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A Conceptual Framework for Aligning Institutional Incentives in the Development of Education Data Systems

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1. Introduction

a. Background: The ecosystem of educational data

The quality and quantity of UNESCO Institute of Statistics (UIS) educational data are highly inconsistent, suggesting several issues at work: (i) low and middle income countries that produce scant data because they do not have the resources or the institutional incentives to support enough trained personnel to produce good quality data on a regular basis for many key indicators; (ii) countries that produce data that they do not use for education policy decisions, but do so because of external funding obligations, and/or to comply with specific requirements of external agencies that provide the funds; (iii) countries that fail to produce data they could use for policy decisions because their limited resources are being crowded out by the production of data that disproportionately benefits the global commons, such as international tests or large education surveys; (iv) countries that do not have enough trained personnel to produce data of good quality on a regular basis, and (v) countries that do not have a culture of openness on data access and analysis, which leads the production of limited data.

The situations just noted have developed over time, reaching a point where development agencies, catalog and disseminate massive amounts of data, but without a clear idea about their purpose, their use, and their impact on education policy decisions. Similarly, low and middle income countries also produce data without a purpose as witnessed by the often observed mismatch between education data and policy priorities (GPE 2018).¹ Data production needs a clear purpose and, to that end, the sustainable development goals (SDG) agenda can be considered as a framework that could give countries such purpose (UNESCO 2018a; UNESCO 2018b).²

There is a clear need in both *funding and coordination*. In that sense, the Second United Nations (UN) Data Forum has ended with a call for both. The Dubai Declaration aims to establish a funding mechanism – under the mandate of the UN Statistics Commission – to raise resources to address the data needs for the full implementation of the 2030 Agenda and support national statistical systems.

The ecosystem of SDG 4 data is very complex because of the large number of indicators to be produced, without a context of priority. SDG 4 targets include several concepts that have never been measured before at the global level. In addition, some SDG 4 indicators are only measured in some countries. Fortunately, some indicators are measured in most countries. Hence, a first approximation to get a quick assessment of the education situation in a given country is to examine the indicators produced in most countries, examine their content and their links to policy, in order to give them a context for priority.

This conceptual framework is a first step. As such, it combines existing research, fieldwork, and data analysis to focus UIS capacity development efforts, and to help it coordinate donors and recipients more effectively. This conceptual framework is part of a more comprehensive study consisting of:

¹ Global Partnership for Education (GPE), 2018. “Data in Education Solutions Roundtable.” Draft Discussion Paper, prepared for GPE Meeting in Dakar, February 1, 2018. Washington DC: GPE.

Custer, Samantha, Matthew DiLorenzo, Takaaki Masaki, Tanya Sethi, and Ani Harutyunyan, 2018. Listening to Leaders 2018. Is development cooperation tuned-in or tone-deaf? Williamsburg VA: AidData at the College of William & Mary. <https://www.aiddata.org/publications/listening-to-leaders-2018>

² UNESCO Institute for Statistics, 2018a. *SDG 4 Data Digest: Data to Nurture Learning*. Montreal: UIS Publishing. <http://uis.unesco.org/sites/default/files/documents/sdg4-data-digest-data-nurture-learning-2018-en.pdf>

UNESCO Institute for Statistics, 2018b. *SDG 4 Data Book: Global Education Indicators 2018*. Montreal: UIS Publishing. <http://uis.unesco.org/sites/default/files/documents/sdg4-data-book-2018-en.pdf>

- i. The conceptual framework itself, outlining the issues behind data reporting,
- ii. The design and implementation of quick tools to identify the factors affecting the market and non-market failures in the production and reporting of SDG 4 indicators. This second phase would include the preparation and analysis of assessment questionnaires for recipient and donor countries to determine their incentives and priorities in SDG 4 data production and reporting, and
- iii. A final report on the analysis and recommendations.

b. Study Objectives

This conceptual framework has as its main *objective* the identification of the most relevant issues in the production and use of education data, with the purpose of bringing some order to the existing lack of coordination in the data ecosystem. As such, it sets the stage for the analysis of the institutional incentives of countries and cooperating agencies in the production and use of SDG 4 data. The *purpose* of the study is to provide countries and donors with a better sense of country priorities in the production of SDG 4 data, which would be in alignment with their statistical capabilities, their financial envelopes, and their education policy priorities. The *goal* of the study is to assist donor and recipient countries in the planning and delivery of financial assistance for the production and reporting of SDG 4 data, with the clear understanding that those data should benefit both stakeholders.

2. The SDG 4 as a Base for Developing Institutional Incentives to Produce and Report SDG Indicators

The UIS has the mandate to develop the SDG methodologies, standards, and indicators for education. These indicators are commonly referred to as SDG 4. The SDG 4 include ten targets covering many aspects of education, of which seven are expected outcomes and three targets are means of achieving these outcomes (UNESCO 2018a).³ In addition, SDG 4 includes 11 global indicators that measure progress towards achievement of targets. These indicators cover four main themes in education: (1) Learning, skills, and knowledge; (2) Equity; (3) Participation and completion, and (4) Policy and provision. This level of detail in listing SDG 4 indicators is important because it results in a long list of statistical tasks to be performed by low and middle income countries that typically lack the institutional and human resources to do so.

Clearly, custodian agencies such as UIS, rely on individual countries to generate the baseline data and the SDG 4 indicators themselves. However, the reality of low and some middle income countries suggests that SDG 4 production of indicators will have large disparities in their capacity for implementation. Countries decide on the data they collect, and on the data and metadata they share with custodian agencies, and this is the main issue affecting the data ecosystem today, as the capacity of countries to generate and share SDG 4 data tends to be related to their level of social and economic development, as will be shown in this conceptual framework.

Recent estimates indicate that implementing the Cape Town Global Action Plan (CTGAP) for 144 countries could cost USD 5.6 billion per year, of which developing countries are assumed to cover over 75% of the total (USD 4.3 billion), leaving USD 1.3 billion per year to be covered by external donors. It assumes that

³ UNESCO Institute for Statistics, 2018a. *Quick Guide to Education Indicators for SDG 4*. Montreal: UIS Publishing. <http://uis.unesco.org/sites/default/files/documents/quick-guide-education-indicators-sdg4-2018-en.pdf>

middle income countries could cover 95% of their cost, and low income countries about 50% (PARIS21 2019a and 2019b).⁴

Why would low and middle income countries be willing to spend money on SDG 4 monitoring, given their tight fiscal envelopes? Because it may be profitable to do so. Estimates by Crouch and Montoya (2018) show that, on average, a low income country would need to invest USD 1.7 million per year on the production of education data, but as a result of the additional efficiencies brought about by the added information it could save at least USD 36 million a year.⁵ Using average figures, funding gaps for SDG 4 monitoring would require about 280 USD million per year, and an extra 60 USD million in financial aid for low and middle income countries for data production.

Given this scenario for funding requirements, one has to address two issues: how much support is provided, and how it is provided. The current set up of SDG 4 production resembles a fairly disorganized ecosystem where actors do not have or share full information on needs, capabilities, and so on. Therefore, a first need is to bring order to the ecosystem for data, using information sharing, networking, and coordination of support by both donors and recipients of aid for education statistics, to better mobilize existing funds.

Ensuring and maximizing the effectiveness of financing for capacity development is essential for the success of the SDG 4 agenda. Support to statistical capacity building has been supply-driven and piecemeal, with little emphasis placed on partner countries' demand for data, which in many cases is focused on external stakeholder needs. Resources are a problem, but also the approach to resource management is somewhat flawed. In many cases, external consultants carry out the work of statistical agencies, an approach described by the Organization for Economic Cooperation and Development (OECD) as fixing a broken piece of a data system without making the system able to fix itself in the future (PARIS21 2019).

The situation has changed since 2015, with the UN Cape Town Global Action Plan for Sustainable Development Data (CTGAP) that defines the role of development cooperation provides with a demand driven approach supporting better coordination (UNSC 2017).⁶ The CTGAP proposes actions in six strategic areas, each associated with several objectives: 1) Coordination and strategic leadership on data for sustainable development; 2) Innovation and modernization of national statistical systems; 3) strengthening of basic statistical activities and programs; 4) dissemination and use of sustainable development data; 5) multi-stakeholder partnerships, and 6) mobilization of resources and coordination of efforts for statistical capacity development.

Each of these steps, and all of them acting as a system, address the educational data gaps that stand in the way of implementation of the SDG 4 agenda. To have an in-depth understanding of educational data gaps, UIS needs to analyze the issues that could prevent countries from reporting SDG 4 indicators in a consistent and sustainable way.

⁴ PARIS21, 2019a. Mobilizing Data for the SDGs. How could a Data Acceleration Facility help, and how might it work? PARIS21 Discussion Paper No. 15, Paris. <http://paris21.org/paris21-discussion-and-strategy-papers>

PARIS21, 2019b. Financing challenges for developing statistical systems: A review of financing options. PARIS21 Discussion Paper No. 45, Paris. <http://paris21.org/paris21-discussion-and-strategy-papers>

⁵ Crouch, Luis, and Silvia Montoya, 2018. "SDG 4 Data: Investing Millions Today Will Save Billions in the Future." Blog post. <http://uis.unesco.org/en/blog/sdg-4-data-investing-millions-today-will-save-billions-future>

⁶ United Nations Statistical Commission (UNSC), 2017. Cape Town Global Action Plan for Sustainable Development Data. New York: UNSC. https://unstats.un.org/sdgs/hlg/Cape_Town_Global_Action_Plan_for_Sustainable_Development_Data.pdf

3. What SDG Data Are Being Produced and by Whom?

A point of departure for a discussion on the incentives to produce SDG data is an inventory of what is being produced now. Table 1 shows the percent of countries reporting indicators 4.11 and 4.1.2, by region.⁷ This table shows that the percentage of countries reporting the percent of students achieving minimum proficiency levels for reading and math in 2017. For indicator 4.1.1, which reports the percent of students achieving a minimum proficiency level in reading and math, the percent of reporting countries is highest in Latin America & Caribbean, and lowest in Oceania. A relatively smaller percent of reporting countries is in Europe and North America, rejecting the notion that reporting SDG 4.1.1 is directly related to a country's income. In particular, the percentage of countries reporting the minimum standards for the end of primary is higher in Sub Saharan Africa than in Europe and North America. These results suggest that reporting the proportion if students achieving minimum standards in reading and math is not necessarily viewed as a strong source of information for policy making in higher income countries, where the education sector may be highly decentralized, and where policy decisions may be made at the provincial or even municipal levels, obviating the need to rely on national-level results.

The results for indicator 4.1.2, which reports on the percent of countries administering learning assessments for reading and math, are totally different. At least 58% of countries (North Africa & West Asia), and more than 90% of the countries in Sub Saharan Africa, report that they administer student assessments.

Table 1. SDG 4, Target 4.1 – Primary and secondary education

SDG Indicator Code	Indicator (Reference year 2017)	Percent of countries reporting indicator, by region						
		Sub Saharan Africa	North Africa & West Asia	Central & South Asia	East & Southeast Asia	Oceania	Latin America & Caribbean	Europe & North America
4.1.1	Achieving minimum proficiency							
	Early grade reading	33.3	4.2	15.4	22.2	11.8	53.7	4.3
	Early grade math	33.3	41.7	23.1	44.4	11.8	53.7	30.4
	Reading-End of Primary	33.3	0.0	15.4	5.6	5.9	61.0	4.3
	Math-End of Primary	33.3	8.3	23.1	5.6	5.9	56.1	19.6
	Reading-End of lower secondary	6.3	41.7	23.1	55.6	11.8	36.6	80.4
4.1.2	Administration of nationally representative learning assessment							
	Reading-End of Primary	93.8	58.3	69.2	61.1	100.0	90.2	67.4
	Math-End of Primary	93.8	58.3	69.2	61.1	100.0	90.2	67.4
	Reading-End of lower secondary	91.7	58.3	53.8	61.1	29.4	65.9	91.3
	Math-End of lower secondary	91.7	66.7	61.5	61.1	29.4	85.4	89.1

Source: Prepared by the author using data from <http://data.uis.unesco.org/Index.aspx>

⁷ The list of countries in each region is shown on Table B8 in Annex B. The percentages for each individual country

Clearly, Table 1 brings forth issues of indicator use and accountability. Most countries measure student performance using reading and math assessments, but very few report the results. This difference in reporting suggest that policy makers are reluctant to publish the indicators of student learning, even though they may be completely aware of the results.

a. So Much Data, so Many Issues: Is there a use for SDG 4 Indicators?

A first step in developing institutional incentives is to review the SDG 4 agenda and compare with what is being produced by countries. The resulting gaps may be related to all of the five constraints stated in the introduction, suggesting that mobilizing incentives could review policies addressing these issues in an ascending scale of commitment and complexity.

Country level, data come from three main sources: Administrative data, household surveys, and learning assessments. Availability and reliability of data depends on (i) the human and institutional capacity of statistical offices and line ministries; (ii) the UIS-defined standards for education data; (iii) the methods used for the production of indicators (statistical methodology, data sources, survey instruments), (iv) the data collection process, and (v) the strategies for dissemination and analysis of indicator data (UNESCO 2018a).⁸

Then number of indicators in the SDG 4 agenda is staggering. Table A1 in the Annex shows a summary list of all SDG 4 indicators to be monitored under the mandate of UIS. For education (SDG 4) there are 7 main indicators, 36 indicators derived from the main ones, and 1,184 sub-indicators derived from the above list. The total number of sub-indicators do not include an additional 412 indicators for education finance and education expenditures. The proliferation of the number of sub-indicators is easily explained: for each indicator there are sub-indicators accounting for sex, location, income level, immigration status, education level (pre-primary, primary, lower secondary, secondary), and proficiency in academic subject (math, language, sciences). In addition, some sub-indicators need to account educational attainment, skills in information and communication technology (ICT), out of school children, teacher training, attendance rates, and several other categories.

Intuitively, several salient issues help explain the current disorder in the data ecosystem. For example, indicator 4.1.1, which is perhaps the key performance indicator for student learning, has 66 sub-indicators measuring reading and math performance by location, income quintile, language, immigration status, sorted by sex and education level (Table A1). The crucial element of this indicator is the country's ability to define a standard that can be comparable across time and across other countries; this is not an easy task. A recent analysis of SDG 4.1.1 shows how difficult is to agree on a comparable estimate of this indicators and its sub-indicators, suggesting the large effort that will be required to match the needs of the global commons with the needs of individual countries (Montoya and Tay-Lim 2018).⁹

Indicator SDG 4.1.1 measures the percentage of children in grades 2 and 3, at the end of primary, and at the end of lower secondary, that meet the minimum proficiency levels in English and math, by sex. However, comparing this indicator across countries is not simple, as countries differ in their definition of proficiency, minimum levels of proficiency, the student sample population, and more technical issues related to the assessment instrument itself. To address this diversity in content and scope, Montoya and Tay-Lim propose a pragmatic approach that could allow for better comparability of SDG 4.1.1 across countries: find ways to link different assessment results and to report them in a globally comparable way. The links would rely on clear definitions of what is being measured and how it is being measured. Such

⁸ UNESCO 2018a, op. cit.

⁹ Montoya, Silvia, and Brenda Tay-Lim, 2018. "Options in Achieving Global Comparability for Reporting on SDG 4." Center for Advanced Studies in Global Education (CASGE) Working Paper No. 3, Mary Lou Fulton Teacher's College. Tempe AZ: Arizona State University.

links can be non-statistical (based on pedagogically informed recalibration of existing data), and statistical (linking common items in the assessments, recalibrating assessments to make them comparable, recalibrating existing data bases on assessments). However, each methodological approach implies different technical complexities, financial costs, and burdens on national authorities. Implicit in this approach is the proposal that a methodologically pure approach—which could be interpreted as an all-or-nothing—would lead to no results.

This seemingly straightforward approach to resolving comparability of one SDG indicator met significant objections that need to be taken into account by participating countries. First of all there are objections about the politics of indicator measurement, where the benefits of international learning assessment may not benefit host countries as much as the international education community. Costly procedures for ensuring comparability would serve UIS (as custodian of SDG 4.1.1) but not the host countries that could ostensibly pay for a large portion of the resources needed to seek comparability (Gorur 2018).¹⁰ Citing Lockheed et al (2105)¹¹ Gorur points out that the continuing problems in the education sector of middle income countries are not due to a lack of global comparisons, as global comparisons produce information of little value to these countries.

Another point of view on the comparability of SDG 4.1.1 suggests that unobserved country-level barriers could lead to false comparisons. Citing the case of the Roma population in Europe, Cerović (2018) argues that administrative data at the municipal level could exclude politically sensitive populations (nomads, migrants, illegal migrants, ethnic groups), yielding data flows and learning assessments that would not be valid or reliable, which in turn would make comparisons unreliable. Such concern also suggests a need to make SDG data meaningful to local communities, especially at the school level, where basic learning data are generated, and where the pressure to manipulate learning results is strong.¹²

In contrast, Crouch and Montoya (2018) argue that the cost of not having SDG 4.1.1 metrics would be even greater than ignoring them as a source of information for policy planning. In their view, education ministers would simply not know which problem to prioritize and address.¹³ The measurement and tracking of performance indicators is a mandate given by UN member countries, and the low use of statistical evidence by policy makers relate more to the policy maker's own decisions to ignore technical advice. Having internationally comparable data has improved knowledge in some key issues that could not be generalized from local knowledge. For example: (i) about 50% of cognitive inequality is between countries and 50% within countries, which helps frame possible progress within a country; (ii) gender has less impact on cognitive inequality than factors like ethnic/linguistic discrimination, or wealth, and (iii) low management capacity and low quality assurance are significant factors for increasing cognitive inequality.

¹⁰ Gorur, Radhika, 2018. "Refocusing the project: What is the problem we are trying to solve?" Commentary on the discussion paper. "Options in achieving global comparability for reporting on SDG 4" by Silvia Montoya and Brenda Tay-Lim. Center for Advanced Studies in Global Education (CASGE), Mary Lou Fulton Teacher's College. Tempe AZ: Arizona State University.

¹¹ Lockheed, M., T. Porkic-Bruer, and A. Shadrova, 2015. *Experience of middle-income countries participating in PISA 2000-2015*. Washington, DC; Paris: World Bank, OECD Publishing.

¹² Cerović, Tünde Kovács, 2018. "Zooming out: Possible threats to the process?" Commentary on the discussion paper "Options in achieving global comparability for reporting on SDG 4" by Silvia Montoya and Brenda Tay-Lim. Center for Advanced Studies in Global Education (CASGE), Mary Lou Fulton Teacher's College. Tempe AZ: Arizona State University.

¹³ Crouch, Luis, and Silvia Montoya, 2018. "Learning from the Center for Advanced Studies in Global Education (CASGE) Symposium at Arizona State University." Commentary on the discussion paper "Options in achieving global comparability for reporting on SDG 4" by Silvia Montoya and Brenda Tay-Lim. Center for Advanced Studies in Global Education (CASGE), Mary Lou Fulton Teacher's College. Tempe AZ: Arizona State University.

The impact of internationally comparable indicators is positive, but for the long term. A key example is girls' education, which was not pushed locally or by governments, but by international research and local activists. This important equity issue was eventually addressed by countries. In that vein, Crouch and Montoya conclude that even though improving learning may be more desirable than measuring learning (within the context of SDG 4), the UIS mandate to report learning outcomes does help in allocating resources by making learning issues more visible. It is true that national assessments should take priority over international assessments and, as such, they should be more determinant factors in the crafting of national education policy.

The above detailed discussion on SDG 4.1.1 underscores the complexity of the production, of reliable and valid SDG indicators, going a long way to explain why so many low income countries produce only limited data, while SDG asks for significantly more indicator information that many countries would be hard pressed to provide. This means that, for the medium run, local statistical capacity and locally produced indicators have to be bolstered to make them a key factor for increasing the demand for technical information among policymakers.

Tables B1-B7 in Annex B show the percentage of countries, by region, reporting on each of the indicators and sub-indicators associated with Targets 4.1 to 4.7, as well as the indicators for Targets 4a to 4c (described in more detail Table A1 in Annex A). A review of these indicators show a similar pattern to the one found in Table 1. The main conclusion that can be drawn from these patterns of reporting is that what countries report respond to several factors that go beyond simple rankings by GDP. This is the focus of the next section.

4. Bringing Order to the SDG Data Ecosystem: A First Approximation

a. Understanding Country Incentives

Bringing some order to the SDG data ecosystem will take some time, as countries align their own interests, capabilities, and funding restrictions, with those of the international community and external donors. *Country interests*—and their built in *incentives*—are manifested in their demand for SDG and other education data. *Donor interest* and incentives are easier to determine, as there are plenty of documents outlining the global strategies toward inclusion and equity, education quality, and lifelong learning to be implemented by 2030 (UNESCO 2015).¹⁴ These strategies have been made operational through the specification of the seven targets and three means of implementation shown in Table A1 in Annex A.

Based on interviews of stakeholders, Sethi and Prakash (2018)¹⁵ outline some conclusions that can be used to bolster the use of data by decision makers:

- a. Data production in low income countries is expensive in human and financial terms, and the relative gains to the use of scarce statistical for SDG data production is not clear to policymakers. As a result, they fail to provide sufficient support to education data systems. As a result, a paradox develops, where support is weak because data are of poor quality, and data are of poor quality because support is weak.

¹⁴ UNESCO, 2015. "Education 2030. Incheon Declaration and Framework for Action." Paris: UNESCO Publishing.

¹⁵ Sethi, Tanya, and Mihir Prakash, 2018. Counting on Statistics: How can national statistics offices and donors increase use? Williamsburg VA: AidData at the College of William & Mary.
<https://www.aiddata.org/publications/counting-on-statistics>

- b. Decision makers think that SDG data are used mostly by international organizations, and even after recognizing that expanding the domestic use of data is a good goal. Data use in countries with low accountability or inadequate incentive structures is lower than it would optimal or desired.
- c. Decisions on funding and on education policy are often based on personal conversations with education experts, other government officials, and presentations by education officials. Ironically, policy makers in these countries place a lot of trust on the data published by international organizations (WB, IDB, UNESCO), which in turn, rely on national agencies as the initial source of the same data.

This apparent contradiction suggests that national data systems tend to lack the skills needed to be more effective in presenting and interpreting data in ways that policy makers can understand easily, and in ways that can be made relevant to policy and financial decisions and, by extension, in ways that can increase support for the production and reporting of education data in their own country. Clearly, more training of national statistical office personnel should move in the direction of user-focused informatics in order to increase data use and support.

A slightly different take on data use is shown by Takaaki et al (2017¹⁶), using data from a previous survey of leaders in 126 low and middle income countries. This analysis concludes that leaders tend to use domestic data more than international data in their decision process. Data and statistical information are mainly used for (i) understanding policy issues better, (ii) designing or informing implementation strategies, (iii) identifying critical issues, and/or (iv) monitoring progress on a specific policy. Only 16% of survey respondents said that they use data to make budgetary decisions. Most leaders rely on formal presentations (80%) and personal meetings (68%) to discover and assess information.

It is interesting to note that about 80% of respondents use national statistics for their decisions; 66% use project evaluation data, and 60% use government expenditure data. It is also interesting to note that leaders use expenditure data to assess a decision, but do not use data to determine expenditures. This study also has clear suggestions for using information to influence decision makers. The suggestions are very useful for crafting capacity development in the use of informatics for presenting data to policymakers.

Another interesting assessment in the demand for data by policy makers is by Custer et al (2018a),¹⁷ who ask a key question: Do investments in education data match data use? A recent analysis shows that decision makers rely on Education Management Information Systems (EMIS) as the most used mechanism for managing education data, as it helps track school performance, and to aggregate data from the bottom up. However, in many countries an EMIS is not yet completely functional and/or decision makers are still not fully aware of its potential.¹⁸

¹⁶ Masaki, Takaaki, Samanta Custer, Agustina Eskenazi, Alena Stern, and Rebecca Latourell, 2017. Decoding data use: How do leaders use data and use it to accelerate development? Williamsburg, VA: AidData at the College of William & Mary. <https://www.aiddata.org/publications/decoding-data-use>

¹⁷ Custer, Samantha, Elizabeth M. King, Tamar Manuelyan Atinc, Lindsay Read, and Tanya Sethi, 2018a. *Toward Data-Driven Education Systems. Insights into using information to measure results and manage change*. Washington DC: Center for Universal Education at Brookings, and AidData at the College of William & Mary. <https://www.brookings.edu/research/toward-data-driven-education-systems-insights-into-using-information-to-measure-results-and-manage-change/>

¹⁸ Source: Abdul-Hamid, Husein, Namrata Saraogi, and Sarah Mintz. 2017. *Lessons Learned from World Bank Education Management Information System Operations: Portfolio Review, 1998-2014*. World Bank Studies. Washington, DC: World Bank.

In assessing evidence on incentives to use data among decision makers, Custer et al conclude that decision makers in the education sector show the following patterns in data use:

- a. They rely on education data to support their decisions, but the data are not the decisive factor, as politics and policy priorities take precedence over strictly technical issues;
- b. They like to use program evaluation data, and would like to have more. Demand for program evaluation data seems to exceed supply.
- c. They want data to be timely, more detailed and disaggregated, and locally relevant. That explains why they like to use data from their own EMIS.
- d. They are more likely to use data and analysis for forward-looking purposes, such as design and implementation of policies or programs.

More detailed incentives for decision makers can be derived from **Table 2**, showing the type of data that they seek in the decision process (Custer et al 2018b).¹⁹ In general, decision makers seek information on student enrollment and attendance by personal characteristics, student learning, as well as information on teachers numbers and qualifications, school infrastructure, and education funding from domestic and external sources. Knowing what type of school-level information is demanded by decision makers is very important because it helps pare down the type of information that should take priority in the implementation of SDG strategies, as it would help generate use of SDG data in the actual policy making process, and would increase support for data quality and the expansion of education data to include other SDG indicators.

Table 2. Types of School Level Data Demanded by Policymakers in Education

Student Data	Human Resource Data	School Data	Financial Data
Enrollment rates	Number of teaching and non-teaching staff	School type (public; private; subsidized private; religious)	Source(s) of funding, including government funding, tuition fees, grants, etc.
Attendance and absenteeism rates	Teacher qualifications	Facilities (e.g., classrooms; electricity; bathrooms, computers; furniture)	Allocation and Expenditures
Repetition and dropout rates	Teacher attendance rates	School inputs (e.g., textbooks; paper)	
Assessment and test scores			
Student characteristics (e.g., parents' level of education, socio-economic level; gender; ethnicity; language; disability)			

Source: Custer et al (2018a), p. 45

The fact that decision makers prefer school-level information on these indicators underscore the need to take a second look at the issue of comparability, as SDG strategies would have to deal with the tradeoffs

¹⁹ Custer, Samantha, Matthew DiLorenzo, Takaaki Masaki, Tanya Sethi, and Ani Harutyunyan, 2018b. Listening to Leaders 2018. "Is development cooperation tuned-in or tone-deaf?" Williamsburg VA: AidData at the College of William & Mary. <https://www.aiddata.org/publications/listening-to-leaders-2018>

involved between methodological rigor and more pragmatic approaches that could still allow intercountry comparisons of SDG indicators. This is an issue that could also benefit from quick assessments of the education sector, which are related to the objectives of this study, as it would narrow down which SDG indicators would be of priority in the search for methodologies that would allow for increased comparability.

Most importantly, the indicators that can be derived from Table 2 flow upward from the school level to the national level, which is a key issue in addressing country incentives. To be relevant, SDG indicators need to be tracked down to the school level (through a country's EMIS) to align the incentives of teachers and principals, with the incentives of global leaders. *This alignment cannot be emphasized enough.*

b. Understanding Donor Incentives

Support for SDG strategies among bilateral and multilateral donors is based on their own research, on their own institutional mandates, and their own internal political pressures and budgetary constraints. The views of the Global Partnership for Education (GPE) and of UIS on donor incentives are worth noting.

The Global Partnership for Education (GPE) is considering solutions to SDG measurement challenges, particularly at country level.²⁰ To that end it created the Data Roundtable (DRT), a venue where experts exchange experiences and ideas around the SDG challenges.²¹ The DRT relies on two initiatives: (i) a collaboration among DRT partners to support the development of solutions for education policy challenges, and (ii) a knowledge and innovation exchange funding platform to finance global and regional development and adoption of these solutions. DRT investment priorities include:

- a. Better tools for education information management. Countries use different EMIS tools that do not allow for standardization of data, the standardization of minimum standards in hardship situations, or adaptability to link data to other sectors (poverty, health, student assessment, finances). Low and lower middle income countries need assistance in order to coordinate standards and adopt more adaptable tools.
- b. Capacity building by public and private providers in the use of better data communication and visualization tools, which could improve the visualization of data by policymakers and increase the demand for data for decision making, as well as capacity building in prioritization of issues, timing of presentation, and outreach.
- c. The integration of data across different systems to produce holistic interventions at the school level. Data must be fed back to schools, including: student assessments, teacher characteristics and school costs, fiscal transfers, physical resources, and poverty profiles.

The second significant viewpoint of note is put forward by UIS through a comprehensive guide to the production and distribution of SDG data (UIS 2018).²² The most salient issues in the UIS refer to funding and capacity building. In particular, UI is concerned about the costs and benefits of data on student learning, which could be very costly for low income countries. UIS reports that data on the quality of

²⁰ Global Partnership for Education, 2018. "Education Data Solutions Roundtable- Challenge Statement and Design Tasks." Unpublished draft, Washington DC.

²¹ Global Partnership for Education (GPE), 2018. "Data in Education Solutions Roundtable." Draft Discussion Paper, prepared for GPE Meeting in Dakar, February 1, 2018. Washington DC: GPE.

²² UNESCO Institute for Statistics, 2018. *SDG 4 Data Digest: Data to Nurture Learning*. Montreal: UIS Publishing. <http://uis.unesco.org/sites/default/files/documents/sdg4-data-digest-data-nurture-learning-2018-en.pdf>

learning, or proficiency levels, will account for around one-half of all costs related to SDG reporting in education (UIS, 2017).²³

Still, UIS makes the case that producing learning data has a positive benefit/cost ratio. Still, even if the benefit/cost ratios for learning assessments are positive, the financial realities of many low and lower middle income countries are a disincentive for local funding. Fiscal constraints—combined with low institutional capacity—in many low income countries, force statistical agencies to rely on one-off external funding and on external consultants to conduct learning assessments. This approach to indicator production leads to an underinvestment in the analysis of the data, and a lower feedback into education policy. This hurdle suggests that there is a need to look closely at local innovations in data production, which are likely to be cost-efficient.

In terms of capacity development, UIS considers that cross-national assessment programs have failed to foster country-led innovations in low and lower middle income countries. Part of the problem is low institutional capacity in statistical agencies in low income countries, and the associated political interference that results when learning assessment are unfavorable. To improve capacity building more efficiently, UIS proposes a list of competencies that could be outsourced *within* a country, along with skills for the dissemination of data.

The viewpoints of GPE and UIS are complementary. They underscore a need to focus on some key issues:

- a. Ensuring that SDG data are rooted on data collection at the school level in order to ensure alignment between SDG data production and their use at the local level through EMIS;
- b. Capacity building that includes the use of informatics in the presentation of SDG data to improve the understanding of important technical messages to decision makers, and to get more support for improved data quality;

These two concluding points are extremely important for the implementation of SDG strategies.

5. Resolving the SDG Data Market Misalignments

To bring some order into the SDG data ecosystem is necessary to follow a long term plan with three important components: (i) A quick assessment of data demand among recipient countries, country by country, rather than to develop an “average” sense of needs, and of institutional barriers and incentives among donor agencies and donor countries. This assessment would help define a stratified approach to data funding, where the data needs of recipient countries take greater precedence over the needs of the global commons; (ii) specific strategies for recipient countries, that would take into account their capabilities for the timely production of essential data needed for decision making; their human resources and funding needs for addressing the production of more sophisticated data or data addressing global public goods as their basic data needs are fulfilled; (iii) the introduction of innovations found in other recipient countries, which would most likely reduce the cost of data production for others, and (iv) the cost-benefit assessment of existing education data in order to reduce the data burden and weed out those data that have little impact on education policy.

²³ UNESCO Institute for Statistics, 2017. Investment Case for Expanding Coverage and Comparability for Global Indicator 4.1.1. Global Alliance for Monitoring Learning, Fourth Meeting November 2017, Madrid Spain. Montreal: UIS Publishing. http://uis.unesco.org/sites/default/files/documents/gaml4-investment_case.pdf

As a first step in resolving the data market mismatch, the second phase of this study will develop a *Quick Assessment Tool* for countries and for donors. The idea is to develop and test a questionnaire for recipient countries and for donors, with clear options for responders.

A quick taxonomy of the SDG data ecosystem suggests the following:

- a. There is market for SDG data, with countries with education data needs, and other, often richer, countries and agencies willing to pay for their supply.
- b. This market is not functioning well because countries and agencies willing to pay for data systems do not know well the type of data demanded by different recipient countries. External funding may be associated with: (i) Data that are excessively detailed but of little use to assisted countries; (ii) Non-sustainable production of excessively detailed data. Data production stops once external funding stops; (iii) Highly demanding data that exceeds the technical and managerial capabilities of recipient countries; (iv) Data that are tied to specific initiatives of donor countries and agencies but that have limited relevance to recipient country needs (v); Data that provide a global public good but that have low cost-efficiency for the recipient country, and (vi) Data that is cost-efficient and of high relevance, which are produced and used by the recipient country. Within this group there are likely to be innovations in the collection, analysis and distribution of data that are not known outside the recipient country, and that could be adapted to the benefit of others.

Improving the market for SDG data implies an alignment between the demand for SDG data by countries—especially low income countries—and assistance in the supply of SDG by donors. Given these characteristics of data systems, the disconnect between donor and recipient countries shows a need to bring some order into the market by providing more detailed information on two issues:

- The list of most essential data items that countries are willing to produce on their own, as they reflect information considered crucial for the proper functioning of their education system, and
- The key incentives and restrictions that donor countries and agencies face, when deciding on the kind of data they are willing to fund, and on the level of assistance to participating countries.

In many countries there are issues with the legal and institutional frameworks. In some countries, institutions that produce educational data often do not have clear lines of responsibility for their production and dissemination. For example, in the Dominican Republic the line of institutional responsibility is blurred. The National Statistics Office (ONE) supposedly publishes and disseminates all education data provided by the Ministry of Education (MOE). ONE does not vouch for data quality or relevance, as it just publishes what is sent by the MOE. Having ONE as the publisher of education data reduces the motivation of ONE to produce timely, reliable, relevant data. As a result, education indicators are outdated, insufficient, and of low relevance to policy decisions.

In many countries relevant indicators are neither measured nor reported. Ideally, policy making should be assisted by evidence, but often such evidence is not available. In Indonesia, for example, education is highly decentralized, but neither the local governments nor federal authorities have a clear idea about the cost of educating a student in different regions or subjects or levels, which would allow them to make good decisions about investments and learning tradeoffs. Because national data and local data are difficult to combine and analyze, some key educational indicators are not accessible, resulting in policy decisions based on incomplete information. Sometimes, as in Egypt, historically, even the simplest ratios such as input use per student (out of fiscal transfers from the national level), are not produced and compared across districts, much less monitored by the national level, resulting in significant and purposeless inequalities.

In many low-income countries, local resources for education indicators are crowded out by large surveys pushed by external agencies. Countries in Africa, for example, assign scarce human resources to surveys such as MICS, PISA, DHS, which produce very useful data but with unintended setbacks in the production and dissemination of regular indicators. The basic annual indicators of educational performance are neglected, while sophisticated indicators collected every few years, capture most of the local resources.

There is a wide variation in human resources and in operational capabilities. In Suriname, for example, there are only four people available for collecting, processing, analyzing, and reporting educational data. They are overworked and undertrained, and there are no local counterpart funds that can be used to improve data system performance. They would welcome on-site additional training, but job pressures at all levels in the Ministry of Education leave little time for seeking and conducting training.

There is a mismatch between what countries want and what countries produce. While many countries underinvest in educational data, other countries misalign their human and financial resources to produce data that are not appropriate to their circumstances, and other countries lack the human and financial resources needed to have an educational data system that fits their need.

a. 5.1 Key Questions for a quick assessment

In summary, education indicators across countries show a discouraging situation, but improving the situation in each country is a complicated issue. A minimum requirement seems to be a very *quick assessment* of some truly fundamental issues related to education data that are currently not often addressed by longer diagnostic tools or, if addressed, are buried in the detail, and are not used in policy dialogue with the countries, or, more importantly, in dialogue amongst the potential donors to the country. The quick assessment proposed here should mimic the pulse, temperature, and blood pressure assessments done during a medical visit, to quickly establish the basic facts about a patient's health. In the case of education data, the assessment should respond to some basic questions:

1. *Does the government have a clear vision and a strategy for the use of education data?* If policy makers do not differentiate between analysis and opinion (or, being able to differentiate, do not value the difference), political support for a professional data system in education may remain low. If policy makers adhere to a clear vision of education, and have a strategy in place, they could find value in the indicators, and political and financial support would follow. But the indicators have to support that vision.
2. *Is there an institutional framework in place that can foster the routine use of data for managerial and policy decisions?* Having clear lines of responsibility, and making it clear that discharging that responsibility requires data, allows for better accountability. Better, data-based accountability can be the institutional incentives to produce relevant, timely, and reliable indicators.
3. *Are staff resources adequate to implement the strategy?* The technical and managerial capabilities of staff in charge of indicators are crucial for determining training needs. This is a first step in the process of producing data of good quality. Lists of capabilities typically needed already exist, but are not widely used for practical purposes.
4. *Are financial resources adequate to implement the strategy?* Collecting, reviewing, cleaning, and publishing data in a timely manner requires funding, which is a second step in the process of producing data of good quality. Data system finance is in itself an area that requires more study, but at the quick assessment stage, one or two questions (see below) could be enough to trigger a more detailed analysis.

5. *Do education data meet the needs of users?* This is a complex issue, since the people who ought to be answering this question may not be the same as the people producing the data. However, this question is crucial for improving a data system. There are three types of potential users: Policy makers (both in Ministries of Education and in related line Ministries such as Finance, Planning, or the Cabinet itself), mid-level managers, and schools. Each level has its own needs and the data system should respond to their needs. There is often a vicious cycle here: high-level officials do not support education data systems because the systems have not given them what they need (in terms of quality of the indicators, or the types of specific indicators), and data systems cannot give them what they need because they have not received high-level support. (While noting that data quality is sometimes under-estimated by high-level officials. They may think data are bad because data from month X are different from data gathered in month Y, for instance.) The failure is not in the data system, but in the management of the education system itself, where data are not used to coordinate the quality and quantity of inputs in the education process, and the very nature of a data ecosystem is not understood.

6. Next Steps

As mentioned in the introduction to this analysis, the next step will incorporate the lessons learned in this study to the design of quick assessment questionnaires for countries and donors, to assess the institutional incentives for the production and distribution of SDG indicators; the selection of non-negotiable indicators that countries would produce with or without external funding, and the identification of innovations used by countries to deal with budgetary and human resource constraints.

Hence, the next step will be the design and implementation of quick assessment tools to identify the factors affecting the market and non-market failures in the production and reporting of SDG 4 indicators.

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ANNEX A

Table A1. Summary list of SDG 4 Indicators under UIS mandate

SDG Indicator Code	Indicator Description	No. of Sub Indicators	Additional Sub Indicator Categories
4.1	Target 4.1: By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes		
4.1.1	Proportion of children and young people (a) in Grade 2 or 3; (b) at the end of primary education; and (c) at the end of lower secondary education achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex	66	Location, income, language, immigration status; reading and math proficiency by gender location language and immigration status
4.1.2	Administration of a nationally-representative learning assessment (a) in Grade 2 or 3; (b) at the end of primary education; and (c) at the end of lower secondary education	6	Reading, math, by education level
4.1.3	Gross intake ratio to the last grade	6	Gender, by education level
4.1.4	Completion rate	162	Gender, location, income quintile and education level
4.1.5	Out-of-school rate	180	Gender, age, location, income quintile and education level
4.1.6	Percentage of children over-age for grade	6	Gender, education level
4.1.7	Number of years of (a) free and (b) compulsory primary and secondary education guaranteed in legal frameworks	8	
4.2	Target 4.2: By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education		
4.2.1	Proportion of children under 5 years of age who are developmentally on track in health, learning and psychosocial well-being, by sex	4	
4.2.2	Participation rate in organized learning (one year before the official primary entry age), by sex	3	
4.2.4	Gross early childhood education enrolment ratio in (a) pre-primary education and (b) early childhood educational development	9	
4.2.5	Number of years of (a) free and (b) compulsory pre-primary education guaranteed in legal frameworks	4	
4.3	Target 4.3: By 2030, ensure equal access for all women and men to affordable quality technical, vocational and tertiary education, including university		
4.3.1	Participation rate of youth and adults in formal and non-formal education and training in the previous 12 months, by sex	3	
4.3.2	Gross enrolment ratio for tertiary education, by sex	56	Location, income quintile and education level
4.3.3	Participation rate in technical and vocational programs (15- to 24-year-olds)	3	Gender

SDG Indicator Code	Indicator Description	No. of Sub Indicators	Additional Sub Indicator Categories
4.4	Target 4.4: By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship		
4.4.1	Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill	27	Gender, and nine ICT skills
4.4.3	Youth/adult educational attainment rates by age group, economic activity status, levels of education and program orientation	23	
4.5	Target 4.5: By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations		
4.5.1	Parity indices (female/male, rural/urban, bottom/top wealth quintile and others such as disability status, indigenous peoples and conflict-affected, as data become available) for all education indicators on this list that can be disaggregated		
4.5.1 (i)	Parity indices (female/male) for all education indicators on this list that can be disaggregated	189	Gender, GIR, attainment, GER, literacy, teachers, reading and math proficiency, TVET, ICT skills, completion, attendance, out of school rates, age groups, education level
4.5.1.(ii)	Parity indices (rural/urban) for all education indicators on this list that can be disaggregated	131	Gender, location, attainment, reading and math proficiency, completion, attendance, out of school rates, age groups, education level
4.5.1.(iii)	Parity indices (bottom/top wealth quintile) for all education indicators on this list that can be disaggregated	71	Gender, location, wealth parity, reading and math proficiency, completion, attendance, out of school rates, age groups, education level
4.5.1.(iv)	Parity indices (immigrant/non-immigrant) for all education indicators on this list that can be disaggregated	9	Immigration status, reading and math proficiency, education level
4.5.1 (v)	Parity indices (speaks language of the test at home) for all education indicators on this list that can be disaggregated	6	Language, reading and math proficiency, education level
4.5.4	Education expenditure per student by level of education and source of funding	17	Household or government funding, education level
4.6	Target 4.6: By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy		
4.6.1	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	14	Socioeconomic status, immigration status
4.6.2	Youth/adult literacy rate	12	Gender, age groups
4.6.3	Participation rate of illiterate youth/adults in literacy programs	3	Public, private

SDG Indicator Code	Indicator Description	No. of Sub Indicators	Additional Sub Indicator Categories
4.7	Target 4.7: By 2030, ensure all learners acquire knowledge and skills needed to promote sustainable development, including among others through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development		
4.7.2	Percentage of schools that provide life skills-based HIV and sexuality education	9	
4.a	Target 4.a: Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all		
4.a.1	Proportion of schools with access to: electricity; Internet; computers; adapted infrastructure and materials for students with disabilities; basic drinking water; single-sex basic sanitation facilities; and basic handwashing facilities	72	Education level
4.a.2	Percentage of students experiencing bullying in the last 12 months	7	Gender
4.a.3	Number of attacks on students, personnel and institutions	1	
4.b	Target 4.b: By 2020, substantially expand globally the number of scholarships available to developing countries, in particular least developed countries, small island developing States and African countries, for enrolment in higher education, including vocational training, information and communications technology, technical, engineering and scientific programs, in developed countries and other developing countries		
4.b.1	Volume of official development assistance flows for scholarships by sector and type of study	1	
4.c	Target 4.c: By 2030, substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least developed countries and small island developing States		
4.c.1	Proportion of teachers who have received at least the minimum organized teacher training, by sex	17	Education level
4.c.2	Pupil-trained teacher ratio	5	Education level
4.c.3	Percentage of teachers qualified according to national standards by education level and type of institution	17	
4.c.4	Pupil-qualified teacher ratio	5	Education level
4.c.6	Teacher attrition rate	32	Gender, education level, public, private
	Total number of indicators*	1,184	

Source: <http://data.uis.unesco.org/> Data dictionary.

* Total excludes 412 indicators of education finance and expenditures, which are listed separately.

ANNEX B

Target 4.1: By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes

Table B1. SDG 4, Target 4.1 – Primary and secondary education Participation/Completion

SDG Indicator Code	Indicator (Reference year 2017)	Percent of countries reporting indicator						
		Sub Saharan Africa	North Africa & West Asia	Central & South Asia	East & Southeast Asia	Oceania	Latin America & Caribbean	Europe & North America
	Out of School Children (000,000)							
	Primary	72.9	87.5	84.6	77.8	94.1	65.9	80.4
	Lower Secondary	56.3	75.0	69.2	83.3	70.6	68.3	84.8
	Upper Secondary	60.4	70.8	69.2	77.8	70.6	65.9	84.8
4.1.5	Out of School Rate (%)							
	Primary	72.9	87.5	84.6	77.8	94.1	65.9	80.4
	Lower Secondary	56.3	75.0	69.2	83.3	70.6	65.9	84.8
	Upper Secondary	60.4	70.8	69.2	77.8	70.6	65.9	84.8
4.1.4	Completion Rate (%)							
	Primary	60.4	25.0	46.2	44.4	0.0	46.3	10.9
	Lower Secondary	60.4	33.3	46.2	44.4	0.0	46.3	73.9
	Upper Secondary	60.4	33.3	38.5	44.4	0.0	46.3	73.9
4.1.6	Over-Age for Grade (%)							
	Primary	79.2	87.5	76.9	77.8	94.1	85.4	71.7
	Lower Secondary	81.3	87.5	84.6	77.8	100.0	80.5	78.3
	GER Primary (%)	91.7	87.5	100.0	94.4	100.0	70.7	91.3
	ANER Primary (%)	72.9	87.5	84.6	77.8	94.1	65.9	80.4
4.1.3	GIR last grade primary (%)	85.4	87.5	84.6	88.9	76.5	63.4	73.9
	Transition from primary to lower secondary (%)	79.2	87.5	76.9	83.3	47.1	58.5	71.7
	NERT lower secondary (%)	56.3	75.0	69.2	83.3	70.6	68.3	84.8
4.1.3	GIR last grade lower secondary (%)	85.4	87.5	92.3	88.9	58.8	61.0	78.3
	NERT upper secondary (%)	60.4	70.8	69.2	77.8	70.6	68.3	84.8
4.1.2	Early grade reading	93.8	41.7	46.2	61.1	100.0	87.8	50.0
	Early grade math	91.7	58.3	53.8	83.3	100.0	90.2	60.9
	Administration of nationally representative learning assessment							
	Reading-End of Primary	93.8	58.3	69.2	61.1	100.0	90.2	67.4
	Math-End of Primary	93.8	58.3	69.2	61.1	100.0	90.2	67.4
	Reading-End of lower secondary	91.7	58.3	53.8	61.1	29.4	65.9	91.3
	Math-End of lower secondary	91.7	66.7	61.5	61.1	29.4	85.4	89.1
4.1.1	Achieving minimum proficiency							
	Early grade reading	33.3	4.2	15.4	22.2	11.8	53.7	4.3

	Early grade math	33.3	41.7	23.1	44.4	11.8	53.7	30.4
	Reading-End of Primary	33.3	0.0	15.4	5.6	5.9	61.0	4.3
	Math-End of Primary	33.3	8.3	23.1	5.6	5.9	56.1	19.6
	Reading-End of lower secondary	6.3	41.7	23.1	55.6	11.8	36.6	80.4
	Math-End of lower secondary	6.3	62.5	30.8	55.6	11.8	36.6	80.4

Source: Prepared by the author using data from <http://data.uis.unesco.org/Index.aspx>

Target 4.2: By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes

Table B2. SDG 4, Target 4.2 – Early childhood education

SDG Indicator Code	Indicator (Reference year 2017)	Percent of countries reporting indicator						
		Sub Saharan Africa	North Africa & West Asia	Central & South Asia	East & Southeast Asia	Oceania	Latin America & Caribbean	Europe & North America
4.2.1	% Children under 5 developmentally on track	37.5	16.7	30.8	22.2	0.0	22.0	4.3
	Under 5 stunting (%)	70.8	37.5	53.8	55.6	17.6	29.3	4.3
4.2.3	Stimulating home environment (%)	29.2	16.7	30.8	33.3	0.0	19.5	4.3
	Children under 5 with 3+ children's books (%)	29.2	20.8	30.8	33.3	0.0	19.5	4.3
4.2.4	GER pre primary (%)	81.3	79.2	92.3	88.9	88.2	70.7	87.0
4.2.2	NER one year before entry into primary (%)	60.4	66.7	46.2	66.7	76.5	70.7	82.6

Source: Prepared by the author using data from <http://data.uis.unesco.org/Index.aspx>

Target 4.3: By 2030, ensure equal access for all women and men to affordable quality **technical, vocational and tertiary education**, including university

Target 4.4: By 2030, substantially increase the number of youth and adults who have **relevant skills**, including technical and vocational skills, for employment, decent jobs and entrepreneurship

Target 4.6: By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve **literacy and numeracy**

Table B3. SDG 4, Targets 4.3, 4.4, and 4.6, TVET, Skills for Work, and Literacy/Numeracy

SDG Indicator Code	Indicator (Reference year 2017)	Percent of countries reporting indicator						
		Sub Saharan Africa	North Africa & West Asia	Central & South Asia	East & Southeast Asia	Oceania	Latin America & Caribbean	Europe & North America

4.3.1	Participation in adult education & training (%)	0.0	12.5	0.0	5.6	5.9	2.4	67.4
4.3.3	% of youth enrolled in TVET	56.3	70.8	69.2	77.8	76.5	75.6	80.4
	TVET share of secondary enrolment (%)	64.6	87.5	84.6	66.7	41.2	63.4	91.3
	Transition from upper secondary to tertiary (%)	18.8	50.0	38.5	33.3	5.9	26.8	71.7
	Gross entry ratio into tertiary (%)	39.6	58.3	46.2	44.4	5.9	22.0	67.4
4.3.2	GER tertiary (%)	72.9	83.3	100.0	94.4	17.6	53.7	91.3
	% of adults 15+ with ICT skills							
4.4.1	Copy & paste within document	4.2	41.7	23.1	22.2	0.0	12.2	65.2
	Use formula in spreadsheet	4.2	45.8	23.1	22.2	0.0	14.6	71.7
	Write computer program	4.2	41.7	23.1	27.8	0.0	12.2	76.1
	% of adults 25+ having attained at least							
4.4.3	Primary	22.9	62.5	30.8	44.4	17.6	43.9	56.5
	Lower secondary	25.0	62.5	38.5	50.0	17.6	43.9	67.4
	Secondary	25.0	62.5	38.5	50.0	17.6	41.5	71.7
	Post-Secondary	25.0	62.5	30.8	38.9	11.8	43.9	63.0
	% achieving proficiency in							
4.6.1	Youth literacy	0.0	8.3	0.0	5.6	5.9	2.4	6.5
	Adult literacy	0.0	8.3	0.0	5.6	5.9	2.4	6.5
	Youth numeracy	0.0	8.3	0.0	5.6	5.9	2.4	6.5
	Adult numeracy	0.0	8.3	0.0	5.6	5.9	2.4	6.5
	Literacy rate (%)							
4.6.2	Youth	50.0	41.7	53.8	44.4	11.8	46.3	10.9
	Adult	52.1	41.7	53.8	44.4	11.8	48.8	10.9
	Illiterates							
	% female youth	50.0	41.7	53.8	44.4	11.8	46.3	10.9
	% female adults	52.1	41.7	53.8	44.4	11.8	48.8	10.9
	Number youth (000,000)	50.0	41.7	53.8	44.4	11.8	48.8	10.9
	Number adults (000,000)	52.1	41.7	53.8	44.4	11.8	51.2	10.9

Source: Prepared by the author using data from <http://data.uis.unesco.org/Index.aspx>

Target 4.5: By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations

Table B.4 SDG 4, Target 4.5 – Equity

SDG Indicator Code	Indicator (Reference year 2017)	Percent of countries reporting indicator						
		Sub Saharan Africa	North Africa & West Asia	Central & South Asia	East & Southeast Asia	Oceania	Latin America & Caribbean	Europe & North America
Gender								
4.5.1	GPIA in completion							
	Primary	60.4	25.0	50.0	44.4	0.0	46.3	10.9%
	Lower Secondary	60.4	33.3	50.0	44.4	0.0	46.3	76.1%
	Upper Secondary	60.4	33.3	57.1	44.4	0.0	46.3	76.1%
	GPIA in minimum proficiency							
	End of primary reading	29.2	0.0	14.3	0.0	5.9	46.3	0.0%
	End of primary math	29.2	8.3	21.4	0.0	5.9	46.3	17.4%
	End of lower secondary reading	2.1	41.7	7.1	55.6	11.8	26.8	78.3%
	End of lower secondary math	6.3	62.5	14.3	55.6	11.8	26.8	80.4%
	GPIA in literacy rate							
	Youth	52.1	41.7	57.1	44.4	11.8	46.3	10.9%
	Adults	54.2	41.7	57.1	44.4	11.8	48.8	10.9%
	GPIA in adult proficiency							
	Literacy	0.0	8.3	0.0	5.6	5.9	2.4	6.5%
Numeracy	0.0	8.3	0.0	5.6	5.9	2.4	6.5%	
	GPIA in Gross Enrollment Ratio							
	Pre Primary	81.3	79.2	92.9	83.3	88.2	68.3	87.0%
	Primary	91.7	87.5	100.0	94.4	100.0	68.3	91.3%
	Secondary	77.1	87.5	92.9	83.3	76.5	68.3	91.3%
	Tertiary	72.9	83.3	100.0	94.4	17.6	48.8	91.3%
Location/Wealth								
4.5.1	Disparity in primary completion							
	Adjusted parity index, Location	58.3	25.0	42.9	44.4	0.0	46.3	8.7%
	Adjusted parity index, Wealth	58.3	25.0	42.9	44.4	0.0	48.8	10.9%
	% of poorest males completing	58.3	25.0	50.0	44.4	0.0	48.8	10.9%
	% of poorest females completing	58.3	25.0	50.0	44.4	0.0	48.8	10.9%
	Disparity in lower secondary completion							

SDG Indicator Code	Indicator (Reference year 2017)	Percent of countries reporting indicator						
		Sub Saharan Africa	North Africa & West Asia	Central & South Asia	East & Southeast Asia	Oceania	Latin America & Caribbean	Europe & North America
	Adjusted parity index, Location	58.3	33.3	50.0	44.4	0.0	43.9	71.7%
	Adjusted parity index, Wealth	58.3	33.3	50.0	44.4	0.0	43.9	71.7%
	% of poorest males completing	58.3	33.3	50.0	44.4	0.0	43.9	71.7%
	% of poorest females completing	58.3	33.3	50.0	44.4	0.0	43.9	71.7%
	Disparity in upper secondary completion							
	Adjusted parity index, Location	58.3	33.3	42.9	44.4	0.0	41.5	67.4
	Adjusted parity index, Wealth	58.3	33.3	42.9	44.4	0.0	43.9	69.6
	% of poorest males completing	58.3	33.3	42.9	44.4	0.0	43.9	73.9
	% of poorest females completing	58.3	33.3	42.9	44.4	0.0	43.9	71.7
	Wealth disparity in minimum proficiency							
	End of primary reading	25.0	0.0	14.3	0.0	0.0	36.6	0.0
	End of primary math	25.0	4.2	21.4	0.0	0.0	36.6	17.4
	End of lower secondary reading	0.0	41.7	7.1	50.0	11.8	26.8	78.3
	End of lower secondary math	4.2	62.5	14.3	50.0	11.8	26.8	78.3

Source: Prepared by the author using data from <http://data.uis.unesco.org/Index.aspx>

GPIA: Gender Parity Index, Adjusted

Target 4.7: By 2030, ensure all learners acquire knowledge and skills needed to promote sustainable development, including among others through **education for sustainable development** and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, **global citizenship**, and appreciation of cultural diversity and of culture’s contribution to sustainable development

Target 4.a: Build and upgrade **education facilities** that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective **learning environments** for all

Target 4.b: By 2020, substantially expand globally the number of **scholarships** available to developing countries, in particular least developed countries, small island developing States and African countries, for enrolment in higher education, including vocational training, information and communications technology, technical, engineering and scientific programs, in developed countries and other developing countries.

Table B5. Target 4.7 and Means of Implementation 4a and 4b. Education for sustainable development, infrastructure, and scholarships

SDG Indicator Code	Indicator (Reference year 2017)	Percent of countries reporting indicator						
		Sub Saharan Africa	North Africa & West Asia	Central & South Asia	East & Southeast Asia	Oceania	Latin America & Caribbean	Europe & North America
4.7.1	Inclusion of Gender equality in national curricula	31.3	20.8	42.9	38.9	64.7	43.9	32.6
	Inclusion of Human rights in national curricula	31.3	20.8	42.9	38.9	64.7	43.9	32.6
	Inclusion of Sustainable development in national curricula	31.3	20.8	42.9	38.9	64.7	43.9	32.6
	Inclusion of Global citizenship in national curricula	31.3	20.8	42.9	38.9	64.7	43.9	32.6
4.7.2	% of schools with skills-based HIV/AIDS education	22.9	12.5	21.4	11.1	29.4	14.6	10.9
4.7.5	% students with understanding of scientific literacy	0.0	66.7	14.3	55.6	11.8	24.4	80.4
4.7.4	% students with understanding of HIV/AIDS and sexuality	43.8	8.3	14.3	22.2	0.0	19.5	6.5
4.a.1	% of Schools with WASH facilities							
	Basic drinking water	35.4	58.3	50.0	50.0	41.2	39.0	50.0
	Basic sanitation or toilets	39.6	62.5	42.9	50.0	41.2	56.1	47.8
	Basic handwashing	27.1	50.0	28.6	50.0	41.2	29.3	52.2
	% of schools with ICT for pedagogical purposes							
	Electricity	68.8	41.7	57.1	44.4	47.1	48.8	52.2
	Internet	29.2	41.7	35.7	38.9	41.2	48.8	50.0
	Computers	37.5	41.7	50.0	38.9	41.2	43.9	47.8
	% of schools with adapted infrastructure and materials for students with disabilities	18.8	16.7	28.6	16.7	35.3	24.4	19.6
4.a.2	Level of bullying	6.3	12.5	7.1	22.2	5.9%	41.5%	15.2%
4.a.3	Levels of attacks on education	54.2	75.0	50.0	38.9	5.9%	14.6%	17.4%
	Internationally mobile - tertiary students							

	% mobility rate - inbound	52.1	75.0	64.3	72.2	11.8%	39.0%	95.7%
	% mobility rate - outbound	72.9	87.5	100.0	94.4	17.6%	61.0%	97.8%
	Number (000) inbound	50.0	70.8	64.3	72.2	11.8%	46.3%	93.5%
	Number (000) outbound	100.0	100.0	100.0	100.0	100.0%	100.0%	100.0%
4.b.1	Official development assistance (US\$ 000,000)							
	Scholarships	100.0	66.7	100.0	66.7	88.2%	70.7%	17.4%
	Imputed student costs	100.0	66.7	100.0	66.7	47.1%	70.7%	17.4%

Source: Prepared by the author using data from <http://data.uis.unesco.org/Index.aspx>

Target 4.c: By 2030, substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least developed countries and small island developing States

Table B6. DG 4, Means of implementation 4.c – Teachers

SDG Indicator Code	Indicator (Reference year 2017)	Percent of countries reporting indicator						
		Sub Sahara n Africa	North Africa & West Asia	Centra l & South Asia	East & Southeas t Asia	Oceani a	Latin America & Caribbea n	Europe & North Americ a
		Pre Primary						
	Classroom teachers (000)	75.0%	75.0 %	42.9%	77.8%	70.6%	51.2%	78.3%
	Pupil/teacher ratio	72.9%	75.0 %	50.0%	77.8%	70.6%	58.5%	80.4%
4.c.1	% of trained classroom teachers	60.4%	50.0 %	42.9%	50.0%	47.1%	46.3%	8.7%
4.c.3	% of qualified classroom teachers	72.9%	58.3 %	42.9%	61.1%	47.1%	34.1%	10.9%
4.c.6	Teacher attrition rate (%)	12.5%	12.5 %	14.3%	16.7%	5.9%	12.2%	6.5%
4.c.5	Relative teacher salary level	0.0%	8.3%	0.0%	0.0%	5.9%	2.4%	41.3%
		Primary						
	Classroom teachers (000)	85.4%	79.2 %	92.9%	94.4%	76.5%	73.2%	89.1%
	Pupil/teacher ratio	85.4%	79.2 %	92.9%	94.4%	76.5%	73.2%	91.3%
4.c.1	% of trained classroom teachers	70.8%	54.2 %	85.7%	72.2%	52.9%	61.0%	10.9%
4.c.3	% of qualified classroom teachers	72.9%	58.3 %	78.6%	83.3%	52.9%	48.8%	13.0%
4.c.6	Teacher attrition rate (%)	35.4%	16.7 %	57.1%	50.0%	5.9%	22.0%	4.3%
4.c.5	Relative teacher salary level	0.0%	8.3%	0.0%	0.0%	11.8%	2.4%	45.7%
		Secondary						
	Classroom teachers (000)	77.1%	62.5 %	78.6%	83.3%	58.8%	73.2%	84.8%
	Pupil/teacher ratio	68.8%	62.5 %	78.6%	77.8%	52.9%	73.2%	87.0%

4.c.1	% of trained classroom teachers	64.6%	33.3 %	50.0%	55.6%	29.4%	58.5%	8.7%
4.c.3	% of qualified classroom teachers	64.6%	41.7 %	50.0%	72.2%	41.2%	56.1%	10.9%
4.c.6	Teacher attrition rate (%)	14.6%	8.3%	14.3%	33.3%	0.0%	17.1%	2.2%
4.c.5	Relative teacher salary level	0.0%	4.2%	0.0%	0.0%	5.9%	2.4%	37.0%

Source: Prepared by the author using data from <http://data.uis.unesco.org/Index.aspx>

Table B7. Education system characteristics and education expenditure

SDG Indicator Code	Indicator (Reference year 2017)	Percent of countries reporting indicator							
		Sub Saharan Africa	North Africa & West Asia	Central & South Asia	East & Southeast Asia	Oceania	Latin America & Caribbean	Europe & North America	
4.2.4	Years of Compulsory Pre Primary	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
4.1.7	Years of Compulsory Primary-Secondary	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
4.2.4	Years of Free Primary	83.0	100.0	100.0	88.9	64.7	90.2	91.3	
4.1.7	Years of Free Primary-Secondary	83.0	100.0	92.9	88.9	64.7	90.2	91.3	
School-age population (000,000)									
	School-Age Population Pre Primary	100.0	95.8	100.0	100.0	100.0	85.4	95.7	
	School-Age Population Primary	100.0	95.8	100.0	100.0	100.0	82.9	93.5	
	School-Age Population Secondary	100.0	100.0	100.0	100.0	100.0	85.4	93.5	
	School-Age Population Tertiary	100.0	100.0	100.0	100.0	100.0	85.4	93.5	
School Enrollment (000,000)									
	Pre Primary	80.9	83.3	92.9	88.9	88.2	82.9	93.5	
	Primary	91.5	91.7	100.0	100.0	100.0	87.8	97.8	
	Secondary	85.1	87.5	92.9	83.3	76.5	85.4	97.8	
	Tertiary	72.3	91.7	100.0	94.4	17.6	61.0	97.8	
4.5.4	Gov't Education Expenditure as % of GDP	80.9	54.2	92.9	77.8	41.2	68.3	84.8	
	Education Expenditure as % of Gov't Exp.	78.7	50.0	92.9	77.8	41.2	63.4	84.8	
	Gov't Education Expenditure per pupil (2015 PPP US\$)								
		Pre Primary	53.2	41.7	85.7	61.1	23.5	43.9	76.1
		Primary	61.7	41.7	57.1	66.7	29.4	53.7	73.9
		Secondary	53.2	50.0	71.4	55.6	23.5	53.7	73.9
		Tertiary	57.4	50.0	85.7	66.7	17.6	36.6	82.6
	Gov't Education Expenditure per pupil (% of GDP per capita)								
		Pre Primary	55.3	41.7	85.7	66.7	29.4	51.2	80.4
		Primary	66.0	41.7	57.1	66.7	35.3	63.4	78.3

Secondary	57.4	50.0	71.4	55.6	29.4	61.0	78.3
Tertiary	57.4	50.0	85.7	72.2	17.6	43.9	87.0
Household Education Expenditure (% of GDP)	8.5	25.0	14.3	27.8	17.6	22.0	58.7

Source: Prepared by the author using data from <http://data.uis.unesco.org/Index.aspx>

Table B8. List of Countries, by Region

Sub Saharan Africa	North Africa & West Asia	Central & South Asia	East & Southeast Asia	Oceania	Latin America & Caribbean	Europe & North America
Angola	Algeria	Afghanistan	Brunei Darussalam	Australia	Anguilla	Albania
Benin	Armenia	Bangladesh	Cambodia	Cook Islands	Antigua and Barbuda	Andorra
Botswana	Azerbaijan	Bhutan	China	Fiji	Argentina	Austria
Burkina Faso	Bahrain	India	DPR Korea	Kiribati	Aruba	Belarus
Burundi	Cyprus	Iran, Islamic Republic	Hong Kong, China	Marshall Islands	Bahamas	Belgium
Cabo Verde	Egypt	Kazakhstan	Indonesia	Micronesia, F. S.	Barbados	Bermuda
Cameroon	Georgia	Kyrgyzstan	Japan	Nauru	Belize	Bosnia and Herzegovina
Central African Republic	Iraq	Maldives	Lao PDR	New Zealand	Bolivia, P. S.	Bulgaria
Chad	Israel	Nepal	Macao, China	Niue	Brazil	Canada
Comoros	Jordan	Pakistan	Malaysia	Palau	British Virgin Islands	Croatia
Congo	Kuwait	Sri Lanka	Mongolia	Papua New Guinea	Cayman Islands	Czechia
Côte d'Ivoire	Lebanon	Tajikistan	Myanmar	Samoa	Chile	Denmark
D. R. Congo	Libya	Turkmenistan	Philippines	Solomon Is	Colombia	Estonia
Djibouti	Morocco	Uzbekistan	Republic of Korea	Tokelau	Costa Rica	Finland
Equat. Guinea	Oman		Singapore	Tonga	Cuba	France
Eritrea	Palestine		Thailand	Tuvalu	Curaçao	Germany
Eswatini	Qatar		Timor-Leste	Vanuatu	Dominica	Greece
Ethiopia	Saudi Arabia		Viet Nam		Dominican Republic	Hungary
Gabon	Sudan				Ecuador	Iceland
Gambia	Syrian Arab Republic				El Salvador	Ireland
Ghana	Tunisia				Grenada	Italy
Guinea	Turkey				Guatemala	Latvia
Guinea-Bissau	United Arab Emirates				Guyana	Liechtenstein
Kenya	Yemen				Haiti	Lithuania
Lesotho					Honduras	Luxembourg
Liberia					Jamaica	Malta
Madagascar					Mexico	Monaco
Malawi					Montserrat	Montenegro
Mali					Nicaragua	Netherlands
Mauritania					Panama	Norway
Mauritius					Paraguay	Poland
Mozambique					Peru	Portugal
Namibia					Saint Kitts and Nevis	Republic of Moldova
Niger					Saint Lucia	Romania
Nigeria					Saint Vincent/Grenadines	Russian Federation
Rwanda					Sint Maarten	San Marino
Sao Tome and Principe					Suriname	Serbia
Senegal					Trinidad and Tobago	Slovakia
Seychelles					Turks and Caicos Islands	Slovenia
Sierra Leone					Uruguay	Spain
Somalia					Venezuela, B. R.	Sweden
South Africa						Switzerland

South Sudan
Togo
Uganda
United Republic of
Tanzania
Zambia
Zimbabwe

TFYR Macedonia
Ukraine
United Kingdom
United States

Source: <http://data.uis.unesco.org/Index.aspx>