship as well as sustainable development for youth and adults. Indicators for global monitoring must emphasise this renewed focus on outcome measures. While the Inter-Agency and Expert Group on Sustainable Development Goal 4 (IAEG-SDGs)[2] is in the process of finalising the list of global monitoring indicators, it is clear today that a cross-national measure of reading and mathematics will be needed.

With the adoption of the SDGs and the Framework for Action for Education 2030, attention has turned to defining a plan and framework for monitoring progress towards the targets. This is the second part of the process to be tackled by the IAEG-SDGs, although UNESCO and partners have already started developing an approach to implement the agenda.

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1 https://sustainabledevelopment.un.org/content/documents/7891TRANSFORMING%20OUR%20WORLD.pdf

2 The IAEG-SDGs was established by the UN Statistical Commission to develop an indicator framework for all SDGs. More information on the November meeting is available at http://unstats.un.org/sdgs/.

No single organization can produce all of the data needed to monitor SDG 4 – which covers a wide range of issues from learning outcomes to global citizenship. Therefore, the first priority will be to develop the measurement framework for SDG 4, building on the progress made thus far to define indicators, assess data availability, coverage and evaluating the existing methodologies. In addition and as agreed by the IAEG-SDG, reliable measures are needed at each level to generate data that are comparable across time and disaggregated by age, sex, disability, socioeconomic status, geographical location (urban/rural areas) and other relevant factors.[3]

Since five of the seven education targets in SDG 4 focus on learning outcomes of children, young people and adults, this clearly is an area of priority for the Global Alliance for Learning (GAL) which is faced with the challenge of putting in place a system to measure and monitor progress in achieving these targets. To date, the IAEG-SDGs has identified 11 global indicators. One of the first challenges will be to address the development of metrics that could serve indicators related to learning outcomes, such as SDG Target 4.1: "Percentage of children/young people i) in Grade 2/3; ii) at the end of primary education; and iii) at the end of lower secondary education achieving at least a minimum proficiency level in (a) reading and (b) mathematics".

The global assessment landscape

Assessing learning outcomes has never been as dynamic as today. A profusion of assessments exist at international, regional and national levels *(see **Figure 1**)*, with research articles flourishing and media attention riveted on any new results from an international survey. League tables stir debate in every country, and opposition to these exercises is fierce in many of them.

In general, large-scale assessments can be divided into two categories: school-based or household surveys. School-based assessments include three types:

a. National assessments designed to measure specific learning outcomes at a particular age or grade that are considered relevant for national policymakers.

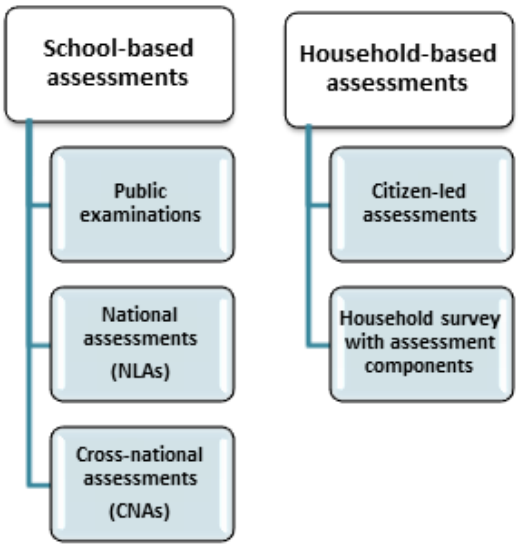
b. Cross-national initiatives (either regional or international) administered in a number of countries, based on an agreed upon framework, following similar procedures to yield comparable data on learning outcomes.

c. Public examinations intended to certify specific learning outcomes linked to curricula and often used to select students for continuing education programmes or attainment of a certain cycle.

In contrast, household-based learning assessments can be used to target populations that may or may not be enrolled in or attend school. They include citizen-led assessments and any household surveys with an assessment component in the data collection.

[3] See: http://www.un.org/ga/search/view_doc.asp?symbol=A/C.3/69/L.9/Rev.1

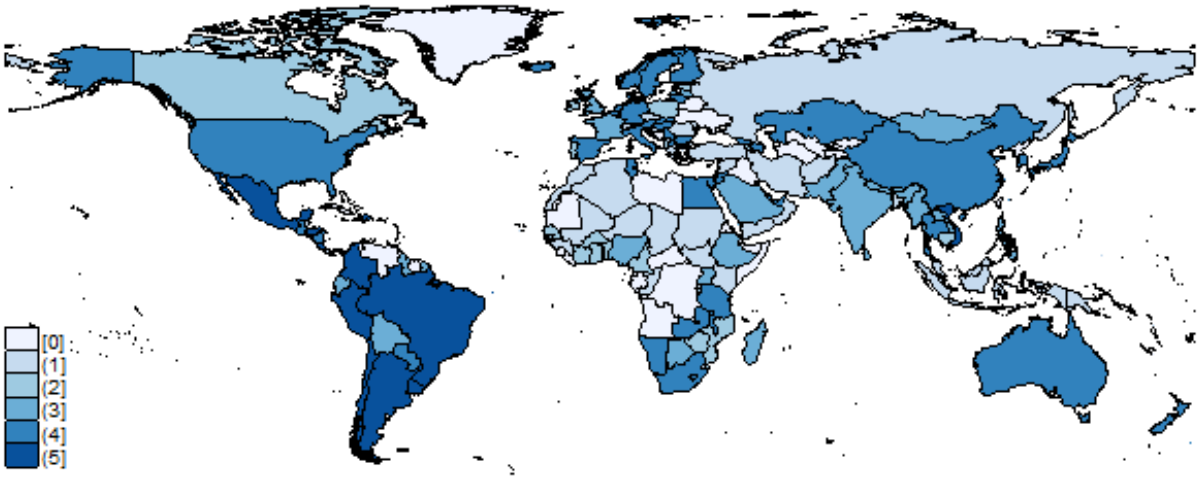
Figure 1. Types of assessments



Source: UNESCO Institute for Statistics (UIS)

The number of countries participating in national and cross-national assessments varies by region. Assessment activity is high in South Asia, North America and Europe *(see **Figure 2**)*. However, in sub-Saharan Africa, few countries participate in international assessments or conduct national assessments. Therefore, it will be essential to find ways to link existing national and cross-national assessments to produce a base for initial monitoring.

Figure 2. Intensity of assessment activity in the world: Findings from the Learning Assessment Capacity Index (LACI)



Note: The index is composed of five criteria based on the following questions: i) Does the country conduct national assessments in primary education between 2010 and 2015? ii) Does the country conduct national assessments in secondary education between 2010 and 2015? iii) Did the country have a national assessment for the two points of measurement in primary and secondary education between 2010 and 2015? iv) Does the country participate in a regional assessment between 2010 and 2015? iv) Does the country participate in an international assessment between 2010 and 2015? A negative response amounts to 0 and a positive response equals 1, with the index ranging from 0 to 5.

Source: UNESCO Institute for Statistics (UIS)

To date, there is no way of comparing national assessments in terms of their metrics. Despite some statistical attempts, cross-national comparability does not exist for several reasons: there is no single measure at any educational level (i.e. the grade at the end of primary education and at the end of lower secondary education varies from country to country); heterogeneity in the quality of national assessments; and each assessment body has its own framework of methodologies that are not necessarily comparable.

In order to have quality data to monitor SDG 4, the international community needs a concrete plan for cross-national tools or assessments to measure reading and mathematics at specific points. The UNESCO Institute for Statistics (UIS) has been leading a group of partners with the aim of developing a measure of learning that focuses on common concepts of minimum proficiencies by drawing links between existing national and international assessments. The objective is not to create a new assessment and instrument but build upon existing evidence by harmonising frameworks, reported populations, test items, test development and data analytics. The proposal is designed to exploit available resources. Given the presence of quality cross-national assessments, the international community could produce an initial pool of comparable results relatively quickly rather than developing a brand new assessment. However, this will require concerted efforts to build consensus among cross-national assessment bodies, while properly managing collaboration in order to develop a pragmatic approach to link the different assessments.

How much might testing cost?

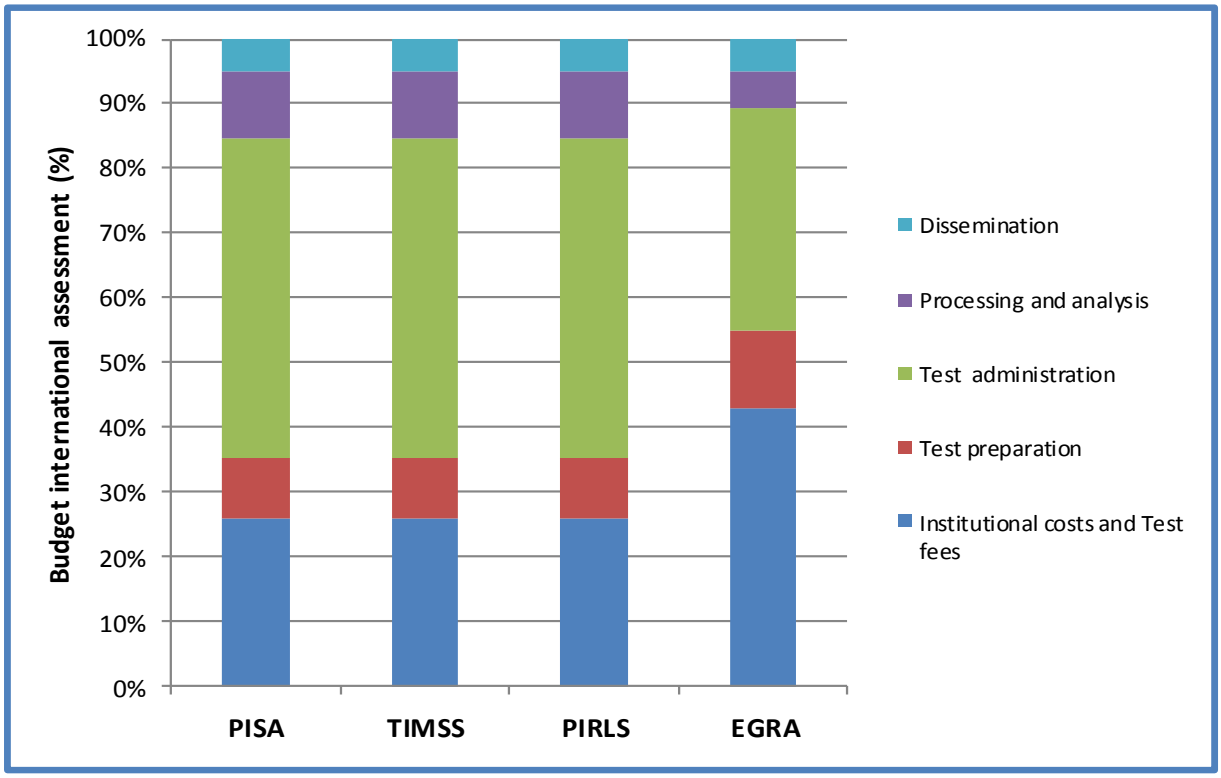
Assessments come at a high cost. Large-scale representative assessments at the country level have numerous associated costs than just producing the test. Related activities to launch the assessment include planning, fundraising, sampling design and reporting of the project in the country. Not only personnel but also material resources are needed in all phases. Setting up the infrastructure for testing could demand up to US$4-5 million, according to some recent estimates.

When undertaking a cross-national assessment, resources are needed to ensure country support and continuity in the project. The international implementing organization requests countries to follow precise guidelines to ensure comparability. In many cases, there is also a need to provide potential cognitive items for the assessment survey, background questions that are relevant to the country context, and adapt and translate existing instruments. The review process includes test and framework alignment, test specifications, survey items, assessment tasks, data analysis and reports. The project should also include data analytics, data dissemination, capacity building and sharing, and publishing national and international reports.

What are the total costs and what is the structure of these costs by category? **Figure 3** provides examples of international assessments and the distribution of their costs. It shows that test fees of some well-known international tests account for only one-third of the budget needed by a country. This costing (based on current observed costs) probably underestimates the costs for data analytics, dissemination and use of information that require further development.[4]

[4] Citizen-led assessments have a different structure costs documented in Development Institute *(2015): Bringing Learning to Light: The Role of Citizen-led Assessments in Shifting the Education Agenda.* Washington, DC.

Figure 3. Distribution of country costs for major international assessments



Source: Estimated, based on Wagner, et al. (2011). How much is Learning Measurement Worth? Assessment Costs in Low-Income Countries, UWEZO (2011), Improving Learning Outcomes

Table 1 provides estimated costs of international assessments, expressed in absolute terms (the total cost of the whole cycle of the test, which is between three to five years in general) and in relative terms (costs per student by ISCED level and student sample[5]). The relative importance of the last two estimates depends on the region of the world. The table shows the average costs for low-income countries, although these estimates do not take into account the potential need for greater capacity building at different stages of test development.

[5] A sample of 6,000 students was used, but simulations with different samples have been made and are available upon request.

Table 1. International assessment costs (in US$)

Responsible	Assessment	Number of countries participating at time of tabulation	Total cost per country	Cost per country per year	Cost per student per year (level education)	Cost per student per year (sampled)
		(a)	(b)	(c)	(d)	(e)
EDDATA-GLOBAL	EGRA 2015-2016	25	212,728	70,909	0.02	14
IEA	TIMSS 2015	57	839,424	279,808	0.10	57
IEA	PIRLS 2016	48	839,424	279,808	0.20	49
IEA	ICILS 2013	20	629,569	209,856	0.09	62
IEA	ICCS 2009	37	743,189	247,730	0.11	65
OECD	PISA 2015	73	824,008	274,669	0.05	39

Note: (b) and (c) include all cost components *(see Figure 3)*.
(c) Over a three-year period. The national costs and EGRA are estimated from Wagner, et al (2011). *How much is Learning Measurement Worth? Assessment Costs in Low-Income Countries*.
(d) Based on enrolment of the countries participating in PISA 2015 (ISCED 2 and 3), TIMSS 2015 (ISCED 2 and 3), PIRLS 2016 (ISCED 1), ICILS 2013 (ISCED 2 and 3), ICCS 2009 (ISCED 2 and 3) and EGRA 2015-2016 (ISCED 1).
(e) Sample size of countries participating in PISA 2013, TIMSS 2011, PIRLS 2011, ICILS 2013, ICCS 2009 and EGRA 2015-16 EDDATA GLOBAL.
Usually, each assessment has a different duration (PISA, 3 years; TIMSS 4 years, e.g.). From the point of view of costing, exercise tests would assume that a cycle of 4 or 5 years to a 3-year cycle that sustains the total costs of the test. For the purpose of the simulation, only the total cost of the test cycle is considered without periodicity in their application. In each country, individual costs may vary depending on the size of enrolment, geographical characteristics and technical agreements between the country and the specialised agency of assessment.
Source: Based on Organization for Economic Co-operation and Development (OECD), International Association for the Evaluation of Educational Achievement (IEA), Education Data for Decision Making (EDDATA) GLOBAL, UIS and Wagner, et al (2011).

As previously explained, there is still no universal learning metric, but one possible scenario is to use and adapt already existing cross-national assessments. To test this, we expanded EGRA, PIRLS, TIMSS and PISA to countries where they are not currently implemented. **Tables 2a** and **2b** summarise the exercise and provide the estimated costs for the international community to expand the base of comparable information.

In practical terms, Table 2a estimates the costs of including more countries in each region within the major international assessments: TIMSS and PISA, EGRA or PIRLS for early grades of primary school and for the end of lower secondary school. Estimates of the total cost for full implementation by all countries in the regions (even those currently participating) are available upon request.

Table 2b offers an alternative perspective by presenting relevant parameters, such as expenditure on public education and official development assistance (ODA) for education. ODA is a term used by the OECD's Development Assistance Committee (DAC) to measure assistance given from one country to another. The remarkable fact is that the cost of measuring skills represents an insignificant part of the general ODA budget, even though it can bring a huge return, as we will show with numbers.

Table 2a. Annual cost of expanding selected assessments (in US$)

Region	PIRLS	TIMSS	PISA	EGRA	SDG 4.1.
	(a)	(b)	(c)	(d)	(e)
East Asia & Pacific	10,073,094	8,674,053	7,690,740	2,552,740	22,677,710
Europe & Central Asia	8,953,861	8,114,437	5,218,716	3,970,929	19,795,548
Latin America & Caribbean	10,.632,710	10,912,518	7,965,409	2,765,469	25,577,017
Middle East	1,958,657	1,399,041	3,021,362	1,205,461	6,002,462
North Africa	839,424	839,424	824,008	283,638	2,224,963
North America	559,616	559,616	549,339	283,638	1,530,582
South Asia	2, 238,465	2,238,465	1,922,685	496,366	5,528,566
Sub-Saharan Africa	12,871,175	12,871,175	13,184,125	2,269,103	33,625,439
Total	**48,127,003**	**45,608,730**	**40,376,383**	**13,827,343**	**116,962,287**

Note: (e) Annual cost for three selected assessments (PISA+TIMSS+((PIRLS+EGRA)/2)). Based on number of countries that do not participating in PISA (147), TIMSS (163), PIRLS (172) and EGRA (195).

Source: Based on the annual cost of the table 1, GGLOBAL/DATA, IEA, PISA/OECD, UNESCO Institute for Statistics and Wagner, et al (2011).

Table 2b. Annual cost of expanding selected assessments (per US$100,000)

Region	In terms of government expenditure on education 2013					In terms of the Official Development Assistance (ODA) education 2013				
	PIRLS	TIMSS	PISA	EGRA	SDG 4.1.	PIRLS	TIMSS	PISA	EGRA	SDG 4.1.
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
East Asia & Pacific	1.01	0.87	0.77	0.26	2.27	536	462	409	136	1,207
Europe & Central Asia	0.80	0.73	0.47	0.36	1.77	1,354	1,227	789	601	2,994
Latin America & Caribbean	3.54	3.63	2.65	0.92	8.51	1,340	1,375	1,004	349	3,224
Middle East	1.57	1.12	2.42	0.97	4.81	193	138	297	119	590
North Africa	1.93	1.93	1.89	0.65	5.11	103	103	101	35	272
North America	0.06	0.06	0.06	0.03	0.16	-	-	-	-	-
South Asia	2.33	2.33	2.00	0.52	5.76	115	115	98	25	283
Sub-Saharan Africa	17.64	17.64	18.07	3.11	46.08	473	473	485	83	1,236
Total	**1.29**	**1.22**	**1.08**	**0.37**	**3.14**	**489**	**463**	**410**	**140**	**1,188**

Source: Based on the annual cost of the table 1, Development Co-operation Directorate (DCD)/OECD, GGLOBAL/DATA, IEA, PISA/OECD, UNESCO Institute for Statistics and Wagner, et al (2011).

We could imagine a scenario where every three to four years a country will have a cohort team taking two to three grade assessments, at the end of primary school and the end of lower secondary school. This means that, for each student in the system, the government will make an investment in order to have information to improve learning for all. A quick and over-simplified calculation is presented in **Table 3**, which presents assessment costs per student with government expenditure per student.

Table 3. Annual government expenditure per secondary student and cost assessment per student

Region	Government expenditure per secondary student (ISCED 2-3) (in US$ PPP)	Cost assessment per student (ISCED 2-3) (US$)	Cost of assessments per year of government expenditure per secondary student
	(a)	(b)	(c) = (b/a)
Europe & Central Asia	8,340	2.28	0.00027
Middle East	6,359	0.43	0.00007
East Asia & Pacific	5,269	16.43	0.00312
Latin America & Caribbean	2,293	2.56	0.00112
North Africa	2,422	0.97	0.00040
South Asia	800	0.19	0.00024
Sub-Saharan Africa	813	1.05	0.00129

Note: (a) average 2013 or last year available.
(b) Example based on three times the cost annual PISA and enrolment (ISCED 2-3) of the countries that do not participating in PISA 2015.
Source: UNESCO Institute for Statistics

Cost per student and per graduate

Another perspective is to analyse investment in terms of the cost of producing a graduate. **Table 4** presents two type of costs: the difference between theoretical government expenditure per graduate and government expenditure per graduate. Additional costs arise from inefficiencies in the education system, for example dropouts, repetition and students who do not complete secondary school on time. Differences vary across regions: in East Asia and the Pacific, the theoretical government expenditure per graduate amounts to US$41,773, while the 'actual' government expenditure per graduate is US$45,108. In Europe and Central Asia, the theoretical government expenditure per graduate is US$86,843 and 'actual' government expenditure per graduate is US$95,000. In Latin America and the Caribbean, differences range from US$26,656 to US$34,647, and in Sub Saharan Africa, from US$5,991 to US$9,283. These numbers highlight the significant inefficiency that widens the gap between the theoretical and real costs.

The challenge is related to “doing the thing right” or managing education in an intelligent way to yield greater results. If we compare the cost per graduate with the cost of international assessments, we find that a small investment to help funding and efforts can have a major impact. The sum of the average costs of TIMSS, PISA and EGRA is US$110 per student sample *(see Table 1).* These three examinations are sufficient to measure skills in the three areas set by the ODG over a student’s lifetime.

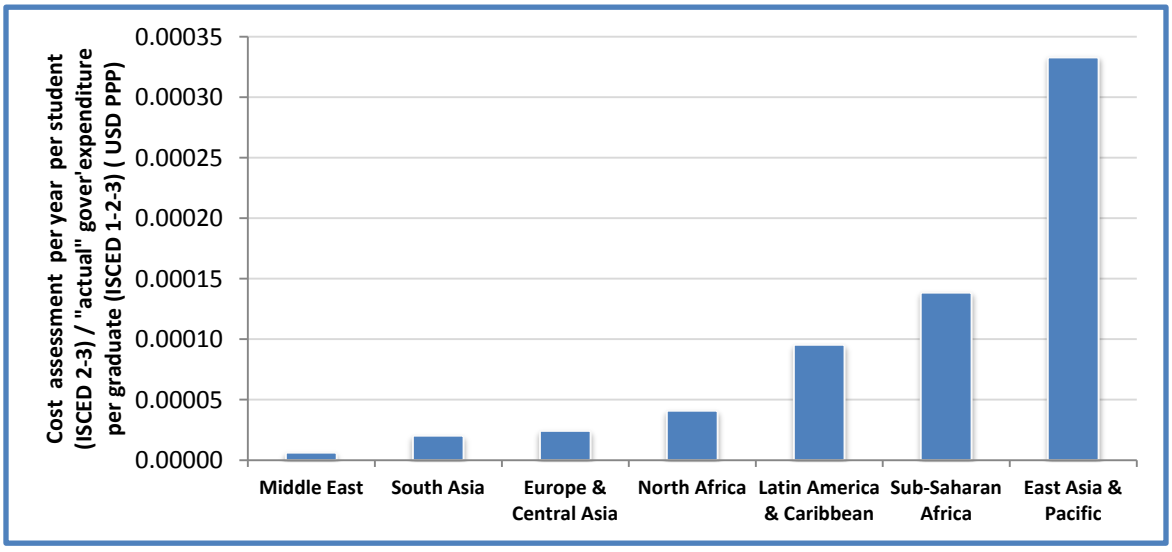
Table 4. Expenditure per graduate (ISCED 1, 2 and 3) (in US$PPP), 2013 or latest year available

Region	Theoretical expenditure	Actual expenditure	Difference between actual and theoretical
	(a)	(b)	(c)
Europe & Central Asia	86,843	95,000	8,156
Middle East	68,880	78,592	9,712
East Asia & Pacific	41,773	45,108	3,335
Latin America & Caribbean	26,656	34,647	7,991
North Africa	23,731	31,062	7,330
South Asia	7,223	10,675	3,452
Sub-Saharan Africa	5,991	9,283	3,292

Note: (a) All grades (ISCED 1, 2, 3).
(b) All grades (ISCED 1, 2, 3) + internal inefficiency.
(c) = (b)-(a).
Source: UNESCO Institute for Statistics

For instance, to evaluate all graduates in Europe three times throughout their progression in basic education, it would cost just 0.12% of the total expenditure (total cost of tests by the cost of producing a graduate (110/86,843). However, only a representative sample of students participate in these tests *(see **Figure 4**)*. So if we divide the total cost per year per student in ISCED 2 and 3 by 'actual' government expenditure per graduate, the cost per graduate would represent, literally, just pennies. In other words, we need less than US$0.000025 per student.

Figure 4. Cost assessments per year per student (ISCED 2-3) in terms of actual government expenditure per graduate (ISCED 1, 2, 3) (in US$ PPP)*



Note: Based on Tables 3 and 4.
Source: *Based on Organization for Economic Co-operation and Development (OECD) and UNESCO Institute for Statistics*

How much does NOT testing cost?

How can we measure the impact of changes in policy decisions on learning achievement? How can we use learning measurement to improve learning outcomes? How can we fairly compare a country with others or better evaluate the current status of learning at an international level? How can we support a more equitable system and raise the quality of learning for children?

These are familiar questions to education ministers around the globe, who need the type of information provided by assessments. Policymakers have to make choices. Monitoring is critical to identify where the needs are and what works. Determining the best use for money depends on cost but also on impact. The cost of not evaluating and reordering priorities is huge, especially for children and families. Information and a comprehensive framework are needed to address efficiency and equity.

The first approach to cost analysis is to evaluate how costs affect the individual's goals, achievements and potential. Education is a lifetime journey. It takes an average of 12 years to complete primary and secondary education. Imagine the costs that this represents for parents and governments? Do you remember the effort that it demands of students? Imagine how frustrating it would be to discover that after all the years of schooling, students are not properly prepared for higher education or work and that inequalities in learning outcomes are widening.

In the previous sections, we have focused on efficiency – or what it would cost to produce the data to "do things right". But more importantly, education systems must be effective and "do the right things". To be effective and efficient, we don't just need statistics – we need comparable data, gathered under the same framework with aligned methodologies and reporting criteria to avoid bias.

Table 5. Gains arising from assessment data (in millions US$ PPP)

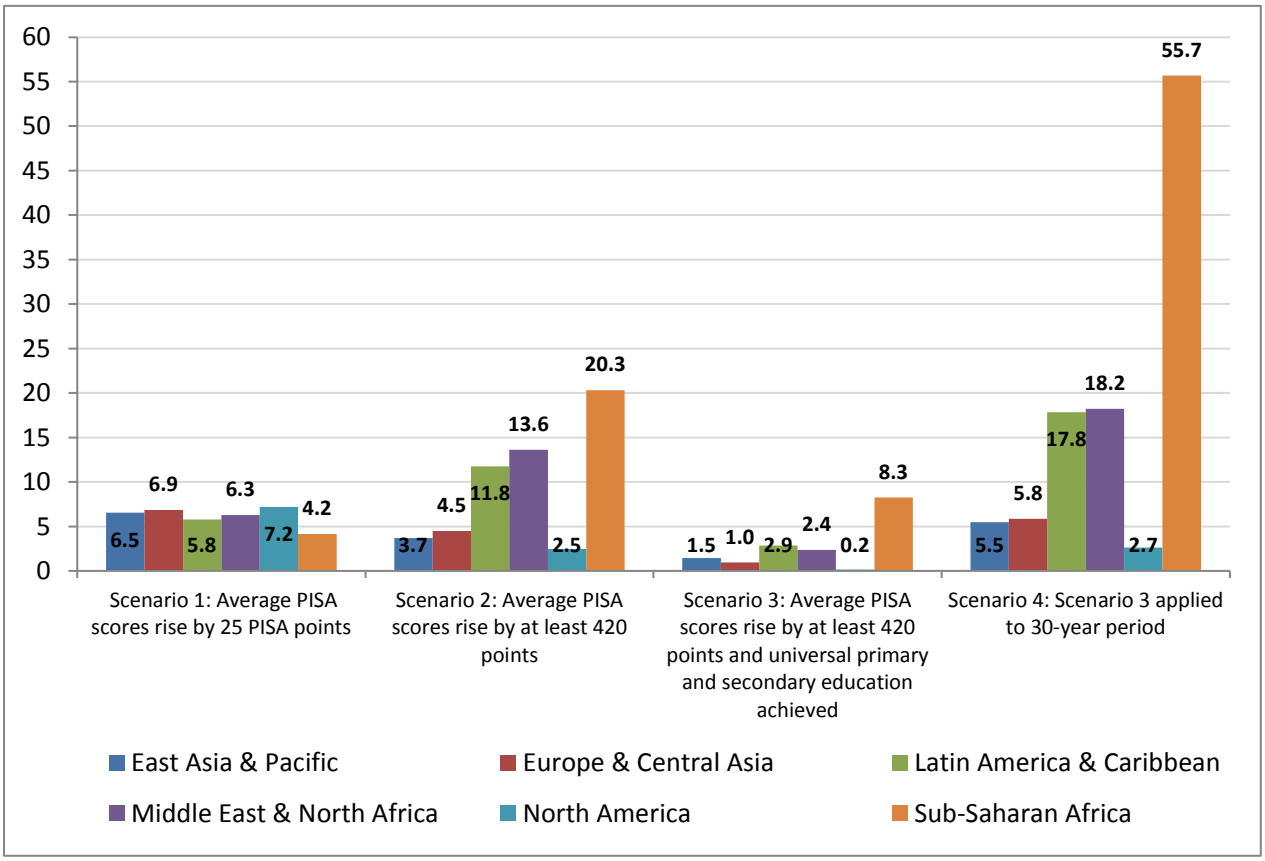
Region	Half difference between actual and theoretical expenditure	Annual cost of assessments per student	Number of graduates	Total savings if all loss is recovered (in millions)
	(a)	(b)	(c)	(d)
Europe & Central Asia	4,078	2.28	507,191	2,068
Middle East	4,856	0.43	6,428,304	31,216
East Asia & Pacific	1,668	16.43	1,572,604	2,622
Latin America & Caribbean	3,996	2.56	4,909,190	19,615
North Africa	3,665	0.97	1,271,912	4,662
South Asia	1,725	0.19	24,930,855	43,006
Sub-Saharan Africa	1,645	1.05	81,692,284	134,384

Note: (d)= ((a) x (c)-(b))/1.000.000
Source: Based on Tables 3 and 4 and UNESCO Institute for Statistics

A second approach to cost analysis has a more macro view and is based on Hanushek and Woessmann (2005). The projection model relies on a simple description of how skills enter the labour market and have an impact on the economy. The development goal is framed as the standard that should be met by 2030, leading to the assumption that improvement occurs linearly from today's schooling situation to attainment of the goal in 15 years. The gain in gross domestic product (GDP) from an improved workforce is then estimated as a proportion over the GDP with the existing workforce from 2015 until 2095. The projection is carried out for 80 years to correspond to the life expectancy of someone born in 2015. Future gains in GDP are discounted to the present with a 3% discount rate.

The resulting present value of additions to GDP is thus directly comparable to the current levels of GDP. Depending on the scenario, what do countries stand to gain? As an example, an improvement of 25 PISA points would have a uniform effect on all countries if there were a 100% enrolment rate. The cumulative present value of the added GDP would be 340% of a country's current GDP, or 7.3% higher GDP over the entire 80 years of the projection. By 2095, the annual GDP would be 30% higher than that expected with today's skill levels, representing an annual growth rate that, in the end, is 0.5 percentage points higher. Of course, the total value of the added GDP differs by the size of the economy, so that the Germany, for instance, would see present value of gains of over US$ 12.7 trillion, while much smaller Montenegro would see gains of US$ 34 billion.

Figure 5. Achievement gains (percentage of GDP)



Source: Hanushek and Woessmann (2005): "Universal Basic Skills: What Countries Stand to Gain?". Paris: OECD

If we compare the cost of an examination (for example, PISA costs US$39.10 per student) with government expenditure per student (US$95,000 in Europe) and future gains in GDP, it is clear that it is very expensive to **not** assess education, with the consequent risk of not providing students with the skills demanded by the labour market and increasing inefficiencies. First, common parameters are used in the classroom to improve learning outcomes. Second, the link between educational performance and economic growth is proven. Whether or not this is a causal relationship, it indicates that relatively small improvements in the skills of a nation's labour force can have, combined with other conditions, very large impacts on future wellbeing. In other words, added years of schooling do not affect growth unless they yield greater achievement. International examinations are designed to identify a common set of skills that can be improved, leading to regional growth for decades. That is the simple reason for the consistency of growth with test scores.

Sisyphus is a character in Greek mythology who was condemned by the gods to forever push a huge boulder up a mountain. Once he arrives at the top, his heavy load rolls back down to the valley. Sisyphus must then find the strength to start again (again and again in the future). Here we must learn. Without information, our efforts become meaningless. It is not enough to give great importance to education in a government's agenda and try to allocate larger portions of GDP to education. We should learn from Sisyphus. We need to leverage resources in the most efficient manner possible and rely on the guidance provided by information on learning outcomes. We, like Archimedes, should use assessment results as the lever to move the world. The financial effort involved in learning assessment is null, compared to the benefits. Remember the old saying: "If you think education is expensive, try ignorance". Now we have a new twist: "If you think education data are expensive, try doing without."