



TEACHER DATA

CHALLENGES AND SOLUTIONS FORWARD

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AND STATISTICS**

INTRODUCTION

The international education agenda includes a 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 monitoring framework has one global indicator and six thematic indicators (**Table 1**). The global indicator is the ‘Proportion of teachers with the minimum required qualifications, by education level’. The thematic indicators refer to qualified teachers, pupil/teacher ratios, teacher salaries, attrition and continuous professional development.

Table 1. SDG target 4.c indicators

	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

The objective of this document is to define the key challenges in monitoring teacher indicators in order to set the agenda for future discussions. The current framework and measurement methodologies as well as a review of recent achievements and remaining challenges to monitoring 4.c are presented. Based on these, a set of topics for further discussion are proposed. 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.

CURRENT METHODOLOGIES

The current methodology for the SDG target 4.c indicators predominantly relies on UIS country survey data, but other 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 the proportions of teachers qualified or trained and the pupil to qualified and trained teacher ratios (**Table 2**). Attrition rates are also collected from the UIS survey. For indicator 4.c.5, teacher salary data are obtained through the UIS country survey (excluding countries with this indicator published in OECD Education at a Glance series), while comparator salaries are obtained from the ILO. For indicator 4.c.7, due to low reporting of the needed data from the UIS country survey, data from teacher questionnaires of international student assessments and from the OECD Teaching and Learning International 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

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

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

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

The teacher salary indicator (4.c.5) methodology relies on a methodology that uses 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 and the fairness of their compensation. The OECD currently publishes this indicator for OECD countries in *Education at a Glance*. The UIS has adopted and aims to follow the same methodology as closely as possible to yield a comparable indicator. The numerator of the indicator is the statutory public teacher salary for a typical teacher at the midpoint through their career (**Box 2**). These data are 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 these data are not published by the ILO); these earnings data may not be available for the year of the teacher salaries data and as a result the earnings data are adjusted using consumer price inflation rates published by the IMF World Economic Outlook, following OECD methodology. The data for this indicator using UIS and IMF sources are added to the OECD published data.

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

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

Numerator: The numerator is the 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 in the following order of preference:

- a)** For OECD countries: (i) the average salary of tertiary-educated workers weighted by teacher qualification (reported in the OECD's Education at a Glance) and (ii) the average salary of tertiary-educated workers (also reported in the OECD's Education at a Glance).
- b)** For non-OECD countries: (i) annualized earnings of professional occupations published by ILO.

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

Indicator 4.c.7, the proportion of teachers having received professional development recently, is reported using the OECD Programme for International Student Assessment (PISA) data and TALIS data. These teacher questionnaires generally ask teachers whether they have received any professional development in the past year or two depending on the study (**Box 3**). They differ in how the question is posed, however. For example, PISA and TALIS provide a list of different types of professional development activities, such as courses and workshops, and for each one they ask whether the teacher has participated in them in the past 12 months. In the Progress in

International Reading Literacy Study (PIRLS) and the Trends in International Mathematics and Science Study (TIMSS), the question asks how many hours of professional development the teacher has participated in over the past two years. Comparability is also limited by the different populations being targeted, e.g. 15-year-olds for PISA versus grade 4 and grade 8 students for PIRLS and TIMSS.

Box 3. Methodology for indicator 4.c.7 on teacher professional development

Indicator definition: Percentage of teachers who received in-service training in the past 12 to 24 months as reported in cross-national assessments and teacher surveys.

Data collection: Data are collected from the following international student assessment programmes based on data reported through the teachers' questionnaire: Laboratorio Latinoamericano de Evaluación de la Calidad de la Educación (LLECE); Programme d'analyse des systèmes éducatifs de la CONFEMEN (PASEC); PIRLS/TIMSS; and PISA. Indicators are calculated using each countries' data sets. Data are also collected from the OECD TALIS programme and use OECD estimates for the indicator.

CHALLENGES

Three challenges related to SDG target 4.c. indicators emerge from the UIS's recent work on revising the teachers' monitoring framework and on benchmarking.

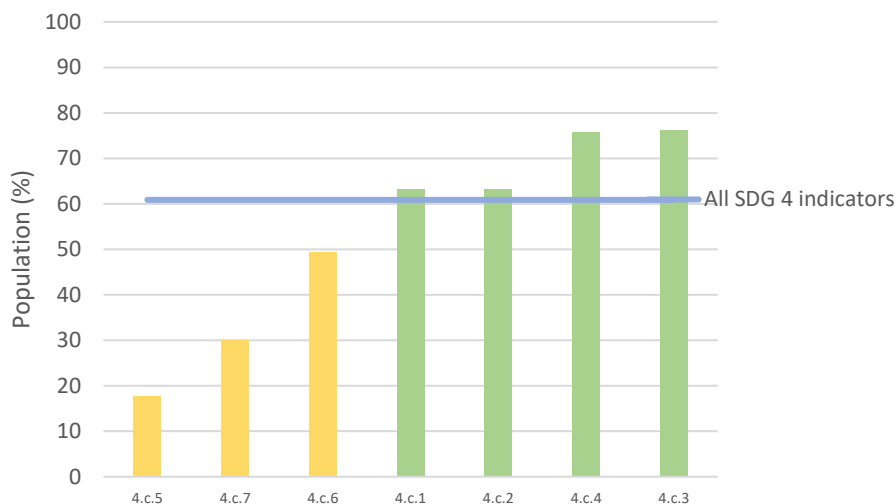
Low coverage

Coverage rates range from 63% to 76% for teacher qualification and pre-service training indicators while coverage rates for relative salaries and in-service training are substantially lower. The global average coverage rate for all SDG 4 indicators is just over 60%. Indicators reflecting teacher qualifications (4.c.3 and 4.c.4) have the highest coverage rates at just over 75% (**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 50%, while the coverage rate for recent professional development (4.c.7) is below 30% and for teacher salaries relative to others (4.c.5) below 20%.

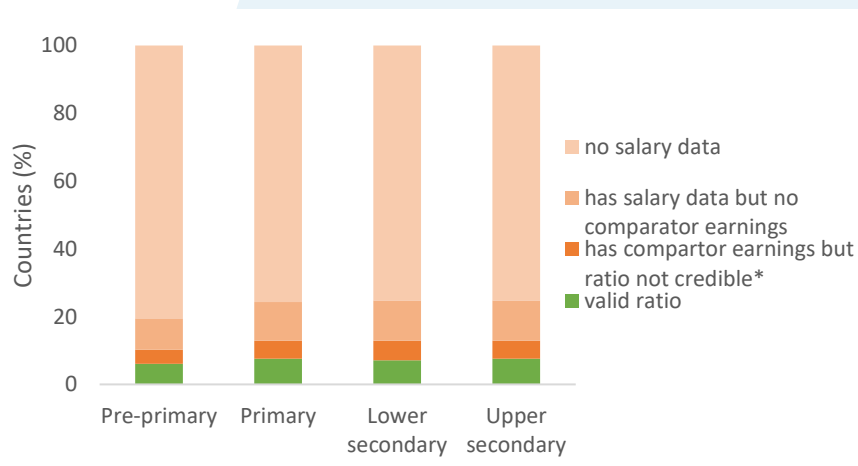
Low coverage rates reflect low reporting rates by countries to the UIS survey. An analysis of country data reporting between 2013 and 2017 found that at least two thirds of data fields in UIS questionnaire A Tables 9 and 10 – the data fields required for calculating 4.c indicators – were not filled out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

Figure 1. Percentage of population in countries covered with at least one data point, 2018–2022



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 salary data are reported for between 6% to 8% of countries that do not have indicator 4.c.5 published by the OECD’s Education at a Glance. No reported salary data is the main reason for low coverage of 4.c.5 (Figure 2). Between 75% and 80% of these countries, depending on the level of education, do not have teacher salary data available in the UIS database. Half of the countries that have reported data (9% to 12% of the total) do not have comparator salaries available in ILOSTAT. A further 4% to 5% have salary data and comparator data but the ratios are not credible. Further analysis is needed to understand the reasons for non-credible ratios. Moreover, salaries reported in units other than specified (e.g. in thousands rather than units) is part of the issue.

Figure 2: Distribution of countries by teacher salary data availability



Notes: Ratios greater than 3 or less than one third were defined as not credible. The analysis excludes countries with OECD teacher salary data.

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. The UIS country survey questionnaires have become increasingly more complex and require more time and skill of the government respondents. For example, teacher salary data requires respondents to first know 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 – are frequently encountered with teacher data and require explanation or correction by country respondents. The lack of reaction from country respondents results in delays in publishing data or the data not being published at all. Lack of expertise has also emerged as a constraint to government responses 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 governments not reporting the 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 teachers or pupils, but are less able to report numbers of teachers trained or qualified; this requires more detailed information to be collected about teachers, which in general is held by the human resources department. 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, 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 Northern America and Western European countries; 83% of data fields are missing for these countries, which is much higher than the two thirds that are unreported for all countries. 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 of 4.c indicators, including the 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 to ensure indicators are well aligned with country needs in terms of achieving SDG 4 more broadly.

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 mask disparities in teachers' preparedness. The indicators on teacher qualifications and training (4.c.1 to 4.c.4) have high coverage but are defined based on national definitions of qualification and training, which hampers comparisons across countries. The UIS has been proactive in assembling a comprehensive database on teacher requirements, prompted by a decision made at the ninth meeting of the [Technical Cooperation Group](#) to establish global metrics for minimum standard teachers' qualification to teach specific levels of education. This data set meticulously documents the variations in **teacher requirement** policies around the world.

There are significant disparities in teaching requirements. At the primary level, upper secondary education is the most prevalent qualification required to teach in sub-Saharan Africa. This is the only region where the most prevalent qualification required is not a bachelor's degree or equivalent. In fact, 17% 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 Northern America is a short-cycle post-secondary qualification (ISCED 5) and only in 1 in 10 countries (**Figure 3**).

Figure 3. Minimum required qualification in ISCED terms to teach by level



The most common requirement for teaching is a teacher diploma obtained through a teacher training programme. However, teacher training programmes differ greatly by countries. A significant development to address this challenge is the introduction of the International Standard Classification of Education for Teachers (**ISCED-T**) framework, which aims to standardize teacher training programme descriptions. It focuses on five essential dimensions of teacher training programmes:

1. ISCED level of the qualification obtained upon completion of the teacher training programme (e.g. secondary, post-secondary non-tertiary, tertiary)
2. Target teaching level of the teacher training programme
3. Minimum educational level required for entry into the teacher training programme
4. Theoretical duration of the teacher training programme
5. Teaching practice ratio (i.e. the duration of the work-based in-school component of the teacher training programme relative to the total duration of the programme)

The ISCED-T has the potential to set minimum standards for an effective teacher training programme. One of its most promising applications lies in exploring the feasibility of establishing

a global minimum standard for each of the five dimensions of a teacher training programme, which could serve as a unifying benchmark, harmonizing teacher training practices across nations. This global standard, working alongside the national standards, would enhance the quality of teacher preparation and elevate teaching standards. Once trained teacher definitions and standards have been adopted based on the ISCED-T, it should be possible to use them for monitoring purposes, at least to document the training status of new entrants to the profession.

Linking evidence on effective teacher training to monitoring SDG target 4.c

The literature on teacher training has demonstrated that teacher training interventions vary in their effectiveness and identified the characteristics of training critical for effectiveness.

Teacher qualification or certification on student learning outcomes alone does 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 varies in impact on learning outcomes. Research has tried to identify the characteristics of both in-service and pre-service teacher training that contribute to student learning (USAID, 2011). 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 the duration of training have been identified as critical factors for impacting 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 critical for the effectiveness of pre-service training including its duration, student–teacher interaction and coaching by trainers (Darling-Hammond, 2006a; Darling-Hammond, 2006b). Overall, the literature offers clear guidance on the aspects of pre-service and in-service teacher training which are important for its effectiveness.

Currently, SDG 4.c has five indicators which measure the prevalence of qualifications and training among teachers, but none reflect the characteristics identified in the literature for programme effectiveness. Target 4.c aims to increase the supply of qualified and trained

teachers, and the current indicator framework aligns with this. However, as discussed above, qualified and trained teacher indicators currently reflect national definitions. The teaching requirement data and ISCED-T illuminate these disparities and enable global definitions of qualified and trained teachers. The remaining challenge is to measure the characteristics of qualifications and training that have been found in the literature to be predictive of learning outcomes.

AGENDA FORWARD: KEY DISCUSSIONS NEEDED

Finalize the revision of the SDG target 4.c indicator framework

Rationale: 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: (i) the lack of the necessary data being collected from schools, (ii) the lack of time, resources and expertise to respond to the UIS questionnaire on teachers, and (iii) the 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 definitions 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 (**Table 3**).

Table 3: Example of changes to teacher qualification and training indicators

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 4.c.3)
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)

2. **Implement ISCED-T:** The ISCED-T framework captures critical characteristics of teacher training and qualifications and administering the questionnaire would enable the monitoring of crucial disparities in the qualification and training of student teachers around the world. It would also enable the establishment of global standards for teacher training programmes and teacher qualifications.
3. **Agree global definitions for qualified and trained teachers:** While countries have different policy approaches including on teacher education, recruitment and working conditions, which 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). 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 at a regional level. 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 that capture attracting and retaining teachers (indicators 4.c.5 and 4.c.6) needs strengthening.
- a.** The indicator on 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. Alternative data sources may not be available for this indicator (Table 4). 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 the competitiveness of teacher salaries or more innovative approaches including web-scraping and AI.
 - b.** Data on the teacher attrition indicator are 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 the UIS. An alternative is a policy indicator that reflects the attractiveness of the teaching profession, given that lack of attractiveness is one of the motivations for the attrition indicator in the framework.

Improve data collection through capacity building and innovation

Rationale: This topic would address the low coverage of indicators due to the lack of expertise on data collection by governments, lack of resources to collect the needed data and data quality issues. As discussed previously, low coverage for 4.c indicators relates to the ability and resources of government respondents to provide data and the quality of that data as well as a lack of resources to collect the needed data from schools. For example, data sources generally exist for teacher salaries through established pay scales or on teacher attrition through payroll data, but expertise is needed to understand the definitions used in the UIS survey and to obtain the data from government systems. Moreover, resources may be too scarce to collect the needed data 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 AI might improve not only the accuracy of data but also the timeliness.
- 2. Define guidelines for country's data collection:** The formulation of comprehensive guidelines for each country's data collection on the teacher workforce is crucial. These guidelines will establish common definitions and methodologies, promoting consistency in data reporting and analysis.

[Link the indicator framework with evidence on teacher training effectiveness](#)

Rationale: This topic would aim to link progress on target 4.c indicators to improved learning outcomes, based on research on effective teacher training. The target 4.c indicator framework effectively provides guidance to countries on how to improve learning, It is essential that indicators capture the factors that contribute to learning outcomes. For example, ISCED-T measures both the qualifications required for entering a teacher training programme as well as the duration of the practicum component. On this basis, what should countries invest in? Should they increase the qualification required to enter a teacher training programme or the duration of the practicum? 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 & Thornton, 2015; Piper & Korda, 2011) without changing required teaching qualifications.

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 the UIS knowledge base on best practice for teacher education:** An updated document is needed which reviews literature on what characteristics are understood to be effective for pre-service and in-service teacher training based on the evidence. This would ensure that the UIS has a current knowledge base. Review of other tools for assessing teacher training programmes (e.g. the In-Service Teacher Training Survey Instrument, ITTSI) would also help develop the knowledge base.
- 2. Extend teaching requirements and ISCED-T data collection to include key characteristics of teacher training:** ISCED-T already includes data collection on the duration of practicum. Both the ISCED-T and the teaching requirements data collection could be extended to collect data on whether teacher training programmes exhibit the characteristics identified in the research as being critical for learning. ISCED-T already collects data on duration of practicum and it may be possible to also collect additional indicators.

Table 4: Alternative sources of data for measuring relative teacher salaries¹

Data source	Labour force surveys (LFS)	Government statutory sources (UIS country questionnaire): the 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 and 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 labour economists or statisticians familiar with labour force survey data and a comparable method for measuring salary differences applied to all data sets. 	<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.

¹ 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*.

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