United Nations
Educational, Scientific and
Cultural Organization

UNESCO Institute for Statistics initiatives for standardization of Information and Communication Technologies (ICT) use in Education indicators

1. Introduction

With the challenges facing the conventional education service delivery in the world, UNESCO believe that under the right conditions, ICT can have a significant impact on the expansion of learning opportunities to wider populations. Technologies can improve the teaching/learning process by reforming conventional delivery systems, enhancing quality of learning achievements, facilitating state-of-art skills formation, sustaining lifelong learning, and improving institutional management. ICTs are perceived as supporting tools to the conventional educational service delivery model and not as substitutes for it. ICTs include older technologies that are still affordable and widely available in the majority of countries (for example, radio and television) and newer technologies (such as computers and the Internet) which may be expensive to introduce, especially in rural areas of developing economies.

Within the framework of the *Partnership for Measuring ICT for Development* established to facilitate the monitoring of the Action Plan of the *World Summit on Information Society (WSIS)*, the UNESCO Institute for Statistics (UIS) is leading its Task Group on Education, whose role is to develop methodologies for global collection of comparable data and indicators on ICT in education. This report outlines briefly the current status and prospects of UIS activities in this regard relation to the development and collection of a core set of internationally comparable indicators on ICT in education.

2. The identification of an initial set of core international ICT in education indicators: process, approach and principles.

A limited set of core ICT in education indicators has been proposed by UIS since 2005 and has underdone a series of validation processes through reviews and consultations conducted worldwide by UIS. This initial core list has been submitted to the United Nations Statistical Commission (UNSC) by the *Partnership* at its 40th session in February 2009.

The selection of this initial set of core indicators was informed or influenced by:

- a stock-taking exercise undertaken in 2004 by the UN Regional Commissions (UNECA, UNESCAP, UNESCWA, UNECLAC and the *Partnership* on behalf of UNECE) in order to identify readily available information society indicators
- a thorough review various international schools surveys[1] to derive commonalities in already tested data items related to ICT use in education;
- a series of regional consultations: Bangkok (26-28 July 2006), Panama (22-24 November 2006), Cairo (13-15 February 2007), Addis Ababa (3-7 December 2007) etc.;
- a review of key regional Information Society policy imperatives and indicators requirements;
- a conduct of a worldwide scoping exercise by UIS in 2006-07 through its annual global education survey.

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[1] These surveys included: i.) Latin American Laboratory for the Assessment of Quality in Education (LABORATORIO 1997); ii.) Programme d'Analyse des Systèmes Educatifs des pays de la CONFEMEN (PASEC 1993-1998); iii.) Southern and East Africa Consortium for Monitoring Educational Quality (SACMEQ 2000-2003); iv.) Literacy Assessment and Monitoring Programme (LAMP); v.) Monitoring Learning Achievement (MLA 1992-2003); vi.) World Education Indicators – Survey of Primary Schools (WEI-SPS 2004); vii.) Second Information Technology in Education Study (SITES-M1 1997-1999, SITES-M2 1999-2002, SITES-M3 2006); viii.) Progress in International Reading Literacy Study (PIRLS 2001); ix.) Programme for International Student Assessment (PISA 2003); x.) Trends in International Mathematics and Science Study (TIMSS 2003); xi.) UNESCO Bangkok: Asia-Pacific Regional Survey (UAPRS 2004).

From the various consultations, country representatives and experts at these regional meetings supported the collection of a limited set of indicators that allow international comparison of countries' progress in the use of ICT in expanding learning opportunities and meeting international education goals. The most common comment expressed was the need for improved standardization of definitions and methodologies to support national data collection and capacity building initiatives. Another major comment was related to the need for further methodology development for an expansion of the initial core list to a more inclusive set of international indicators that encompass the particularities of both advanced and developing countries.

The key principles for determining the initial core list of indicators are summarized as follows:

- The maximum probability of a response from all countries regardless of their capacity constraints and level of development;
- Minimization of the data collection burden on countries, given the current paucity of data on ICT in national statistical systems;
- Avoidance of duplication of data collection on education within countries;
- Sustainability of international data collection modalities of ICT in education data;
- Consistency of the core indicators with the state of knowledge regarding impact issues; and;
- Promotion of a policy-relevant set of indicators at global level.

Based on the above principles and the stock-taking exercise, the UIS proposed a core set of nine indicators for measuring ICT in education presented below in *Table 1*.

Table 1. Core Indicators for ICT

ED1	Proportion of schools with a radio used for educational purposes (for ISCED[2] level 1-3)
ED2	Proportion of schools with a TV used for educational purposes (for ISCED level 1-3)
ED3	Proportion of schools with a telephone communication facility (for ISCED level 1-3)
ED4	Learner-to-computer ratio (for ISCED level 1-3)
ED4. bis	Learner-to-computer ratio (for ISCED level 1-3)
ED5	Proportion of schools with Internet access at school, by type (for ISCED level 1-3) • Fixed narrowband Internet access (using modem dial-up, ISDN) • Fixed broadband Internet access (DSL, cable, other fixed broadband) • Both fixed narrowband and broadband Internet access
ED6	Proportion of learners who have access to the Internet at school (for ISCED level 1-3)
ED7	Proportion of learners enrolled by gender at the **post-secondary non-tertiary and tertiary** level in ICT-related fields (for ISCED level 4 and level 5- 6)
ED8	Proportion of ICT-qualified teachers in primary and secondary schools (for ISCED level 1-3)
EDR1	Proportion of schools with electricity (for ISCED level 1-3) --- *Reference indicator*

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[2] ISCED is the International Standard Classification of Education, 1997, for which UNESCO is responsible. Please see the Annex III for a detailed description of ISCED levels.

3. Detailed specifications of the initial core ICT in education indicators

ED1 Proportion of schools with a radio used for educational purposes (for ISCED[3] level 1-3)

Definition:

Schools offering **radio assisted instruction** as a percentage of the total number of schools in the country for ISCED level 1-3.

Purpose:

To measure the overall presence of **radio assisted instruction** in schools.

Data requirement:

(**EIR**) Total number of educational institutions (public and private) providing **radio assisted instruction** for ISCED levels 1- 3.

(**EI**) Total number of educational institutions (public and private) for ISCED levels 1-3.

Method of collection:

Administrative data collection through annual school census (based on school registers).

Data source(s):

Statistical units of ministries of education or, alternatively, national statistical offices.

Formula:

$$\frac{\sum_{h=1}^{3} EIR_h^t}{\sum_{h=1}^{3} EI_h^t} * 100$$

Where:

EIR_h^t = Educational institutions offering radio assisted instruction at level of education **h** in school-year **t**

EI_h^t = Educational institutions at level of education **h** in school-year **t**

Interpretation:

A high percentage or value for this indicator shows that radio-based technologies are a widespread mode of instruction within schools in a given country. Such situation reflects only a high accessibility or availability of this mode of delivery in schools but not the actual intensity of use.

By comparing this indicator to the proportion of other modes of delivery using ICT facilities, one can figure which are the most predominant or least accessible ICT used for teaching and learning purposes within or across countries.

Methodological and definition issues or operational limitations:

- **Radio assisted instruction** includes both radio broadcast education and interactive radio instruction (IRI) – *see the Glossary*.
- A **radio** is considered to be a stand-alone device (in working condition) capable of receiving broadcast radio signals, using popular frequencies (such as FM, AM, LW and SW). Unless they are intentionally used for educational purposes, radio sets integrated into other devices (such as a walkman, in motor vehicles, an alarm clock, audio cassette or CD players/recorders, portable radios like transistor radios) must be excluded from the data provided.

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[3] ISCED is the International Standard Classification of Education, 1997, for which UNESCO is responsible. Please see the **Annex (d)** for a detailed description of ISCED levels.

ED2   Proportion of schools with a TV used for educational purposes (for ISCED level 1-3)

Definition:

Schools offering **television assisted instruction** as a percentage of the total number of schools in the country for ISCED levels 1-3.

Purpose:

To measure the overall presence of **television assisted instruction** in schools. The indicator measures only the accessibility of this mode of delivery in schools but not the actual intensity of use.

Data requirement:

(EIT) Total number of educational institutions (public and private) providing **television assisted instruction** for ISCED levels 1-3

(EI) Total number of educational institutions (public and private) for ISCED levels 1-3

Method of collection:

Administrative data collection through annual school census (based on school registers).

Data source(s):

Statistical units of ministries of education or, alternatively, national statistical offices.

Formula:

$$\frac{\sum_{h=1}^{3} EIT_{h}^{t}}{\sum_{h=1}^{3} EI_{h}^{t}} * 100$$

Where:

EIT_{h}^{t} = Educational institutions offering television assisted instruction at level of education **h** in school-year **t**

EI_{h}^{t} = Educational institutions at level of education **h** in school-year **t**

Interpretation:

A high percentage or value for this indicator shows that television-based technologies are a widespread mode of instruction within schools in a given country.

In comparison to the value of other modes of ICT-based educational service delivery, this value indicates which service deliveries are the most accessible or the least accessible in terms of the predominance of use of ICT for teaching and learning within or across countries.

Methodological and definition issues or operational limitations:

- A TV (**television set**) is considered a stand-alone device (in working condition) capable of receiving broadcast television signals using popular access means (such as over-the-air, cable and satellite). TV broadcast receivers integrated into other devices (such as a computer, PDA, Smartphone or mobile phone) are considered only if their intended use is for educational purposes.

ED3   Proportion of schools with a telephone communication facility (for ISCED level 1-3)

Definition:

Schools with telephone communication facilities as a percentage of the total number of schools in the country for ISCED levels 1-3. Note that the facility should be directly associated with the school. For instance, a mobile phone owned by an individual working at the school would not constitute a school *telephone communication facility*.

Purpose:

To measure the availability of minimum pre-requisite conditions for Internet accessibility in schools.

Data requirement:

(EIP) Total number of educational institutions (public and private) with a telephone communication facility for ISCED levels 1-3

(EI) Total number of educational institutions (public and private) for ISCED levels 1- 3

Method of collection:

Administrative data collection through annual school census (based on school registers).

Data source(s):

Statistical units of ministries of education or, alternatively, national statistical offices.

Formula :

$$\frac{\sum_{h=1}^{3} EIP_{h}^{t}}{\sum_{h=1}^{3} EI_{h}^{t}} * 100$$

Where:

EIP_{h}^{t} = Educational institutions with a telephone communication facility at level of education **h** in school-year **t**

EI_{h}^{t} = Educational institutions at level of education **h** in school-year **t**

Interpretation:

A low percentage or value for this indicator reveals that challenges remain for policymakers to have Internet connectivity available at schools.

Methodological and definition issues or operational limitations:

Classifications variable that distinguish telephone access that may or may not warrant public usage might useful to ensure more accurate comparability. Telephone access which is **primarily limited** to administrative use (and not for instructional purposes) is to be considered separately.

Privately owned devices even if used as a liaison channel with the outside world must be excluded.

ED4 Learner-to-computer ratio (for ISCED level 1-3)

Definition:
Average number of learners per computer in schools that offer computer-assisted instruction (CAI) for ISCED levels 1-3.

Purpose:
To measure if the provision of computers in schools offering CAI corresponds to any "acceptable norm" for the use of computers in such schools to be effective.

Data requirement:

(LC) Total number of learners entitled to use computer labs at school as pedagogical aid for ISCED levels 1-3

(CP) Total number of computers available for pedagogical use for ISCED levels 1-3

Method of collection:
Administrative data collection through annual school census (based on school registers).

Data source(s):
Statistical units of ministries of education or, alternatively, national statistical offices.

Formula:

$$\frac{\sum_{h=1}^{3} LC_h^t}{\sum_{h=1}^{3} CP_h^t} * 100$$

Where:

LC_h^t = Enrolment of learners entitled to use computer labs at school as pedagogical aid at level of education **h** in school-year **t**

CP_h^t = Total number of computers available for pedagogical use at level of education **h** in school-year **t**

Interpretation:
In the absence of nationally defined norms, a ratio of 1 learner to 1 computer reveals a perfect adequacy of the provision of computer-assisted instruction (CAI) to all learners officially entitled to benefit from it in schools. Where national benchmarks exist, a learner/computer ratio higher than the officially set norm implies that more efforts are required from policymakers to equip schools in order to ensure equitable opportunity for all entitled learners across the country. However, this ratio is seen in the context of the overall proportion of schools that offer CAI in each country. It is important to distinguish between broad-based nation-wide implementation as opposed to a number of small pilot projects within selected educational institutions.

Methodological and definition issues or operational limitations:
Further methodological work will be required to test more robust measures than a simple average (e.g. median, percentiles) in order to improve cross-country comparisons.

This ratio is an indicator of potential access to computers for educational purposes. It is neither a measure of actual use of computers in schools nor of time spent by learners for computer-assisted instruction.

ED4. bis   Learner-to-computer ratio (for ISCED level 1-3)

Definition:
Average number of total learners per computer in ALL schools for ISCED level 1-3.

Purpose:
To measure the possibilities available for the use of computers in schools to promote or expand computer-assisted instruction.

Data requirement:
(L) Total number of learners at school for ISCED level 1-3

(CP) Total number of computers available for pedagogical use for ISCED level 1-3

Method of collection:
Administrative data collection through annual school census (based on school registers).

Data source(s):
Statistical units of ministries of education or, alternatively, national statistical offices.

Formula:

$$\frac{\sum_{h=1}^{3} L_h^t}{\sum_{h=1}^{3} CP_h^t} * 100$$

Where:

L_h^t = Enrolment of learners at level of education **h** in school-year **t**

CP_h^t = Total computers available for pedagogical use at level of education **h** in school-year **t**

Interpretation:
This indicator measure solely the digital gap when the value is compared to other countries: the higher the value the greater is the digital gap in terms of computer use for pedagogical support.

Methodological and definition issues or operational limitations:

Further methodological work will be required to test more robust measures than a simple average (e.g. median, percentiles) in order to improve cross-country comparisons.

This ratio is neither a measure of actual use of computers in schools nor of time spent by learners in using computers.

ED5 Proportion of schools with Internet access at school, by type (for ISCED level 1-3)
- Fixed narrowband Internet access (using modem dial-up, ISDN)
- Fixed broadband Internet access (DSL, cable, other fixed broadband)
- Both fixed narrowband and broadband Internet access

Definition:

Schools with access to the Internet as a percentage of the total number of schools in the country for ISCED levels 1-3.

Purpose:

To measure the overall presence of the Internet in schools.

Data requirement:

(EII) Total number of educational institutions (public and private) providing Internet access by type for ISCED levels 1-3

(EI) Total number of educational institutions (public and private) for ISCED levels 1-3

Method of collection:

Administrative data collection through annual school census (based on school registers).

Data source(s):

Statistical units of ministries of education or, alternatively, national statistical offices.

Formula :

$$\frac{\sum_{h=1}^{3} EII_{h,s}^{t}}{\sum_{h=1}^{3} EI_{h}^{t}} * 100$$

Where:

$EII_{h,s}^{t}$ = Educational institutions with Internet access at level of education **h** by type of access **s** in school-year **t**

EI_{h}^{t} = Educational institutions at level of education **h** in school-year **t**

Interpretation:

A high percentage or value for this indicator shows the extent to which Internet accessibility is prevalent within schools in a given country.

Methodological and definition issues or operational limitations:

This indicator measures only the availability of Internet access in schools but not the intensity of use and time spent on it by learners for learning purposes.

ED6 Proportion of learners who have access to the Internet at school (for ISCED level 1-3)

Definition:

Total number of learners with access to the Internet in schools as percentage of the total number of learners in schools for ISCED levels 1-3.

Purpose:

To measure the accessibility to Internet use for educational purposes by learners.

Data requirement:

(LI) Total number of learners entitled to use Internet labs at school as pedagogical aid for ISCED levels 1-3

(L) Total number of learners for ISCED levels 1- 3

Method of collection:

- Administrative data collection through annual school census (based on school registers); or alternatively
- Sample school survey or household survey (self-reported item response by household members attending ISCED levels 1 to 3).

Data source(s):

Statistical units of ministries of education or, alternatively, national statistical offices.

Formula :

$$\frac{\sum_{h=1}^{3} LI_{h}^{t}}{\sum_{h=1}^{3} L_{h}^{t}} * 100$$

Where:

LI_{h}^{t} = Total number of learners entitled to use Internet labs at school as pedagogical aid at level of education *h* in school-year *t*

L_{h}^{t} = Enrolment of learners at education level *h* in school-year *t*

Interpretation:

A high percentage for this indicator suggests greater access to the Internet for learners. However, in order to have a better sense of its potential effectiveness, one needs to match the number of learners with Internet access entitlement to the number of computers used for instructional purposes that are connected to the Internet.

Depending on the pedagogical need, 100% access to the Internet for all learners may not be an intentional educational goal for all grades.

Methodological and definition issues or operational limitations:

- Distortion may be possible with some private (or even public) or some specialized institutions offering Internet access at grade or age different from a nationally defined grade or age of learners.
- The type of bandwidth for Internet connectivity in schools as well as the number of simultaneous users can constrain the amount of Internet resources accessible within a given time span.
- This indicator is limited as it does not account for the actual use or frequency of use of the Internet by learners.

ED7   Proportion of learners enrolled by gender at the post-secondary non-tertiary and tertiary level in ICT-related fields (for ISCED level 4 and level 5- 6)

Definition:

Number of learners currently admitted in ICT-related fields[4] by gender as a percentage of all learners enrolled in educational institutions in a given country by gender for ISCED level 4 and level 5-6.

Purpose:

To measure the share of learners in ICT-related fields of study in tertiary education institutions.

Data requirement:

(LIT) Total number of learners (by gender) enrolled in ICT-related fields in tertiary education institutions for ISCED level 4 and level 5- 6

(L) Total number of learners (by gender) enrolled in tertiary education institutions regardless of their fields of study for ISCED level 4 and level 5- 6

Method of collection:

Administrative data collection through annual school census (based on school registers).

Data source(s):

Statistical units of ministries of education or, alternatively, national statistical offices.

Formula :

$$\frac{LIT^{t}_{h=4}}{L^{t}_{h=4}} * 100 \quad , \quad \frac{\sum_{h=5}^{6} LIT^{t}_{h}}{\sum_{h=5}^{6} L^{t}_{h}} * 100$$

Where:

LIT^{t}_{h} = Enrolment of learners (by gender) in ICT-related field at tertiary education level **h** in school-year **t**

L^{t}_{h} = Enrolment of learners (by gender) at tertiary education level **h** in school-year **t**

Interpretation:

A high percentage for this indicator may indicate an important demand for ICT-related studies by learners in relation to other fields of study. Compared to its value over time, a rapidly increasing percentage may suggest a fast adaptation to the new information age by a country in the provision of larger training opportunities in ICT-related fields. A computation of this indicator by key sub-categories may be useful to monitor more adequately some specific sub-fields of studies.

Methodological and definition issues or operational limitations:

Further mapping and classificatory work will be required to re-code within the ISCED fields of study those fields that have emerged after 1997.

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[4] See Annex IV for definition of ICT-related fields.

ED8 Proportion of ICT-qualified teachers in primary and secondary schools (for ISCED level 1-3)

Definition:

Number of teachers trained to teach Basic Computer Literacy (or computing) expressed as a percentage of the total number of teachers at these levels of education.

Purpose:

To measure the extent to which primary and secondary school teachers receive ICT training.

Data requirement:

(**TTB**) Total number of teachers trained to teach Basic Computer Literacy (or computing) as a subject for ISCED levels 1-3

(**T**) Total number of teachers in primary and secondary schools regardless of subject(s) taught for ISCED level 1-3

Method of collection:

Administrative data collection through annual school census (based on school registers).

Data source(s):

Statistical units of ministries of education or, alternatively, national statistical offices.

Formula :

$$\frac{\sum_{h=1}^{3} TTB_{h}^{t}}{\sum_{h=1}^{3} T_{h}^{t}} * 100$$

Where:

TTB_{h}^{t} = Teachers trained in basic computer literacy (or computing) at level of education **h** in school-year **t**

T_{h}^{t} = Teachers at level of education **h** in school-year **t**

Interpretation:

A high percentage of ICT-qualified teachers among the overall teaching staff in primary and secondary schools of a nation suggests its readiness to offer ICT skills in order to meet emerging and evolving skills requirements in the information economy and society.

This does not infer automatically that ICT classes are effectively delivered to learners by all teaching staff having received a formal training to teach ICT skills (e.g. if certain pre-requisites - such as computer labs, ICT course syllabus, etc - are not available in schools).

Methodological and definition issues or operational limitations:

- All teachers trained specifically in pre-service or in-service schemes according to **nationally defined qualification standards** are counted as qualified.

- This indicator only presents the skilled teaching force available to deliver ICT courses but this does not necessarily mean that each of the teachers recorded as qualified does actually teaches an ICT course as part of the formal curricula. Furthermore, in schools where there are no ICT equipment or inadequate ICT equipment, course delivery may not be effective even though the schools have teachers qualified to teach ICT.

Reference indicator

EDR1   Proportion of schools with electricity (for ISCED level 1-3)

Definition:
Schools with electricity as a percentage of the total number of schools in the country for ISCED levels 1-3.

Purpose:
To measure the availability of a minimum necessary condition for ICT to be introduced to schools.

Data requirement:
(EIE) Total number of educational institutions (public and private) with electricity for ISCED levels 1- 3

(EI) Total number of educational institutions (public and private) for ISCED levels 1-3

Method of collection:
Administrative data collection through annual school census (based on school registers).

Data source(s):
Statistical units of ministries of education or, alternatively, national statistical offices.

Formula:

$$\frac{\sum_{h=1}^{3} EIE_{h}^{t}}{\sum_{h=1}^{3} EI_{h}^{t}} * 100$$

Where:

EIE_{h}^{t} = Educational institutions with electricity at level of education **h** in school-year **t**

EI_{h}^{t} = Educational institutions at level of education **h** in school-year **t**

Interpretation:
A low percentage or value for this indicator reveals that the potential implementation of ICT in education is largely constrained by a poor enabling environment. It suggests that policymakers in this situation should aim first at improving the provision of electricity to schools before introduction of any ICT, or they should package electricity provision together as a co-requisite to any investment in ICT for education.

It should be noted, however, that not all technologies which improve teaching and learning (e.g. radio broadcast classes or lessons) require both permanent and sustainable sources of electricity.

Methodological and definition issues or operational limitations:
- Some developed countries may find it trivial to include items on electricity in the school questionnaires. National experts should then provide estimates of the number of schools with electricity and specify that the data are estimates.
- Whenever disaggregating data on schools by ISCED levels proves complex, countries should supply to the UIS data by their national definition of primary, lower and upper secondary education and append the system of national grade structure as metadata.

4. The UIS established international Working Group for Information and Communication Technology Statistics in Education (WISE)[5]

As a response to the need for expansion of the initial core list, the UIS has established the international Working Group for Information and Communication Technology (ICT) Statistics in Education (WISE). The purpose of the working group is to bring together statisticians (national focal points) from Ministries of Education (or National Statistical Offices) from twenty-five countries around the world. These national focal points are providing their feedback on a proposed draft model questionnaire and methodological guidebook for cross-nationally comparable measurement of ICT in education indicators. Two workshops are planned for 2009. The first workshop (Rabat, 4-7 May 09) aims to review and validate the draft UIS model questionnaire and the UIS new ICT4E indicators methodological guidebook. The results will serve as a platform to launch a pilot phase of for the proposed draft model questionnaire. The second workshop will examine the results of the pilot exercise. The methodological guidebook, which contains the international questionnaire, will be published in the latter half of 2009.

A preliminary expanded list of indicators (see Annex (a)) has been developed based on an enlarged conceptual scope (Table 2) in tandem with new survey items proposed in the draft questionnaire for the pilot exercise.

Table 2. A broader conceptual framework: mapping of policy goals and information needs

Conceptual domains	Potential policy questions	Monitoring dimensions of an information requirement mapping exercise
Political commitment	Do countries have deliberate policies and incentives that constitute an enabling environment for ICT integration in their national education system?	Presence of national and/or education sector-specific policy or regulatory framework for ICT implementation strategy
Infrastructure	To what extent do the schools in a country have access to ICT in support of teaching and learning process?	Presence of ICT facilities or related resources in schools for educational purposes
Teaching staff development	What proportion of countries teaching staffs are adapting their competencies to an ICT-enabled instruction model or teach ICT subjects?	Availability of teachers trained to use ICT for teaching and train in ICT subjects
Curriculum	Are countries introducing changes in their curriculum delivery using ICT and to what degree are ICT taught as a subject?	Presence of ICT in and/or for curriculum
Usage	What is the nature and the intensity of use of ICT in schools?	Accessibility of ICT in schools (as proxy measure for usage)
Participation, skills and output	What is the evolution in structure (all fields versus ICT fields) of the skills or outputs produced annually by national education systems?	Stock of learners trained or graduated in generic and specific ICT related fields of study
Outcomes and impact	Does ICT-enhanced instruction make a difference in learners' achievements?	Differential success rates of learners in schools with ICT assisted instruction versus students in schools with conventional pedagogy (as proxy measure for impact)

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[5] Currently confirmed membership includes: Argentina, Bahrain, Belarus, Bolivia, Costa Rica, Dominican Republic, Egypt, Estonia, Ethiopia, Ghana, Guatemala, Jordan, Malaysia, Mauritius, Morocco, Oman, Palestinian Autonomous Territories, Paraguay, Republic of Korea, Russia, Rwanda, Senegal, Thailand, Tunisia, and Uruguay.

5. Annex (a): Expanded list of internationally comparable indicators

Conceptual domains	Indicator label	Indicator	Comments
Political commitment	ED9	**Proportion of ISCED levels covered by existing national or sector policies on ICT use in education (for ISCED1-6)**	
	ED9 bis	**Proportion of Grades covered by existing national or sector policies on ICT use in education (for ISCED1-3)**	
	ED10	**Proportion of learners who are in grades where ICT are used to deliver teaching and learning (for ISCED level 1-3)**	
	ED15	**Proportion of total public expenditure on ICT in education for current expenditure on ICT in education (for ISCED level 1-3, level 4 and level 5-6)**	
	ED16	**Proportion of total public expenditure on ICT in education for capital expenditure on ICT in education (for ISCED level 1-3, level 4 and level 5-6)**	
	ED21	**Proportion of total Government current expenditure for current expenditure on ICT in education (for ISCED level 1-3, level 4 and level 5-6)**	
	ED22	**Proportion of total Government capital expenditure for capital expenditure on ICT in education (for ISCED level 1-3, level 4 and level 5-6)**	
	ED55	**Average public current expenditure on ICT in education per learner (for ISCED level 1-3, level 4 and level 5-6)**	
Public-private partnership	ED17	**Proportion of total current expenditure on ICT in education for private current expenditure on ICT in education (for ISCED level 1-3, level 4 and level 5-6)**	
	ED18	**Proportion of total capital expenditure on ICT in education for private capital expenditure on ICT in education (for ISCED level 1-3, level 4 and level 5-6)**	
	ED19	**Proportion of total current expenditure on ICT in education for foreign current expenditure on ICT in education (for ISCED level 1-3, level 4 and level 5-6)**	
	ED20	**Proportion of total capital expenditure on ICT in education for foreign capital expenditure on ICT in education (for ISCED level 1-3, level 4 and level 5-6)**	
	ED23	**Ratio of non-governmental to government sources of current expenditure for ICT in education (for ISCED level 1-3, level 4 and level 5-6)**	
Curriculum	ED11	**Proportion of grades where basic computer literacy courses are prescribed within the curricula (by nature of training, by type and for ISCED level 1-3)**	
	ED11 bis	**Proportion of learners enrolled in grades where basic computer literacy courses are prescribed within the curricula (for ISCED level 1-3)**	
	ED13	**Average number of expected hours per week for usage of ICT in the classroom as prescribed within the curricula (by major subjects and for ISCED level 1-3)** • **Maths** • **Sciences** • **Basic computer literacy** • **Languages** • **Arts**	
	ED14	**Average number of hours per week for usage of ICT in the classroom as prescribed within the curricula (for ISCED level 1-3)** • **Exercises on computer using educational software** • **Exercises on computer using the Internet** • **Radio (Interactive Radio Instruction)** • **Television**	
Infrastructure	EDR1	**Proportion of schools with electricity (for ISCED level 1-3)**	Original core indicator
	ED3	**Proportion of schools with a telephone communication facility (for ISCED level 1-3)**	Original core indicator
	ED5	**Proportion of schools with Internet access (for ISCED level 1-3)**	Original core indicator
	ED1	**Proportion of schools with a radio used for educational purposes (for ISCED level 1-3)**	Original core indicator

Conceptual domains	Indicator label	Indicator	Comments
	ED2	**Proportion of schools with a TV used for educational purposes (for ISCED level 1-3)**	Original core indicator
	ED24	**Proportion of schools with computer assisted instruction (for ISCED level 1-3)**	
	ED25	**Proportion of schools with Internet assisted instruction (for ISCED level 1-3)**	
	ED27	**Number of radio sets available in schools per 100 learners (for ISCED level 1-3)**	
	ED28	**Number of TV sets available in schools per 100 learners (for ISCED level 1-3)**	
	ED29	**Number of audio-visual materials available in schools per 100 learners (by type and for ISCED level 1 to 3)** • **Digital projectors** • **Video players and recorders** • **Audio-cassette players and recorders**	
	ED30 ED30 bis	**Average number of subscriptions to scientific digital resources per educational institutions (for ISCED level 4 and level 5-6)** **Average number of subscriptions to virtual experiment laboratories per educational institutions (for ISCED level 4 and level 5-6)**	
	ED4	**Learner-to-computer ratio (for ISCED level 1-3)**	Original core indicator
	ED31	**Ratio of student-to-computer connected to Internet (for ISCED level 1-3)**	
	ED32	**Average number of computers per educational institutions (for ISCED level 1-3, level 4 and level 5-6)**	
	ED33	**Average number of computers connected to internet per educational institutions (for ISCED level 1-3, level 4 and level 5-6)**	
	ED34	**Proportion of available computers for pedagogical purposes that are privately-owned (by learners) (for ISCED level 4 and level 5-6)**	
	ED35	**Proportion of all computers available for pedagogical purposes (for ISCED level 1-3, level 4 and level 5-6)**	
	ED36	**Proportion of all computers available for administrative purposes (for ISCED level 1-6)**	
	ED50	**Proportion of schools with a website (for ISCED level 1-3)**	
	ED51	**Proportion of schools with a blog page (for ISCED level 1-3, level 4 and level 5-6)**	
	ED54	**Proportion of educational institutions offering distance education programmes (for ISCED 5-6)**	
Teaching staff development	ED12	**Ratio of school-based ICT Coordinators to the number schools offering any ICT assisted instruction (for ISCED level 1-3)**	
	ED37	**Proportion of primary and secondary teachers trained via distance education programmes (for ISCED level 1-3)**	
	ED38	**Proportion of primary and secondary teachers trained to teach basic computer literacy (by mode of training)** • **trained via formal pre-service programmes** • **trained via formal in-service (on-the-job) programmes** • **trained via informal programmes**	
	ED39	**Proportion of primary and secondary teachers trained to teach any subject using ICT (by mode of training)** • **Trained via formal pre-service programmes at Teacher education institutions** • **Trained via formal in-service (on-the-job) programmes at Teacher education institutions** • **Trained via informal programmes**	
	ED40	**Proportion of trained teachers using ICT facilities for teaching (by gender, by type of institution for ISCED level 1-3)**	
	ED8	**Proportion of teachers in primary and secondary schools trained to teach Basic Computer Literacy (for ISCED level 1-3)**	Original core indicator

Conceptual domains	Indicator label	Indicator	Comments
Usage	ED41	Proportion of learners who have access to computer labs at school (by gender, by type of institution for ISCED level 1-3)	
	ED52	Proportion of schools providing an email account to all teachers (for ISCED level 4 and level 5-6)	
	ED53	Proportion of schools providing an email account to all learners (for ISCED level 4 and level 5-6)	
	ED6	Proportion of learners who have access to the Internet at school (for ISCED level 1-3)	Original core indicator
Participation, skills and output	ED7	Proportion of learners enrolled by gender at the post-secondary non-tertiary and tertiary level in ICT-related fields (for ISCED level 4 and level 5- 6)	Original core indicator
	ED42	Proportion of learners who graduated last academic year by gender at the tertiary level in ICT-related fields (for ISCED level 4 and level 5-6)	
	ED43	Ratio of learners-to-teachers of Basic Computer Literacy (by ISCED level 1-3)	
	ED44	Ratio of learners-to-teacher using ICT to teach (for ISCED level 1-3)	
	ED45	Proportion of learners enrolled by gender at the tertiary level in distance education programmes (for ISCED level 4 and level 5-6)	
Outcomes and impact	ED46	Promotion rate of learners using ICT as pedagogical aid (by gender, by type of institution at grades 4, 8 and 10)	
	ED47	Promotion rate of learners not using ICT as pedagogical aid (by gender, by type of institution at grade 4, 8 and 10)	
	ED48	Index of ICT in education impact (by gender, by type of institution for ISCED level 1-3)	
Equity	ED26	Proportion of schools with any ICT used for educational purposes in rural areas (for ISCED level 1-3, level 4 and level 5-6)	
	ED49	Number of female graduates per 1000 male graduates in ICT-related fields (for ISCED level 4 and level 5-6)	

6. Annex (b): Reference definitions, standards and classifications

6.1 Audiovisual materials

Audiovisual materials refer to specialized equipment that permits the delivery of off-the-air audio and/or visual educational content. In this context, off-the-air implies that the equipment does not require a connection to the Internet or a broadcast signal for effective course delivery. Batteries or electrical connections serve as the main source of power for use of this equipment. Audiovisual materials include the following:

- **Digital projectors:** includes liquid crystal display (LCD) projectors or Digital Light Processing (DLP) projectors;

- **Video players and recorders:** includes Video Home System (VHS) and Digital Video Disc players (DVD);

- **Audio cassette players and audio recorders:** Includes only off-the-air cassette players and recorders. Radio sets with integrated audio cassette players and recorders that are capable of receiving broadcast radio signals are not included.

6.2 Basic computer literacy

Basic computer literacy is a curriculum module that covers the most common uses of a computer, including a majority or all of the following: basic concepts of ICT, managing computer files, word processing, using spreadsheets and databases, creating presentations, finding information and communicating using computers, being aware of social and ethical issues of Internet use, and searching for jobs using the Internet.

From a statistical perspective, nationally defined content of such modules for each grade or ISCED level should be considered. In the absence of a national standard, please consider curriculum modules that have a majority or all of the above content units as equivalent to basic computer literacy.

The most well-known internationally standardized curriculum is the International Computer Driving Licence (ICDL), which is derived from the European Computer Driving Licence (ECDL).

6.3 Blog page

See definition for website.

6.4 Capital expenditure

Capital expenditure is expenditure on assets that last longer than one year. It includes expenditure on construction, renovation and major repairs of buildings and the purchase of heavy equipment or vehicles.

6.5 Capital expenditure on ICTs in education

Capital expenditure is expenditure on ICT assets that last longer than one year. It includes expenditure on construction, renovation and major repairs of infrastructure to accommodate electricity, computer networks, main telephone lines and other ICT equipment within the context of educational institutions. Capital expenditures on computers, servers, audiovisual materials, radio sets, television sets and other related ICT equipment that last longer than one year are included.

6.6 Computer

The number of computers covers those which are installed and available for use in an educational institution. The data should include personal computers (PCs), laptops, notebooks, terminals connected to mainframes and mini-computers that are primarily intended for shared use.

6.7 Computer-assisted instruction

Computer-assisted instruction is an interactive learning method in which a computer is used to present instructional material, monitor learning and select additional material in accordance with individual learner needs.

From a statistical perspective, an educational institution that has a computer laboratory devoted to pedagogical use is counted as having computer-assisted instruction. (*See definition for computer laboratory.*)

6.8 Computer laboratory

A computer laboratory is a room or space with computers devoted to pedagogical use in an educational institution or school library. Irrespective of the number of computers available for pedagogical use, the computer laboratory must be able to accommodate computer-assisted instruction with appropriate software to support learner activities. This includes learner use of software from a computer terminal to prepare course materials and assignments in electronic formats.

6.9 Computing

Subjects in computing are primarily included in the curricula of ISCED 4, 5 and 6. The content of courses in these fields consists of computer sciences: system design, computer programming, data processing, networks and operating systems (software development only; hardware development is excluded).

6.10 Current expenditure

Current expenditure is expenditure on goods and services consumed within the current year and which would need to be renewed if there were a need for prolongation the following year. It includes expenditure on:
- staff salaries and benefits;
- contracted or purchased services;
- other resources including books and teaching materials;
- welfare services; and
- other current expenditure such as furniture and equipment, minor repairs, fuel, telecommunications, travel, insurance and rents.

6.11 Current expenditure on ICTs in education

Current expenditure on ICTs in education is expenditure for ICT goods and services consumed within the current year and which would need to be renewed if there were a need for prolongation the following year. It includes expenditure on:
- salaries and benefits of teachers responsible for teaching basic computer literacy and computing as a subject (irrespective of other non-ICT courses taught) and staff salaries and benefits of ICT Coordinators or technologists responsible for administering and delivering ICT in their educational institutions;
- contracted or purchased services for the implementation of ICTs in educational institutions;
- resources, including books and teaching materials, specifically aimed at the curriculum of basic computer literacy (ISCED 1-3) and computing (ISCED 4- 6); and
- other current expenditure such as minor repairs to existing ICT goods and equipment, telecommunications services, Internet subscriptions and insurance on ICT goods.

6.12 Distance education programmes

Distance education refers to an educational process and system in which all or a significant proportion of the teaching is carried out by someone or something removed in space and time from the learner. Distance education requires structured planning, well-designed courses, special instructional techniques and methods of communication by electronic and other technology, as well as specific organizational and administrative arrangements. Distance learning can take a variety of forms. It is characterized by (a) separation/distance of place and/or time between instructor and learner, amongst learners, and/or between learners and learning resources; and (b) interaction between the learner and the instructor, among learners and/or between learners and learning resources conducted through one or more media. Course delivery for distance education programmes requires the use of the following technologies (or a combination thereof):
- audiovisual materials (off-the-air)

- Internet (webcasts and online tutorials)
- radio sets (on-the-air)
- TV sets (on-the-air)
- personal computers; and
- print materials to a minimal degree.

Distance education programmes that are based exclusively on print materials and that make no use of technologies in the delivery of course content and curriculum are excluded.

6.13 Educational and research digital resources

Count the number of formal subscriptions (paid or unpaid) or purchased licenses to electronic journals, databases, virtual laboratories and other digital documents at the end of the year.

See definitions for scientific digital libraries and virtual experiment laboratories.

6.14 Educational institution

Educational institutions or schools have the provision of education as their sole or main purpose. Such institutions are normally accredited or sanctioned by some public authority. While the majority of educational institutions fall under the jurisdiction of – or are operated by – education authorities, other public agencies dealing with such areas as health, training, labour, justice, defence, social services, etc. may also be involved. Educational institutions may also be operated by private organizations such as religious bodies, special interest groups or private educational and training institutions, both profit and non-profit.

6.15 Email account

Electronic mail (email) represents a means in which an originator of information can distribute information to at least one or many recipients via a value added network service that mimics the functions of the paper postal services. An email account refers to an individualized user name for each learner with a corresponding domain (or host name).

From a statistical perspective, only those educational institutions that have a policy to provide universal access to individualized email accounts for all learners (or for all teachers) should be counted as institutions that offer email accounts.

6.16 Fixed broadband Internet

Fixed broadband refers to high-speed Internet access to the public Internet (a TCP/IP connection). High-speed access is defined as being at least 256 kbit/s in one or both directions. It should include cable modem Internet connections, DSL Internet connections, fibre and other fixed broadband technology (such as satellite broadband Internet, Ethernet LANs, fixed-wireless access, Wireless Local Area Network, WiMAX, etc.) connections. Educational institutions with access to data communications (including the Internet) via mobile cellular networks are excluded.

6.17 Fixed narrowband Internet

Fixed narrowband includes analogue modem (dial-up via standard phone line), ISDN (Integrated Services Digital Network), DSL at speeds below 256kbit/s, and other forms of access with an advertised download speed of less than 256 kbit/s.

6.18 Graduates

A graduate is a person who has successfully completed the final year or grade of a level of education as defined by ISCED97. Successful completion can be accomplished through passing an examination or series of examinations; or accumulating the specified number of hours of study credits throughout a programme; or a formal assessment of the skills/knowledge acquired by the student during the programme. In the case of ISCED 1 (or primary) and ISCED 2 (or lower secondary), a graduate is defined as a pupil who completes successfully the final year/grade of the level and becomes eligible to continue on to the next ISCED level (i.e. to ISCED 2 in the case of ISCED 1 graduates and to ISCED 3 for ISCED 2 graduates). Yet completion, especially at lower levels of education, can also be simply promotion or even automatic promotion to the next higher grade at the next higher level of education. The latter applies especially to countries where

programmes span different ISCED level, e.g. basic education spanning ISCED 1 and ISCED 2 or secondary education spanning ISCED 2 and 3.

6.19   ICT-assisted instruction

ICT-assisted instruction refers to teaching methods or models of delivery that employ the use of ICTs in supporting, enhancing and enabling course content delivery. Audiovisual materials may be combined with other technologies in supporting the delivery of content. Any, all or combinations of the following types of ICT instruction are included:
- Radio-assisted instruction
- Television-assisted instruction
- Computer-assisted instruction
- Internet-assisted instruction

6.20   ICT Coordinator

An ICT coordinator's role is usually one of strategic leadership and management across subjects to promote the use of ICTs in teaching and learning. Although functions may differ throughout countries, it is recommended that the responsibilities of an ICT coordinator include the following:

- ascertaining that every department, including special needs and the library, identifies its requirements for ICT provision;

- coordinating the effective use of ICTs across the whole curriculum and encouraging aspects of cross-curricular planning;

- helping departments to consider how ICTs can support the teaching and learning of other subjects and what those subjects can contribute to the teaching and learning of ICT capability;

- monitoring on behalf of the senior leadership team the use of accommodation, the acquisition, maintenance and replacement of equipment and software, and its storage, access and use by pupils and staff;

- ensuring that sensible, transparent decisions are made where there are competing demands for resources and that the school improvement plan includes plans for encouraging and supporting the professional development of all staff in the use of ICTs in their subjects, in line with whole school policy and practice;

- liaising with partner primary schools, any local city learning centre, the local education authority and the wider community; and

- managing the school's ICT technician and network manager, etc.

From a statistical perspective, similar services could be sub-contracted to a private information technology entity. If this is the case for some educational institutions, the existence of such long-term or renewable contractual services must be counted as equivalent to a presence of an ICT Coordinator.

6.21   **ICT-qualified teachers** *(see Annex)*

Teachers trained to teach basic computer literacy (or computing) as a subject represent the skilled teaching force available to deliver ICT courses. However, this does not necessarily mean that each teacher recorded as qualified does actually teach an ICT course as part of the formal curriculum.

6.22   **ICT-related fields** *(see Annex)*

ICT-related fields include all programmes that are comprised of the following four detailed fields of education and training:

- **Audiovisual techniques and media production** is the study of techniques and skills to produce books, newspapers, radio/TV production, film/video production, recorded music production and graphic reproduction with ICT. It includes programmes in methods of colour reproduction, photography and computer graphics. Study of combining pictures, words and decorations in the production of books, magazines, posters, adverts etc. is also included.

- **Computer science** is the study of the design and development of computer systems and computing environments. It includes the study of the design, maintenance and integration of software applications.

- **Computer use** is the study of using computers and computer software and applications for different purposes. These programmes are generally of short duration.
- **Electronics and automation** (engineering and engineering trades) is the study of planning, designing, developing maintaining and monitoring electronic equipment, machinery and systems. It includes designing computers and equipment for communication.

6.23 (Expenditure on ICTs in education from) International (foreign) sources

This consists of funds from international development agencies supporting ICTs in education. Included in these organizations are multilateral development banks (e.g. the World Bank, regional development banks, etc.), United Nations agencies and other intergovernmental organizations, bilateral development cooperation government agencies and international NGO agencies established (or not) in a country.

6.24 Internet

See definitions for fixed narrowband Internet and fixed broadband Internet.

6.25 Internet-assisted instruction

Internet-assisted instruction refers to an interactive learning method in which the World Wide Web is used via a computer terminal sometimes with other audiovisual materials to present instructional material in accordance with individual learner needs. The goal of this instruction is to develop a set of information literacy skills. This type of instruction aims to develop learners' ability to:

- Recognise their information needs;
- Locate and evaluate the quality of information;
- Store and retrieve information; and
- Make effective and ethical use of information, and apply information to create and communicate knowledge.

From a statistical perspective, an educational institution that has an Internet laboratory devoted to pedagogical use is counted as having Internet-assisted instruction. (*See definition of Internet laboratory.*)

6.26 Internet laboratory

An Internet laboratory is a room or space with computers connected to the Internet devoted to pedagogical use in an educational institution or school library. Irrespective of the number of available computers connected to the Internet for pedagogical use, the Internet laboratory must be able to accommodate Internet assisted instruction. This includes learner use of the laboratory for Internet research, information retrieval and other uses of the World Wide Web for educational purposes.

6.27 ISCED levels (see Annex for detailed description of ISCED levels)

The main classificatory variable used for indicators on ICTs in education is the 1997 version of the International Standard Classification of Education (ISCED) maintained by UNESCO. ISCED recognizes several levels of education as follows:

ISCED 0 – Pre-primary
ISCED 1 – Primary or first stage of basic education
ISCED 2 – Lower secondary or second stage of basic education
ISCED 3 – Upper secondary education
ISCED 4 – Post-secondary non tertiary education (programmes that lie between the upper secondary and tertiary levels of education)
ISCED 5 – First stage of tertiary education (not leading directly to an advanced research qualification)
ISCED 6 – Second stage of tertiary education (leading to an advanced research qualification)

6.28 Learners

Learners refer to either pupils or students enrolled in programmes at educational institutions.

6.29 Private educational institution

A private educational institution is one controlled and managed by a non-governmental organization (church, trade union or business enterprise), whether or not it receives financial support from public authorities.

6.30 Privately-owned computers

Privately-owned computers refer to those that belong to individual learners and that are operated by learners for their own educational use. This includes laptops or any personal computer (excluding personal digital assistants and smartphones).

From a statistical perspective, please count educational institutions that have an explicitly defined mandatory policy requiring all learners to possess their own computer as part of the pedagogical kit. The total learner enrolment for these corresponding institutions (by ISCED group) will denote the total number of privately-owned personal computers.

6.31 Public educational institution

A public educational institution is one controlled and managed by a governmental education authority or agency (national/federal, state/provincial or local), whatever the origin of its financial resources.

6.32 Radio-assisted instruction

Radio-assisted instruction includes both radio broadcast education and interactive radio instruction (IRI).

Radio broadcast education entails an audio lecture or lesson, with printed materials for learners to follow the lecture. Any teacher, not necessarily qualified in the subject matter, can use the radio programme as a main instructional source for the learners. Broadcast programmes follow the traditional model of education and can cover every subject in many different languages, depending on the target audience. They can also be geared toward adults for lifelong learning.

Interactive radio instruction (IRI) turns a typically one-way technology into a tool for active learning inside and outside the classroom. It requires that learners react to questions and exercises through verbal responses to radio characters, group work, and physical and intellectual activities while the programme is on air. For both teacher and learner, the lesson becomes an immediate hands-on, practical guide.

6.33 Radio sets

A radio set is considered to be a standalone device (in working condition) capable of receiving broadcast radio signals, using popular frequencies (such as FM, AM, LW and SW). Unless they are intentionally used for educational purposes, radio sets integrated into other devices (such as a walkman, an alarm clock, audio cassette or CD player/recorder, portable radios like transistor radios) must be excluded from the data provided. Radios that are integrated in a mobile phone, a digital audio player (MP3 player) or in a computer are excluded.

6.34 Rural areas

The classification 'rural' is based on the definition applied in national statistical practices and exercises.

As a reference, a rural area is considered to be a geographical region outside of the urban agglomeration within a country. The urban agglomeration is defined as the city proper along with the suburban fringe and any built-up, thickly settled areas lying outside of, but adjacent to, the city boundaries.

6.35 Scientific digital libraries

Scientific digital libraries refer to any of the following types of electronic collections (or combination thereof):

- **Databases:** Collection of electronically stored descriptive records or content units (including facts, full texts, pictures, and sound) with a common user interface and software for the retrieval and manipulation of the data.
- **Electronic books (eBooks):** Digital document, licensed or not, where searchable text is prevalent and which can be seen in analogy to a print book (monograph).

- **Electronic serials:** Serials published in electronic form only or in both electronic and another format. Comprises serials held locally and remote resources for which access rights have been acquired, at least for a certain period of time. Open access journals (free Internet resources) are excluded.

Count the number of regular subscriptions (paid or free of charge) or purchased licenses to electronic journals, databases and other digital documents by an educational institution at the end of the year.

6.36 Special needs education

This entails educational intervention and support designed to address children with special needs broadly defined as group of children for which schools need to adapt their curriculum, teaching and organization and/or to provide additional human or material resources so as to stimulate efficient and effective learning for these learners.

6.37 Telephone communication facility

Telephone communication facility refers to fixed telephone lines, cable connections (i.e. cable telephony) or mobile cellular lines that connect an educational institution's terminal equipment (e.g. telephone set, facsimile machine) to the public switched telephone network (PSTN) and which has a dedicated port on a telephone exchange. Access to these telephone facilities are defined by a committed subscription to these services that enable the physical presence of the facilities in a given educational institution. A mobile cellular phone owned by an individual working at a school does not constitute a school telephone communication facility.

6.38 Teachers

Teachers and teaching staff refer to those persons employed in an official capacity for the purpose of guiding and directing the learning experience of pupils and learners, irrespective of his/her qualification or the delivery mechanism, i.e. whether face-to-face and/or at distance. This definition excludes educational personnel who have no active teaching duties (e.g. headmasters, principals who do not teach) or who work occasionally or in a voluntary capacity in educational institutions (e.g. parents).

6.39 Teachers trained informally

This refers to teachers who are trained through a personal initiative outside the formal teacher training institutions to teach with the use of ICT or to teach ICT-related courses. Only teachers that have received some type of recognized certification in ICT are included.

6.40 Television-assisted instruction

Television-assisted instruction has the same benefits of radio programmes with the additional benefit of video. It can bring abstract concepts to life through clips, animations and simulations, visual effects, and dramatization. It can also connect a classroom to the world, but shares the same rigid scheduling and lack of interactivity as radio programmes.

6.41 Television sets

A television set is considered to be a stand-alone device (in working condition) capable of receiving broadcast television signals using popular access means (such as over-the-air, cable and satellite). TV broadcast receivers integrated into other devices (such as a computer, PDA, Smartphone or mobile phone) are considered only if their intended use is for educational purposes. It excludes television set functionality integrated into another device, such as a computer or a mobile phone.

6.42 Total private expenditure on education

Total expenditure from private sources is the sum of direct payments of learners/households and other private entities to educational institutions, plus learner/household payments other than to educational institutions which include: i) direct purchases of personal items used in education; and ii) subsidized household expenditure for living expenses of the learner.

Payments to learners/households by other private entities in the form of scholarships, grants or loans should not be included in the total private expenditure because such financial aid is internal to the private sector and should be netted out in calculating total private spending for education.

6.43 Total government (public) expenditure on education

All expenditure for education by a central, regional or local public body should be reported in total government expenditure. Thus, a country should include in total public expenditure not only the expenditure of its national Ministry of Education but also all expenditure on education of other central government ministries and authorities. Similarly, if a regional or a local department of public works spends money on the maintenance of school buildings, this should be reported in the corresponding total expenditure column in the questionnaire, even if it does not normally appear under education in their budget.

Double-counting expenditure should be avoided. If, for example, a ministry transfers education funds to another ministry or if a municipality transfers funds to another local education authority, the transfers must be netted out of government expenditure.

Total government expenditure (all government levels combined) should be equal to the sum of all direct expenditure to the different types of institutions, expenditure other than on educational institutions and transfers and payments to private entities for education.

Direct expenditure for educational institutions

The direct expenditure for educational institutions of a government agency may take one of two forms:

i) purchases by the government agency itself of educational resources (goods and/or services) to be used by educational institutions, e.g.:

- direct payment of teachers' salaries by an education ministry;

- direct payment by a municipality to building enterprises for the construction of school buildings; or

- procurement of textbooks by a ministry of education for subsequent distribution to local authorities or schools.

ii) payments by the government agency to educational institutions that have the responsibility for purchasing educational resources (goods and/or services) themselves, e.g.:

- government appropriation or block grant to a university which then uses it to compensate personnel or purchase other resources; or

- government allotment of funds to a fiscally autonomous public school; a government subsidy payment to a private school, etc.

Expenditure other than for educational institutions

Expenditure in this category should refer mainly to expenditure for the general administration of education at the central, regional and local levels and for other functions such as inspection, evaluation and curriculum development.

Transfers for education

Transfers for education are divided into two types: intergovernmental transfers and payments to private entities.

Intergovernmental transfers for education have been defined as net transfers from higher level to lower level governments, e.g. central government transfers to regional governments should be equal to central-to-regional transfers for education less any regional-to-central transfers for education.

Transfers and payments to private entities for education refer to transfers to learners/households and transfers to other private entities.

6.44 Trained teachers

A trained teacher has received at least the minimum formal teacher training (pre-service or in-service) required for teaching at the relevant level.

Teachers trained to teach basic computer literacy or computing as a subject represent the skilled teaching force available to deliver ICT courses, but this does not necessarily mean that each teacher recorded as qualified does actually teach an ICT course as part of the formal curriculum.

6.45   Virtual experiment laboratories

Virtual experiment laboratories are multimedia applications, which allow for video and digital simulations of laboratory activities in a very real manner, but without the risks and costs associated with laboratory experiments. Simulations of science laboratory experiments can also use real data. Computer simulations are particularly helpful for learning science when:

- experiments are too risky, expensive or time-consuming to be conducted in a school laboratory, such as those involving volatile gases;

- experiments require precision so that learners can see patterns and trends or ones where learners may not be able to achieve the necessary precision without simulation tools;

- experiments break the laws of nature, such as exploring kinematics collisions that violate conservation of momentum law; and

- ethical issues are at stake, such as in the case of some biology experiments.

Count the number of regular subscriptions (paid or unpaid) or purchased licenses to electronic virtual laboratories at the end of the year.

6.46   Website

A website refers to a collection of interlinked web pages with a related topic, usually under a single domain name, which includes an intended starting file called a "home page". From the home page, you can get to all the other pages on the website. Also called a "web presence".

In the context of educational institutions, a web presence includes a home page with links to pertinent pedagogical information and other related activities.

A **blog** page is a website that allows users to upload text, documents or images in an interactive format in reverse chronological order. Learners and teachers may interact online for pedagogical activities or on specific subjects of interest that are affiliated to an educational institution.

7. Annex (c) Adapted from Fields of Education and Training – Manual (Eurostat, 1999)

Broad fields	Narrow fields	Detailed fields	Description	Inclusions	Exclusions
2 Humanities and Arts	*21* Arts	*213* Audio-visual techniques and media production	***Audio-visual techniques and media production*** is the study of techniques and skills to produce books, newspapers, radio/TV production, film/video production, recorded music production and graphic reproduction. It includes programmes in methods of colour reproduction, photography and computer graphics. Study of combining pictures, words and decorations in the production of books, magazines, posters, adverts etc. is also included. Programmes with the following main content are classified here: • Bookbinding • Camera operating • Compositing (printing) • Computer type-setting • Film production • Graphic design • Graphic reproduction • Illustration • Media techniques • Multimedia production • Photography • Printing • Publishing design, lay-out • Radio and TV production • Recorded music production • Sound technique • Type-setting	Programmes in *desktop publishing and layout* are included in this field.	Separate programmes in using *specific software applications* for desktop publishing are excluded from this field and included in field 482 'Computer use'. Study of *Journalism* (wording and content of messages) is excluded from this field and included in field 321 'Journalism and reporting'.
4 Science, Mathematics and Computing	**48** Computing	**481** Computer science	***Computer science*** is the study of the design and development of computer systems and computing environments. It includes the study of the design, maintenance and integration of software applications. Programmes with the following main content are classified here: • Computer programming • Computer science • Computer system analysis • Computer system design • Informatics • Network administration • Operating systems • Programming languages (Visual Basic, C++ etc.)	.	*Computer engineering (hardware)* is excluded from this field and included in field 523 'Electronics and automation'. Programmes in *using computer applications* are excluded from this field and included in field 482 'Computer use'
		482 Computer use	***Computer use*** is the study of using computers and computer software and applications for different purposes. These programmes are generally of short duration. Programmes with the following main content are classified here: • Computer use • Software for calculating (spreadsheets) • Software for data processing • Software for desk top publishing • Software for word processing • Use of Internet		

Broad fields	Narrow fields	Detailed fields	Description	Inclusions	Exclusions
5 Engineering, Manufacturing, Construction	**52** Engineering and Engineering trades	**523** Electronics and Automation	***Electronics and Automation*** (Engineering and engineering trades) is the study of planning, designing, developing maintaining and monitoring electronic equipment, machinery and systems. It includes designing computers and equipment for communication. Programmes with the following main content are classified here: ▪ Broadcasting electronics ▪ Communication systems ▪ Communications equipment installation ▪ Communications equipment maintenance ▪ Computer engineering ▪ Computer repairing ▪ Control engineering ▪ Data processing technology ▪ Digital technology ▪ Electronic engineering ▪ Electronic equipment servicing ▪ Network technology ▪ Robotics ▪ Telecommunication technology ▪ Television and radio repairing		*Computer science* (design of computer systems and software applications) is excluded from this field and included in 481 'Computer science'.
5 Engineering, Manufacturing, Construction	**52** Engineering and Engineering trades	**523** Electronics and Automation	***Electronics and Automation*** (Engineering and engineering trades) is the study of planning, designing, developing maintaining and monitoring electronic equipment, machinery and systems. It includes designing computers and equipment for communication. Programmes with the following main content are classified here:		

8. Annex (d): ISCED classification of levels of study

	Description of ISCED97 levels, classification criteria and sub-categories			
ISCED levels	**Description**	**Main criteria**	**Auxiliary criteria**	**Sub-categories**
0	**PRE-PRIMARY LEVEL OF EDUCATION**			
	Initial stage of organized instruction, designed primarily to introduce very young children to a school-type environment.	Should be centre - or school-based, be designed to meet the educational and developmental needs of children of at least 3 years of age, and have staff that are adequately trained (i.e. qualified) to provide an educational programme for children.	Pedagogical qualifications for the teaching staff; implementation of a curriculum with educational elements.	
1	**PRIMARY LEVEL OF EDUCATION**	**Main criteria**	**Auxiliary criteria**	
	Normally designed to give pupils a sound basic education in reading, writing and mathematics.	Beginning of systematic studies characteristic of primary education, e.g. reading, writing and mathematics. Entry into the nationally designated primary institutions or programmes. The commencement of reading activities alone is not a sufficient criteria for classification of an educational programme at ISCED level 1.	In countries where the age of compulsory attendance (or at least the age at which virtually all students begin their education) comes after the beginning of systematic study in the subjects noted, the first year of compulsory attendance should be used to determine the boundary between ISCED 0 and ISCED 1.	

Description of ISCED97 levels, classification criteria and sub-categories						
ISCED levels	**Description**	**Main criteria**	**Auxiliary criteria**	**Sub-categories**			
	LOWER SECONDARY LEVEL OF EDUCATION	**Main criteria**	**Auxiliary criteria**		**Destination for which the programmes have been designed to prepare students:**	**Programme orientation**	
2	The lower secondary level of education generally continues the basic programmes of the primary level, although teaching is typically more subject-focused, often employing more specialised teachers who conduct classes in their field of specialisation.	Programmes at the start of level 2 correspond to the point where programmes are beginning to be organised in a more subject-oriented pattern, using more specialised teachers conducting classes in their field of specialisation. If this organizational transition point does not correspond to a natural split in the boundaries between national educational programmes, then programmes should be split at the point where national programmes begin to reflect this organisational change.	If there is no clear break-point for this organisational change, however, then countries should artificially split national programmes into ISCED 1 and 2 at the end of six years of primary education. In countries with no system break between lower secondary and upper secondary education, and where lower secondary education lasts for more than 3 years, only the first 3 years following primary education should be counted as lower secondary education.	A	Programmes designed to prepare students for direct access to level 3 in a sequence which would ultimately lead to tertiary education, that is, entrance to ISCED 3A or 3B.	General	Education which is not designed explicitly to prepare participants for a specific class of occupations or trades or for entry into further vocational / technical education programmes.
				B	Programmes designed to prepare students for direct access to programmes at level 3C.	Vocational	Education which prepares participants for direct entry, without further training, into specific occupations. Successful completion of such programmes leads to a labour-market relevant vocational qualification.
				C	Programmes primarily designed for direct access to the labour market at the end of this level (sometimes referred to as 'terminal' programmes).		

Description of ISCED97 levels, classification criteria and sub-categories						
ISCED levels	**Description**	**Main criteria**	**Auxiliary criteria**	**Sub-categories**		
	UPPER SECONDARY LEVEL OF EDUCATION	**Main criteria**	**Modular programmes**		**Destination for which the programmes have been designed to prepare students:**	**Programme orientation**
3	The final stage of secondary education in most countries. Instruction is often more organized along subject-matter lines than at ISCED level 2 and teachers typically need to have a higher level, or more subject-specific, qualification than at ISCED 2.	National boundaries between lower secondary and upper secondary education should be the dominant factor for splitting levels 2 and 3. Admission into programmes at this level usually requires the completion of ISCED 2 for admission, or a combination basic education and life experience that demonstrates the ability to handle ISCED 3 subject matter.	An educational qualification is earned in a modular programme by combining blocks of courses, or modules, into a programme meeting specific curricular requirements. A single module, however, may not have a specific educational or labour market destination or a particular programme orientation.	**A**	Programmes designed to provide direct access to ISCED 5A.	**General** — Education which is not designed explicitly to prepare participants for a specific class of occupations or trades or for entry into further vocational/technical education programmes.
				B	Programmes designed to provide direct access to ISCED 5B.	**Vocational** — Education which prepares participants for direct entry, without further training, into specific occupations. Successful completion of such programmes leads to a labour-market relevant vocational qualification.
				C	Programmes not designed to lead directly to ISCED 5A or 5B. Therefore, these programmes lead directly to the labour market, ISCED 4 programmes or other ISCED 3 programmes.	

Description of ISCED97 levels, classification criteria and sub-categories						
ISCED levels	**Description**	**Main criteria**	**Auxiliary criteria**	**Sub-categories**		
4	POST-SECONDARY NON-TERTIARY	Main criteria	Types of programmes can fit into level 4		Destination for which the programmes have been designed to prepare students:		Programme orientation
	These programmes straddle the boundary between upper secondary and postsecondary education from an international point of view, even though they might clearly be considered as upper secondary or post-secondary programmes in a national context.	Students entering ISCED 4 programmes will typically have completed ISCED 3.	The first type are short vocational programmes where either the content is not considered tertiary in many countries or the programmes do not meet the duration requirement for ISCED 5B – at least two years.	A	Programmes designed to provide direct access to ISCED 5A or 5B.	General	Education which is not designed explicitly to prepare participants for a specific class of occupations or trades or for entry into further vocational / technical education programmes.
	They are often not significantly more		These programmes are often				

Description of ISCED97 levels, classification criteria and sub-categories

ISCED levels	Description	Main criteria	Auxiliary criteria	Sub-categories			
				B	Programmes not designed to lead directly to ISCED 5A or 5B. These programmes lead directly to the labour market or other ISCED 4 programmes.	Vocational	Education which prepares participants for direct entry, without further training, into specific occupations. Successful completion of such programmes leads to a labour-market relevant vocational qualification.
5	**FIRST STAGE OF TERTIARY EDUCATION**	**Classification criteria for level and sub-categories (5A and 5B)**			**Cumulative theoretical duration at tertiary**		**Position in the national degree and qualifications structure**
	ISCED 5 programmes have an educational content more advanced than those offered at levels 3 and 4.	Entry into these programmes normally requires the successful completion of ISCED level 3A or 3B or a similar qualification at ISCED level 4A.					

Description of ISCED97 levels, classification criteria and sub-categories							
ISCED levels	Description	Main criteria	Auxiliary criteria	Sub-categories			
	ISCED 5A programmes are largely theoretically based and are intended to provide sufficient qualifications for gaining entry into advanced research programmes and professions with high skills requirements.	1. have a minimum cumulative theoretical duration (at tertiary level) of three years; 2. typically require that the faculty have advanced research credentials; 3. may involve completion of a research project or thesis; 4. provide the level of education required for entry into a profession with high skills requirements or an advanced research programme.		A	Duration categories: less than 5 years; 5 years or more.	A	Categories: First; Second or further.
	ISCED 5B programmes are generally more practical / technical / occupationally specific than ISCED 5A programmes.	1. are more practically oriented and occupationally specific than programmes at ISCED 5A and do not prepare students for direct access to advanced research programmes; 2. have a minimum of two years' duration; 3. the programme content is typically designed to prepare students to enter a particular occupation.		B	Duration categories: None.	B	Categories: None.
6	SECOND STAGE OF TERTIARY EDUCATION (LEADING TO AN ADVANCED RESEARCH QUALIFICATION)						

		Description of ISCED97 levels, classification criteria and sub-categories				
ISCED levels	**Description**	**Main criteria**	**Auxiliary criteria**	**Sub-categories**		
	This level is reserved for tertiary programmes that lead to the award of an advanced research qualification. The programmes are devoted to advanced study and original research.	1. requires the submission of a thesis or dissertation of publishable quality that is the product of original research and represents a significant contribution to knowledge; 2. are not solely based on course-work; 3. prepare participants for faculty posts in institutions offering ISCED 5A programmes, as well as research posts in government and industry.				