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TEACHERS' INDICATORS: WHAT ARE THE CHALLENGES GOING FORWARD?

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ABSTRACT

This paper summarizes the key challenges for monitoring teaching under SDG 4 (indicators SDG 4c) and proposes three areas as agenda items for working group discussions going forward. The key challenges are (1) low coverage of SDG 4c indicators especially those related to the attractiveness of the teaching profession, (2) the comparability and relevance of indicators related to teacher preparedness (4c1 to 4c4 and 4c7), and (3) the current framework focusing on prevalence of teacher training and lack of indicators on what the research literature has identified as critical for successful teacher education. The agenda items proposed in this paper are:

- 1. Finalize the revision of the SDG framework on teachers:** Potential actions include
 - a. Revise the indicator framework related to teacher preparedness
 - b. Implement ISCED-T: administer the ISCED-T questionnaire to collect relevant data on TTPs
 - c. Define global standards for teacher training programs and trained teachers
 - d. Revise framework for attracting and retaining teachers (indicators 4c5-6): review how attracting and retaining teachers can be better monitored either through improving coverage of existing indicators or through alternative indicators including policy indicators
- 2. Improve data collection through better capacity building and innovation:** Potential actions include
 - a. Update/review data collection instruments and strategy in compliance with global standards and making use of innovative ways of data collection; e.g., web scrapping and AI
 - b. Define guidelines for country's data collection on teacher workforce, with common definitions, etc.
- 3. Extend link between the 4.C framework and the evidence-base on teacher training**
 - a. Build and maintain UIS knowledge-base on best-practice for teacher education
 - b. Extend the teaching requirements and ISCED-T data collections to include key characteristics of teacher training

1. Introduction

A. Teacher framework

The international education agenda includes an explicit quantitative target and a set of monitoring indicators on teachers. Target 4.c is to “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”. The ambitious goal of SDG Target 4--quality education for all--cannot be achieved unless all students receive high-quality teaching.

The current framework monitors the quality of teaching by looking at teacher preparation, retention and salaries. The framework has 1 global indicator and 6 thematic indicators (see **Table 1**). The global reporting framework uses as a global indicator the “Proportion of teachers with the minimum required qualifications, by education level” (Indicator 4.c.1) that focus on trained teachers as defined by the UIS. The global indicator focuses on the quality gaps in teacher preparedness that may occur, specifically whether enough teachers have the knowledge and skills to meet the teaching needs in a continuously changing educational context. This is expressed in indicator 4.c.1 that tries to capture the percentage of qualified teachers. Additionally, six other indicators are recommended in the thematic monitoring framework that referred to qualified teacher, teacher/student ratio, teacher’s salaries, attrition, and continuous professional development. The framework has 3 indicators related to the Preparation and development of teachers group includes factors associated with initial teacher education, the certification of teachers, and the professional development of teachers during their careers (trained/qualified and participation on CDP). 2 indicators are intending to measure resources by the 2 pupil teacher ration associated to the indicator on trained and qualified. The framework is completed by a salaries indicator (trying to measure teaching as an attractive career choice) and teacher’s retention.

Table 1. SDG 4.C Indicators

Indicator	Definition
4.c.1	Proportion of teachers with the minimum required qualifications , by education level
4.c.2	Pupil-trained teacher ratio by education level
4.c.3	Percentage of teachers qualified according to national standards by education level and type of institution
4.c.4	Pupil-qualified teacher ratio by education level
4.c.5	Average teacher salary relative to other professions requiring a comparable level of qualification
4.c.6	Teacher attrition rate by education level
4.c.7	Percentage of teachers who received in-service training in the last 12 months by type of training

B. Objective of this document

The objective of this document is to define the key challenges faced in monitoring the contribution of teaching to target SDG 4 in order to set the agenda for working group discussions going forward. The current framework and measurement methodologies as well as a review of the recent achievements and remaining challenges to monitoring 4.C are presented. Based on these, a set of topics for further discussion by working groups are proposed. Note that much of the analysis presented in this note is not new: these issues have been the subject of discussion and ongoing research by the UIS.

2. Current Methodologies

The current methodology for the SDG 4.C indicators predominantly relies on the UIS country survey data, but international learning assessment data, OECD data, and ILO data are also used. Indicators 4.c.1 to 4.c.4 as well as 4.c.6 utilize data collected through the UIS country survey about numbers of teachers, trained teachers, and pupils to calculate proportions of teachers qualified or trained and the qualified and trained teacher to pupil ratios (Table 2). Attrition rates are also collected from the UIS survey. For SDG 4.c.5, teacher salaries relative to similarly qualified individuals, the teacher salary data is obtained through the UIS country survey (excluding countries with this indicator published in the OECD at a glance) while comparator salaries are obtained from the ILO. For SDG 4.c.7, due to low reporting of the needed data on the UIS country survey, data from teacher questionnaires of international student assessments and from the OECD's teacher survey (TALIS) are used.

Table 2: Indicators and data sources

Indicator	Data sources (link to metadata documents)
4.c.1 (trained teacher)	UIS country survey
4.c.2 (pupil trained-teacher ratio)	UIS country survey
4.c.3 (qualified teacher)	UIS country survey
4.c.4 (pupil-qualified teacher ratio)	UIS country survey
4.c.5 (relative salaries)	OECD; UIS country survey for salaries, ILO data for comparator salaries, IMF data for price inflation adjustments
4.c.6 (teacher attrition rate)	UIS country survey
4.c.7 (recent in-service training)	International learning assessments; teacher surveys

Teacher indicator calculation follows the protocol for data collected used by the UIS more broadly for indicators derived from the country survey. This protocol involves sending the UIS country questionnaire to country respondents, awaiting countries to reply, UIS staff detecting inconsistencies or other quality issues, resolution of problems by country respondents, and publishing the data (Box 1). The extent to which this protocol is applied, particularly around the validation of data and follow-up from countries, varies, as discussed below, but this protocol broadly describes the current approach used.

Box 1. Protocol for 4.c.1, 4.c.2, 4.c.3, 4.c.4, 4.c.6

1. UIS questionnaire sent to countries
2. Countries fill survey, entered REP database
3. UIS staff verify the consistency of the data and issues are reported to countries who respond
4. Updated and calculated indicators stored in the EST database (including additions of data from other sources); some data flagged as not publishable due to quality issues
5. EST data is published

The teacher salary indicator (4.c.5) methodology relies on a different methodology that utilizes data from multiple sources including the UIS country survey, OECD data, ILO data, and IMF data. The objective of 4.c.5 is to provide a measure of the attractiveness of becoming a teacher as well as the fairness of their compensation. The OECD currently publishes this indicator for OECD countries in its Education at a Glance--the methodology adopted by the UIS aims to follow this methodology as closely as possible in

order to provide a comparable indicator. The numerator of the indicator is the statutory public teacher salary for a typical teacher at the midpoint through her or his career (see **Box 2** for the methodological details). This data is reported through the UIS country survey. The denominator uses the average earnings of individuals employed in professional occupations (as a substitute for those with a given level of education as this data is not published by ILO); this earnings data may not be available for the year of the teacher salaries data and as a result the earnings data is adjusted using consumer price inflation rates published by the IMF's latest World Economic Outlook, following methodology used by the OECD. The resulting data for this indicator using UIS and IMF sources is then added to the OECD published data.

Box 2. Methodology for 4.c.5 teacher salaries

Indicator definition: ratio of annual statutory teacher compensation for a teacher with typical qualifications and 15 years of experience (numerator) to the annual earnings of similarly qualified individuals (denominator)

Numerator: The numerator is statutory salaries of teachers with 15 years of experience with typical qualifications where the preferred definition of typical qualifications is the level of qualifications and training held by the largest proportion of teachers.

Denominator: Three measures of annual earnings of similarly qualified individuals are used, depending on availability of data according in the following order of preference:

- a) For OECD countries (1) the average salary of tertiary educated workers weighted by teacher qualification (reported in the OECD's Education at a Glance), (2) the average salary of tertiary educated workers (also reported in the OECD's Education at a Glance);
- b) For non-OECD countries (3) the annualized earnings of professional occupations published by ILOSTAT.

Data collection: OECD data are collected from OECDSTAT; ILO data are from ILOSTAT; and teacher salary data are from the UIS questionnaire. Ratios that are greater than three or less than one third are not published.

Indicator 4.c.7, proportion of teachers having received professional development recently, is reported using international student assessment data and the OECD's teacher survey, TALIS. These teacher questionnaires generally ask the teacher about whether they have received any professional development in the past year or two depending on the assessment programme (see **Box 2** for details). They differ in how the question is posed, however. For example, PISA and TALIS provide a list of different types of professional development activities (courses, workshops, etc.) and for each one asks whether the teacher has participated in it in the past 12 months. In PIRLS and TIMSS, the question asks how many hours of professional development has the teacher participated in the past two years. These differences in the question items limits comparability of the indicator from different data sources and is an important limitation of this data source. The comparability is also limited by the different populations being targeted (e.g.: 15 year-olds for PISA versus 4th or 8th grade for TIMSS and PIRLS).

Methodology for 4.c.7 recent professional development (PD)

Indicator definition: Percentage of students whose teachers have received in-service training in the past 12 to 24 months as reported in cross-national assessments (CNAs) and teacher surveys.

Data collection: Data are collected from the following International Student Assessment programmes based on data reported through the teachers' questionnaire: LLECE 2013; PASEC 2014; PIRLS 2016/21; PISA 2018. Indicators are calculated using the each countries' datasets. Data are also collected from the OECD TALIS programme and use OECD estimates for the indicator.

3. Developments

In education, the terms "trained teacher" and "qualified teacher" carry significant weight, yet their definitions can vary widely from one country to another. Currently, the global education community faces a critical issue regarding the comparability of data related to teachers, specifically under Sustainable Development Goals (SDG) 4.c.1 and 4.c.3.

A. ISCED-T

To address this challenge, there is an ongoing effort to enhance the SDG framework on teachers. A revision is underway to establish a clearer definition of quality teaching, ensuring consistency and comparability across diverse educational systems globally. One significant development in this pursuit is the creation of the **ISCED-T** (International Standard Classification of Education for Teachers) framework. This framework aims to standardize the classification of teachers' qualifications, providing a common ground for understanding teachers' training and qualifications worldwide.

The development of ISCED-T stands as a significant milestone in the pursuit of global education standards. By focusing on five essential dimensions of teacher training programs, ISCED-T offers a comprehensive framework. The five dimensions are:

- a. ISCED level of the qualification obtained upon completion of the teacher training programme;
- b. target teaching level of the teacher training programme;
- c. minimum educational level required for entry into the teacher training programme;
- d. theoretical duration of the teacher training programme;
- e. teaching practice ratio.

The data reported through ISCED-T holds the potential to improve the education assessment and policy formulation. One of its most promising applications lies in exploring the feasibility of establishing a global minimum standard for teacher qualifications. Such a standard could serve as a unifying benchmark, harmonizing teacher-training practices across nations. By doing so, it would significantly contribute to improving the monitoring of SDG global indicator 4.c.1, which tracks the proportion of teachers who have received at least the minimum organized teacher training required. This global standard, working alongside the national standards, would not only enhance the quality of education but also foster international collaboration in elevating the standards of teaching and learning.

In essence, ISCED-T is not merely a classification system; it is a catalyst for a transformative shift in global education. By embracing these standardized dimensions and the potential for a global minimum standard,

the education community is poised to create a more equitable, consistent, and universally high-quality teacher training landscape. This initiative does not just impact the education sector; it shapes the future by empowering teachers and students alike, ensuring that the foundational elements of education are strong, uniform, and accessible to all, regardless of geographical location or socio-economic status.

B. Database on teacher requirements

Additionally, the UIS has taken a proactive step by assembling a comprehensive database. This dataset meticulously documents the variations in **teacher requirement** policies around the world. This initiative was prompted by [decisions made at the UIS's Technical Cooperation Group \(TCG 9\)](#) to establish suitable country coverage (prevalence rate) that determines the global metrics for minimum standard teachers' qualification to teach specific levels of education. Through these concerted efforts, the global education community aims to bridge the gap between the definitions of a trained teacher and a qualified teacher, ensuring that the education sector's progress is accurately measured and comparable across nations.

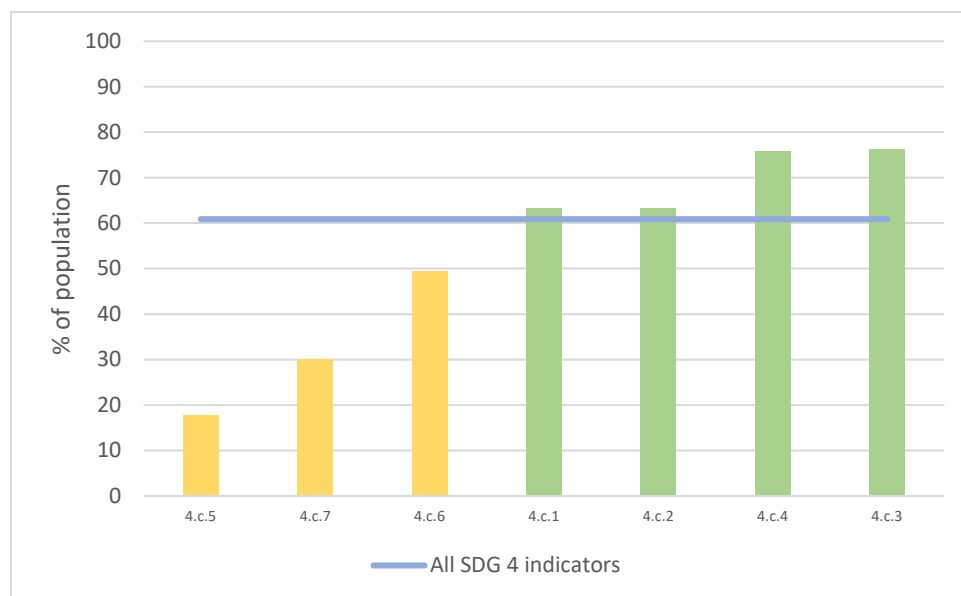
4. Current Challenges

The UIS has been undertaking research activities to document and identify solutions to remaining challenges facing SDG 4.C: these include low coverage, comparability of teacher preparedness indicators, and how the indicator framework, through existing research on teaching, links to target 4. These three challenges emerge from the UIS's recent work on revising the teachers' monitoring framework and on benchmarking. Coverage rates range from 63 to 76 percent for teacher qualification and pre-service training indicators but are substantially lower for the others. Teacher qualification and pre-service teacher training indicators rely on national definitions which masks disparity in how well qualified or trained teachers are in different countries. Finally, the logic and selection of indicators of 4.C implies a link to the indicator 4; however, the literature on what aspects of teacher professional development lead to improved learning outcomes is more nuanced, emphasizing the importance of the content, duration and modality of training. Achievements described above, including ISCED-T and policy data collection, advance the ability to strengthen the link between 4C indicators and the research on how teaching can improve learning outcomes.

A. Low coverage

Coverage rates range from 63 to 76 percent for teacher qualification and pre-service training indicators while coverage rates for relative salaries and recent in-service training are substantially lower. The global average coverage rate for all SDG 4 indicators is just over 60 percent. Indicators reflecting teacher qualifications (4.c.3 and 4.c.4) have the highest coverage rates at just over 75 percent (**Figure 1**), followed by indicators reflecting teacher training (4.c.1 and 4.c.2) which are just over the global average for SDG 4. The other teacher indicators tend to have lower coverage rates. The teacher attrition indicator (4.c.6) has a coverage rate just below half, while the coverage rate for recent professional development (4.c.7) is below 30 percent and for teacher salaries relative to others (4.c.5), below 20 percent.

Figure 1. Percent of population with at least one data point from 2018 to 2022



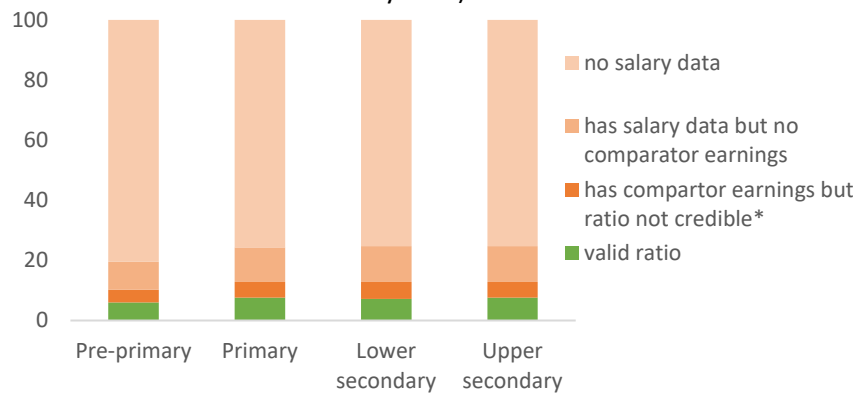
Low coverage rates in 4.c reflect low reporting rates by countries to the UIS survey. An analysis of country data reporting between 2013 and 2017 found that at least two-thirds of data fields in UIS questionnaire A Table 9 and 10--the data fields required for calculating indicators 4.c--were not filled out by country respondents. Only 22 percent of these fields had been reported, validated and used in indicator calculation. 6.5 percent of these fields were reported but were not used in indicator calculation due to quality issues identified by UIS staff, and finally an additional 4 percent were not reported by countries and found through alternative sources. Since the 2019 analysis, there have been increases in the use of alternative data sources including, as described previously, OECD data, ILO data, and IMF data for indicators on relative teacher salaries and recent professional development; however, large data gaps remain for these indicators.

For the indicator on relative teacher salaries (4.c.5), low coverage rates are due to low reporting by countries but also a lack of comparator salaries. Teacher salaries data are reported for between 6 to 8 percent of countries that do not have indicator 4.c.5 published by the OECD's Education at a Glance (Figure 2). 75 to 80 percent of these countries, depending on the level of education, do not have teacher salary data available in the UIS database.¹ Half of the countries that have reported data (9 to 12 percent of the total) do not have comparator salaries available in ILOSTAT. A further 4 to 5 percent have salary data and comparator data but the ratios are not credible. Further analysis is needed to understand reasons for non-credible ratios, and salaries reported in units other than specified (e.g.: in thousands rather than units) is part of the issue.

¹ The reasons for why the data is missing from the UIS database have not been tabulated is likely due to a lack of reporting a value by countries.

No reported salary data main reason for low coverage of 4.c.5

Fig. 2: Teacher salary data classification (percent of countries without OECD teacher salary data)



*Ratios greater than 3 or less than 1/3 were defined as not credible

Three major reasons for low reporting by countries have been identified in UIS research; the first is the staff time and expertise required to respond to the UIS country survey questionnaires. One potential reason is that the UIS country survey questionnaires have become increasingly more complex requiring more time and skill on behalf of the government respondents; however, the skills and time available by government for responding to the UIS questionnaires have not increased sufficiently. For example, teacher salary data requires respondents to know first the most prevalent qualification of a teacher with 15 years' experience and then select the appropriate pay-scale. The lack of time available by country respondents also hinders country responses to data quality issues identified by UIS staff during data validation. For example, unresolved out-of-trend data--when there is, for example, a large unexplained jump in an indicator value for one year--is frequently encountered with teacher data and requires explanation or correction by country respondents. The lack of reaction from country respondents results in delays in publishing data or data not being published at all. Expertise has also emerged as a constraint to government response to the UIS country survey questionnaire related to teachers, particularly around the definition of qualified and trained teachers. The definition of these concepts and differences between them may not be apparent to country respondents and clarification or training may be needed. Key definitions of these terms are not included in the UIS survey itself but rather in the [survey manual](#), which country respondents need time to read and master.

A second major reason for government not reporting data needed for 4.c is that governments do not collect the necessary data through their regular school surveys or EMIS. Countries can report headcount data including the number of teacher or number of pupils, but they are less able to report numbers of teachers trained or qualified; this requires more detailed information to be collected from schools about teachers. The number of teachers that have recently undergone in-service professional development also requires either additional data reporting from school or data collection from teacher training programmes.

A third major issue is related to global coordination or governance, particularly around the definitions of trained and qualified teachers. The highest proportion of data fields needed for 4.c in the UIS country survey questionnaire that were not reported by governments are in North America and Western European countries; 83 percent of data fields are missing for these countries, which is much higher than the two-thirds that are unreported for all countries (see above). High income and some upper middle-income

countries do not agree with the international definitions of qualified and trained teachers, and as a result, are not reporting these figures. Data collection from high income countries for the UIS is done jointly through the UNESCO-OECD-EUROSTAT (UOE) questionnaire; however, the UOE questionnaire does not contain many of the UIS country survey questions needed to calculate a number 4.c indicators, including trained and qualified status of teachers and in-service training. This lack of alignment or agreement is a result of a more fundamental issue around 4.c which is a lack of global coordination or governance to ensure indicators are well aligned with country needs in terms of achieving SDG 4 more broadly.

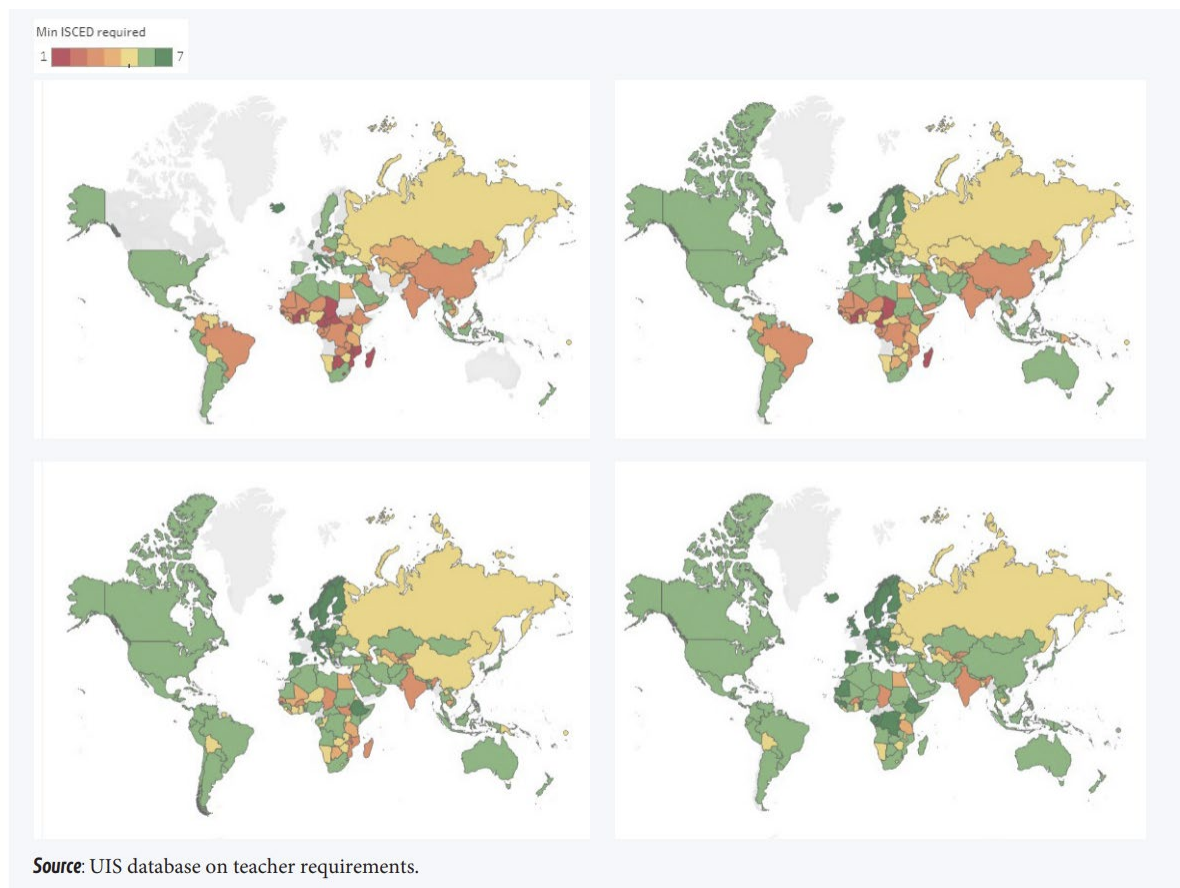
B. Comparability of teacher preparedness indicators across countries

Indicators related to qualifications and training of teachers are defined based on national standards and as a result they mask critical disparities in the preparedness teachers. The indicators on teacher qualifications and training (4.c.1 to 4.c.4) are the most successful in terms of coverage, but they are defined based on national definitions of qualification and training. Comparing these indicators across countries, however, masks critical differences in the preparedness of teachers to teach children. The children in countries with equal proportions of qualified teachers have very different educational experiences depending on the what training and qualifications teachers actually have.

The UIS has recently collected data on teacher requirement policies and has found substantial disparities in teacher qualifications, particularly for low-income countries. In order to better understand differences in teaching requirements including qualifications and training, the UIS undertook data collection and created a new database capturing key aspects of government policies related to teaching requirements (see discussion above). This data has uncovered significant disparities in the preparedness of teachers that are not apparent in the current indicators looking at teacher qualifications and training (i.e.: 4.c.1 to 4.c.4). For example, at the primary level, the most prevalent qualification required to teach in sub-Saharan Africa is an upper-secondary qualification (**Figure 3**). This is the only region where the most prevalent qualification required is not a bachelor's degree or equivalent. In fact, 17 percent of sub-Saharan African countries have a lower secondary education qualification as the minimum required qualification to teach; the lowest accepted qualification in Europe and North America is a short cycle post-secondary qualification (ISCED 5) and only in 1 out 10 countries. Also, the most common requirement for teaching is a teacher diploma obtained through a teacher training programme. However, teacher training programmes differ greatly by countries. For example, they differ in terms of the level of qualification obtained upon completion of the teacher training program (e.g., secondary, postsecondary non-tertiary, tertiary); the minimum educational level required for entry into the teacher training program; the theoretical duration of the teacher training program and the teaching practice ratio (which is the duration of the work-based in-school component of the teacher training program relative to the total duration of the program). The data currently used for monitoring trained and qualified teachers are based on national standards, which vary across countries.

Figure 3 Minimum required qualification (ISCED terms) to teach by level

Disparity in required teaching qualifications (as an indicator of teacher preparedness) is masked by looking at the percent of teacher qualified alone



C. Linking to Evidence on Effective Teacher Training and SDG Target 4

The literature on teacher training has (a) demonstrated that that teacher training interventions vary in their effectiveness and (b) identified the characteristics of training critical for effectiveness. Teacher qualification or certification on student learning outcomes alone do not necessarily imply impact on student achievement, and the importance of the quality of pre-service teacher education for student learning is well established in the literature (Rivkin, Hanushek, & Kain, 2005; Nye, Konstantopoulos, & Hedges, 2004). Likewise, in-service teacher training vary in their impact on learning outcomes and research has sought to identify the characteristics of both in-service and pre-service teacher training that contribute to student learning. For example, the modality of in-service training (e.g.: coaching and mentoring), the content of training (e.g.: subject-specific pedagogy and formative assessment), and duration of training have been identified as critical factors for impact on student learning (Popova et al. 2018; Kraft et al. 2017; Evans & Popova 2016; McEwan 2015; Hattie 2009). Similar characteristics have been identified for pre-service training; however, the quality of teaching practicum has emerged as being critical for the effectiveness of pre-service training including its duration and the student teachers' interaction and coaching by trainers (Darling-Hammond, 2006a; Darling-Hammond 2006b). In effect, the

literature offers clear guidance on the which aspects of pre- and in-service teacher training are important for its effectiveness.

Currently, SDG 4.c has five indicators measure prevalence of qualifications and training among teachers and students, but none reflect the characteristics that have been identified in the literature for the effectiveness of these programs. Target 4.c aims to increase the supply of qualified and trained teachers, and the current indicator framework faithfully follows this. However, as discussed above, qualified and trained teachers currently reflect national definitions masking disparities in how well qualified and trained teachers are, and the teaching requirements data and ISCED-T illuminate these disparities and enable global definitions of trained and qualified teachers. The remaining challenge is identifying and measuring the characteristics of training and qualifications that have been found in the literature to be predictive of learning outcomes.

See: https://pdf.usaid.gov/pdf_docs/PNADZ721.pdf

5. Agenda: What are the key discussions needed going forward?

A. Finalize the revision of the SDG framework

Motivation: This topic would address the comparability and relevance of teacher preparedness indicators and low coverage. As discussed previously, 4.c indicators have low coverage due to (a) lack of the necessary data being collected from schools, (b) lack of time, resources and expertise to respond to the UIS questionnaire on teachers, and (c) lack of global consensus on definitions of trained and qualified teachers. A second major challenge is that teacher preparedness indicators are defined based on national definition and mask disparities in the qualification and training of teachers; this also relates to the issue of relevance of the definition for countries including high income countries.

Guidance: The UIS has been reviewing the indicator framework for 4.c to address these challenges and offers the following guidance. This work would be a critical input into the discussions for this topic.

- 1. Revise the indicator framework related to teacher preparedness:** The UIS has been researching and discussing potential changes to the indicator framework including changing the global indicator and including indicators that measure policy characteristics in addition to measuring prevalence of qualifications and training (see Table 3 for example).
- 2. Implement ISCED-T:** The ISCED-T framework captures critical characteristics of teacher training and qualifications and administering the questionnaire would enable monitoring of crucial disparities in the qualification and training of students' teachers around the world but also enable the establishment of global standards for teacher training programs and teacher qualification and training.
- 3. Define global definitions for qualified and trained teacher:** While countries have differing approaches to their teaching policies including education, recruitment, and working conditions that reflect the unique circumstances in each country, understanding the qualifications of teachers in other jurisdictions offers valuable information for countries in developing or revising their own teacher qualification requirements. This is reflected in the spirit of SDG monitoring where, "Global monitoring should be based, to the greatest possible extent, on comparable and standardized national data..." (UNGA 2015, "Transforming our world: the 2030 Agenda for Sustainable Development", Resolution

70/1). For example, using the most prevalent minimum requirement has been discussed by the TCG as a potential definition for a global qualification, which could also be applied regional—this could form the basis for a revised global indicator for 4.c.

4. **Revise the indicator framework related to attracting and retaining teachers:** Measuring the indicators at that capture attracting and retaining teachers (indicators 4c5-6) needs strengthening. Teacher salaries relative to similarly qualified individuals has very low coverage primarily due to a lack of country reporting, despite teacher pay scales being relatively well defined in countries. A lack of comparator salaries is a second major constraint to coverage. Alternative data sources may not be available for this indicator (see **Table 4** below). Simplifying the questionnaire may help improve reporting by countries, for example, dropping the requirement for specifying salaries for the most prevalent teacher qualification. Other alternatives include using a policy indicator reflecting how competitive teacher salaries are or more innovative approaches including web-scraping and AI (see discussion below). As for the teacher attrition indicator, data for this indicator is likely to be available through querying payroll records or through union data. Tools that offer countries guidance may be needed to help countries monitor this indicator for their own needs and report to UIS. An alternative here is also a policy indicator reflecting the attractiveness of the teaching profession given that attractiveness is one of the motivations for the attrition indicator in the framework.

Table 3: Example of changes to teacher qualification and training indicators discussed (from the proposed revisions to the framework in the teachers’ paper)

Indicator	Definition
Proposed Global Indicator: proportion of teachers with the minimum required academic qualification according to a global standard , by education level taught	A qualified teacher is one who has the minimum ISCED qualification necessary to teach at a specific level of education according to a global reference (new indicator)
Percentage of teachers with the minimum required academic qualification according to national definition, by education level taught	A qualified teacher is one who has the minimum required qualifications necessary to teach at a specific level of education in each country (currently 4c3)
Whether a country’s in-service teacher training policies have specific features	Policy level indicator measuring key features of in-service training policies (content of training, timing, etc.)
Percentage of teachers with training in the last 12 months	Currently collected using international student assessment data and teacher surveys (TALIS)

B. Improve data collection through better capacity building and innovation

Motivation: This topic would address low coverage of indicators due to lack of expertise on data collection by governments, lack of resources to collect needed data, and data quality issues. As discussed previously, low coverage for 4.c relates to the ability and resources of government respondents to provide data and the quality of that data as well as lack of resources to collect needed data from schools. For example, data sources generally exist for teacher salaries through established pays scales or on teacher attrition through payroll data, but expertise is needed to (a) understand the definitions used in the UIS survey and (b) to obtain the data from government systems. In addition, resources may be too scarce to collect the needed from schools and alternative data sources may be needed.

Guidance: UIS is currently reviewing data collection methods, technical assistance tools to countries and alternative methods for data collection. The following guidance emerges from this work:

1. **Update and review data collection instruments and strategy:** A thorough review and update of data collection instruments and strategies are in motion, aligning with global standards. Embracing innovative techniques such as web scraping and artificial intelligence (AI) might improve not only the accuracy of data but also its timelines.
2. **Define guidelines for country's data collection:** Moreover, a pivotal step involves the formulation of comprehensive guidelines for each country's data collection on the teacher workforce. These guidelines will establish common definitions and methodologies, promoting consistency in data reporting and analysis. Through these collaborative endeavors, the global education community is forging a path towards a more robust, informed, and unified approach to teacher training, thereby shaping a brighter future for education worldwide.

C. Extend the link between 4.C framework and evidence-base on teacher training

Motivation: This topic would address linking progress in the 4.C indicators to improved learning outcomes, based on existing research on effective teacher training. As described above, the current framework is primarily devoted to prevalence of qualifications and training (5 out of 7 indicators), and the creation of the teaching requirements database as well as ISCED-T has now enabled comparison of teacher qualifications and training and enables the ability to set global standards. However, the 4.C indicator framework effectively provides guidance to countries on how to improve learning, and it is essential that indicators capture the factors to the extent possible that contribute to learning outcomes. For example, ISCED-T measures both the qualification required for entering a teacher training program as well as the duration of the practicum component. On this basis, what should countries invest in, increasing the qualification required to enter a teacher training programme or the duration of the practicum? As another example, if ISCED 5 is set as a global standard for minimum teaching qualification, does this mean that countries that currently have ISCED 3 should invest resources to increase qualifications to ISCED 5? There is compelling research that well designed in-service teacher training can improve learning outcomes of children (e.g.: early grade reading interventions evaluated by Macdonald et al. 2018; Macdonald & Vu 2018; Piper, Zuilkowski & Ong'ele 2016; Kerwin & Thorton 2015; Piper & Korda 2011) without changing the teachers' qualifications. In essence, providing an indicator framework should coincide with a clear conceptual and evidence-based link to improve learning in order to assist countries to navigate progress through the framework.

Guidance: In order to assist countries to navigate the 4.C indicator framework to improve teaching quality and improve learning outcomes, the following could be considered:

1. **Build and maintain UIS knowledge-base on best-practice for teacher education:** An updated document reviewing literature on what characteristics are understood to be effective for pre- and in-service teacher training based on the evidence would ensure that the UIS has a current knowledge-based to work from. Review of other agencies' tools for assessing teacher training programs (e.g.: World Bank ITTSI) would also help develop and apply the knowledge base to measurement.
2. **Extend the teaching requirements and ISCED-T data collection to include key characteristics of teacher training:** Already ISCED-T includes data collection on the duration of practicum and both the ISCED-T and the teaching requirements data collection could be extended to collect data on whether teacher training programs exhibit the characteristics identified in the research as being critical for learning. ISCED-T already collects data on duration of practicum and additional indicators may be possible as well.

Table 4: Alternative sources of data for measuring relative teacher salaries²

Data source	Labour force surveys (LFS)	Government statutory sources (UIS country questionnaire) * current method used	teaching staff compensation (UIS country questionnaire)	International student assessments' teacher questionnaires
Measure definition	Estimated monthly and hourly earnings of teachers relative to other workers (expressed as a ratio) controlling for differences in educational attainment, experience, gender (Mincer model)	Statutory annual earnings of a public school teacher with typical qualifications and 15 years' experience relative to average professional salaries	Teaching staff compensation per teacher relative to average professional salaries	Average teacher salaries relative to average professional salaries of teachers of assessed grade level
Main advantages	Only method that provides an estimate of SDG Indicator 4.c.5 conforming to its definition. Includes public and private school teachers, can control for education level.	Generally the easiest source of data as it does not require any special surveys or analysis; currently used by OECD	This measure was found to be available for 22 countries already compared to statutory sources (see below)	Provides an average of teacher salaries for public and private providers
Main disadvantages	<ol style="list-style-type: none"> 1. Small sample size of teachers may result in insufficient statistical power to make comparisons depending on the survey and context. 2. Requires considerable analytical work by labor economists or statisticians familiar with labor force survey data and a comparable method for measuring salary differences applied to all datasets 	<ol style="list-style-type: none"> 1. Provides salaries for public school teachers only at approximately the mid-point in their career, not at average for all teachers 2. Requires an additional source of data for comparator salaries 3. Requires analytical capacity by government / informant to study the applicable laws and regulations and a method for aggregating when laws and regulations vary within countries (e.g.: federal system; different regulations within same level of school, etc.) 	<ol style="list-style-type: none"> 1. Provides an overestimate of teacher salaries compared to the comparator salaries (those of professional occupation) because it includes employer contributions to social security and pensions 2. Provides salaries for public school teachers only 3. May be an average of full and part-time teachers together (not full-time equivalents) in some countries 	<ol style="list-style-type: none"> 1. Provides averages only for teachers of assessed grade level 2. Has only been included in PASEC 2014 so far 3. Sample-based, and large confidence intervals possible below

² Based on a review for the UIS in 2019: Macdonald (2019). *Measuring SDG Indicator 4.C.5 and The Role Of The UNESCO Institute For Statistics*. Discussion paper for the UIS.

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