



United Nations
Educational, Scientific and
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UNESCO
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STATISTICS

TECHNICAL PAPER NO. 2



GUIDE TO MEASURING INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT) IN EDUCATION

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UNESCO

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The UIS is based in Montreal, Canada.

Published in 2009 by:

UNESCO Institute for Statistics
P.O. Box 6128, Succursale Centre-Ville
Montreal, Quebec H3C 3J7
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Tel: (1 514) 343-6880
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Email: publications@uis.unesco.org
<http://www.uis.unesco.org>

ISBN 978-92-9189-078-1

Ref: UIS/TD/09-04

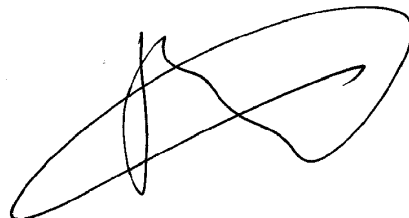
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Foreword

Following the World Summits on the Information Society (WSIS) in Geneva (2003) and Tunis (2005), the Partnership for Measuring ICT for Development was formed to develop comparable data and indicators for monitoring WSIS goals. The Partnership comprises Eurostat, ITU, OECD, UNCTAD, UNDESA, the UNESCO Institute for Statistics (UIS), UN Regional Commissions (UNECLAC, UNESCWA, UNESCAP and UNECA) and the World Bank. Within this framework, the primary assignment of the UIS is to lead the Task Force responsible for developing indicators on information and communication technologies (ICT) use in education. In February 2009, the UIS submitted an initial core set of ICT in education indicators to the 40th session of the United Nations Statistical Commission.

This manual presents a more comprehensive set of internationally comparable indicators on the use of ICT in education, along with standardized definitions of key concepts, detailed measurement specifications and practical guidance on appropriate interpretation of the indicators. The proposed set of new indicators covers a wider range of conceptual domains, which will address policy needs at both national and international levels (e.g. WSIS, Millennium Development Goals and Education for All). They provide multiple angles for the assessment of ICT penetration in education systems in a comparative perspective.

This technical paper is designed to assist Members States in developing their capacity and monitoring national goals in this area. Its aim is also to set standards in a rapidly-changing field where technologies induce the use of new devices, different norms and procedures for teaching and learning. In consequence, the UIS will produce systematic revisions to this guide in order to reflect such technological evolution.



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Acknowledgements

The UNESCO Institute for Statistics (UIS) would like to express its gratitude to Dr Willem Johan Pelgrum, University of Twente (Netherlands), for developing the theoretical and conceptual foundations of the UIS information and communication technologies (ICT) in education indicators initiative, using a cross-country comparative framework and perspective. Dr Pelgrum is an active researcher in international comparative educational assessments. He was the coordinator of the Computers in Education studies launched by the International Association for the Evaluation of Educational Achievement (IEA) and the international coordinator of the three rounds of the IEA Second Information Technology in Education Studies (SITES). He has authored and edited several books on ICT in education.

We would like to acknowledge the substantial contributions of Claude Akpabie (UIS), Shiu-Kee Chu (former UNESCO staff member) and Patrick Lucas (UIS) for establishing the methodological basis and technical specifications for the expanded list of ICT in education indicators. Katja Frostell coordinated the editing and production of this guide.

Valuable input was also received from other UIS staff members and partners: Simon Ellis (UIS Regional Advisor for Asia and the Pacific), Albert Motivans (UIS), Debbie Wong (UIS Bangkok), Beatriz Valdez-Melgar (UIS), Talal El Hourani (UIS), Moritz Bilagher (UIS), Ivan Castro de Almeida (UNESCO Santiago), Micheal Trucano (World Bank), Eugenio Severin (Inter-American Development Bank), Toby Harper-Merrett (ICT Observatory, *Université de Montréal*), Steven Shaw (Concordia University) and Vivek Venkatesh (Concordia University). Mariana Balboni and other team members from the Observatory for the Information Society in Latin America and the Caribbean (OSILAC) of the United Nations Economic Commission for Latin America and the Caribbean (UN ECLAC) provided helpful comments and recommendations for supplementary indicators. Sheridan Roberts, an information society statistics consultant to the *Partnership on Measuring ICT for Development*, provided useful suggestions to enhance existing statistical definitions and indicators.

National focal points of the international Working Group on ICT Statistics in Education (WISE) played a vital role in reviewing this guide and making contributions to the *Prototype Questionnaire on Statistics of ICT in Education*:

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Abbreviations

EFA	Education for All
ERT	European Round Table of Industrialists
ICT	Information and Communication Technologies
IEA	International Association for the Evaluation of Educational Achievement
InfoDev	Information for Development Programme (World Bank)
ISCED	International Standard Classification of Education
ITU	International Telecommunication Union
MDG	Millennium Development Goals
NRC	National Research Coordinator
OECD	Organisation for Economic Co-operation and Development
OSILAC	Observatory for the Information Society in Latin America and the Caribbean
PDA	Personal digital assistant
PIRLS	Progress in International Reading Literacy Study
PISA	Programme for International Student Assessment
SACMEQ	Southern and East Africa Consortium for Monitoring Educational Quality
SITES	Second Information Technology in Education Study
TIMSS	Trends in International Mathematics and Science Study
UIS	UNESCO Institute for Statistics
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNECA	United Nations Economic Commission for Africa
UNECLAC	United Nations Economic Commission for Latin America and the Caribbean
UNESCWA	United Nations Economic and Social Commission for Western Asia
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
WSIS	World Summit on the Information Society

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Executive summary

The *Guide to Measuring Information and Communication Technologies (ICT) in Education* represents a groundbreaking attempt to put in place internationally standardized concepts and indicator measurement specifications that will ensure consistent use and interpretation of ICT in education statistics among policymakers, statisticians, researchers, experts and statistical institutions across the world. Given the rapidly evolving nature of ICT, this guide should be viewed as a living document, subject to future refinements.

The proposed ICT in education indicators have been based on data that can be generated within existing official administrative sources rather than on irregular, costly or external resource-dependant national surveys in order to ensure long-term sustainability in data collection efforts for a majority of countries. A few methodological and operational caveats have been identified for improvement over time.

This guide presents an expanded set of indicators for monitoring ICT in education beyond the core list developed by the UNESCO Institute for Statistics (UIS) (UIS, 2008b). It elaborates on data collection modalities and indicator calculation methodologies based on proposed questionnaire items. The guide also provides a review of concepts previously used in international comparative assessments of ICT use in education and examines global policy concerns.

1. Introduction

Since the introduction of information and communication technologies (ICT), their integration into education and the associated financial investments have been policy concerns in many countries. The initiatives that were taken to give ICT a place in education have resulted in a need to monitor these developments, using reliable and valid indicators. Once these indicators are available through standardized international data collection efforts, policymakers can review progress of their countries over time in comparison with their nationally defined targets and other relevant reference countries.

It is believed that the use of ICT in education can increase access to learning opportunities. It can help to enhance the quality of education with advanced teaching methods, improve learning outcomes and enable reform or better management of education systems. Yet, a recent “knowledge mapping” exercise conducted by the World Bank's Information for Development Programme (InfoDev) (Trucano, 2005) revealed that, despite decades of large investments in ICT to benefit education in OECD countries and its increased use in developing countries, data to support the perceived benefits from ICT are limited and evidence of effective impact is elusive or even debatable. These findings highlighted various knowledge gaps and underscored the need for internationally accepted standards, methodologies and indicators to better measure the real benefits of ICT in education.

This lack of reliable, quality data, in addition to the absence of standardized guidelines for establishing relevant and comparable indicators, hinder policymakers in making informed decisions or in demonstrating greater commitment to integrating ICT into their education systems.

Measuring the contribution of ICT to development was a major concern at the two World Summits on the Information Society (WSIS), held in Geneva in 2003 and in Tunis in 2005. The “Follow-up and Evaluation” section (E.28) of the *WSIS Plan of Action* outlines the objectives of measuring ICT for development. It invites the international community to develop methodologies with realistic metrics and to establish internationally comparable and policy-relevant indicators in order to track the progress of countries towards digital inclusiveness. An excerpt from section E.28 states:

“A realistic international performance evaluation and benchmarking (both qualitative and quantitative), through comparable statistical indicators and research results, should be developed to follow up the implementation of the objectives, goals and targets in the Plan of Action, taking into account different national circumstances.” (WSIS, 2003)

In response, the Partnership on Measuring ICT for Development was formed in June 2004. Its current members include Eurostat, ITU, OECD, UNCTAD, UNDESA, the UNESCO Institute for Statistics (UIS), UN Regional Commissions (UNECLAC, UNESCWA, UNESCAP and UNECA) and the World Bank. To date, one of the key achievements of the Partnership has been the development of a list of core ICT for development indicators, which were endorsed by the UN Statistical Commission at its 38th session in February 2007. With the perspective of expanding this core list to indicators on ICT in education, the Partnership established a Task Group on Education, led by the UIS. The UIS has defined the initial set of ICT in education indicators (UNESCO-UIS, 2008b), together with their underlining definitions and collection methods.¹ Revisions and additions to the core list of indicators were subsequently presented as an item for information to the 40th session of the UN Statistical Commission in February 2009 and noted by members ².

The aim of this guide is to build on the core set of ICT in education indicators by further refining them and suggesting an expanded list of indicators or proxy measures in order to address a wider range of policy concerns. The methodologies for collection and calculation, as well as a proposal for a prototype questionnaire, are presented in this guide. Furthermore, it should serve as a reference and training guide for collecting comparable data at the country level and completing future UIS questionnaires on ICT in education.

More specifically, this guide seeks to:

- i) strengthen the conceptual framework on ICT use in education;
- ii) map indicator gaps in order to better monitor progress of countries towards international goals, including the UNESCO strategic areas of focus on ICT in education;
- iii) propose an expanded list of internationally comparable indicators or proxies to measure ICT use in education; develop their definitions, purpose, measurement and interpretation; and review their comparability and their methodological or operational limitations; and
- iv) outline criteria for prioritising the new indicators.

¹ For more details, see UIS (2008).

² For reference, see Partnership on Measuring ICT for Development (2009).

2. ICT in education policy frameworks

Many policy reports have argued that societies are changing from industrial societies into 'information societies', in which the creation and dissemination of knowledge is of paramount importance (ERT, 1997). They contend that, in order to combat social exclusion and to maintain competitiveness in a global economy, education must go beyond the framework of initial schooling in order to prepare and support citizens for lifelong learning (European Commission, 1995; ERT, 1997; PCAST, 1997). Accompanying this argument is the belief that ICT can play an important role in reshaping education to respond to contemporary information society needs. Furthermore, it is believed that ICT in education will reduce the gaps that exist between socio-economic realities and the outputs of education systems (ERT, 1997).

With the challenges faced by the international community in meeting the Millennium Development Goals (MDGs) and the Education for All (EFA) targets, it seems unrealistic to assume that conventional delivery mechanisms will ensure quality and equal educational opportunities for all in affordable and sustainable ways by 2015. Indeed, the biggest challenge for many education systems is to be able to offer training or learning opportunities on a lifelong basis to all individuals and, more importantly, to the traditionally under-served or marginalized groups (i.e. girls and women who face barriers to schooling; rural populations that are too dispersed to populate regular schools cost-effectively with reasonable class sizes; children from families in extreme poverty; special needs groups or persons with disabilities who have no access to learning centres; etc.). According to Haddad and Draxler (2002), the rigidity associated with conventional, face-to-face, classroom-based education delivery yields unsuspected costs for society:

"Conventional educational systems offer limited flexibility. [...] For low-income students, schools offer even less; the wealthier schools lure the best teachers, leaving the least prepared for schools in poor and remote areas. [...] As a result, these systems perpetuate social inequalities, lose many excellent students to boredom, increase the costs of education through high dropout rates and grade retention, and pass on to employers or other systems the costs of training their graduates."

The challenges of traditional education systems are amplified by the rapidly changing skills in demand in a globalizing labour market. New paradigms are also emerging where the delivery of education becomes less about teaching and more about learning (i.e. via self-tutoring and the use of individualized information research abilities). Education becomes increasingly less confined within the sole geographical location of learners (e.g. a country) or less dependent on a physical space (e.g. a classroom for pooling a critical mass of learners together). More flexibility is required in order to be adjustable to learners, with modular curricula no longer constrained by a rigid schooling path or predetermined certification goals.

Under the right conditions, it is believed that ICT can have a monumental impact on the expansion of learning opportunities for greater and more diverse populations, beyond cultural barriers, and outside the confines of teaching institutions or geographical boundaries (Haddad and Draxler, 2002). Technologies can improve the teaching/learning process by reforming conventional delivery systems, enhancing the quality of learning achievements, facilitating state-of-the-art skills formation, sustaining lifelong learning and improving institutional management.

International development goals

The development of indicators on ICT in education is aimed at monitoring the progress of countries towards major international goals, such as those set by the World Summit on the Information Society (WSIS), MDGs and EFA. **Table 1** summarises the various global policy concerns related to the use of ICT in education.

Table 1. International goals and ICT in education policies

Main policy concerns	Major policy platforms			
	WSIS	MDGs	EFA	UNESCO
ICT for enhancing teaching and expanding learning opportunities	X	X	X	X
ICT for improving curricula and quality of educational achievements and for educational reform	X	X	X	X
ICT for equity and inclusive education (targeting marginalized groups)	X	X	X	X
ICT for learners' employability and for diversity of life skills			X	X
ICT integration in education with private partnerships		X		
ISCED levels concerned	ISCED 1-6	ISCED 1	ISCED 1-3	<ul style="list-style-type: none"> • ISCED 0-2 (ICT for teacher education) • ISCED 3-6 (ICT for increased and diversified learning opportunities) • With special focus on teacher education, vocational training and tertiary-level distance education

The Plan of Action of the first phase of WSIS includes two targets that are directly relevant to ICT in education and fall within UNESCO's area of competence:

- i) to connect universities, colleges, secondary schools and primary schools with ICT; and
- ii) to adapt all primary and secondary school curricula to meet the challenges of the information society, taking into account national circumstances.

The Plan of Action also recognized that all individuals should have "the necessary skills to benefit fully from the Information Society", specifying the need for ICT literacy (WSIS, 2003, C4.11).

There are two MDG goals which require the measurement of ICT in education: Goal 2 (Achieve universal primary education) and Goal 8 (Develop a global partnership to use ICT for development). It is expected that ICT will contribute significantly to addressing international poverty alleviation goals by harnessing the potentials of technologies to improve the quality of educational outcomes; transcending the usual barriers to the empowerment of poor people through social networking and greater accessibility to information; and increasing the productivity of marginalized groups and their inclusion into the labour market.

Similarly, ICT support to education is perceived to be critical for reaching EFA goals, by boosting the current rate of progress in developing countries, especially through accelerated distance teacher-training. (*For a complete list of the EFA goals, see **Box 1.***) These goals aim to increase participation, equity and quality of schooling or lifelong learning for all, in addition to diversifying the skills supply so that it adequately meets the demand of a rapidly evolving information society.

Box 1. The six Education for All (EFA) goals

- Goal 1:** Expanding and improving comprehensive early childhood care and education, especially for the most vulnerable and disadvantaged children
- Goal 2:** Ensuring that by 2015 all children, particularly girls, children in difficult circumstances and those belonging to ethnic minorities, have access to, and complete, free and compulsory primary education of good quality.
- Goal 3:** Ensuring that the learning needs of all young people and adults are met through equitable access to appropriate learning and life-skills programmes.
- Goal 4:** Achieving a 50 per cent improvement in levels of adult literacy by 2015, especially for women, and equitable access to basic and continuing education for all adults.
- Goal 5:** Eliminating gender disparities in primary and secondary education by 2005, and achieving gender equality in education by 2015, with a focus on ensuring girls' full and equal access to and achievement in basic education of good quality.
- Goal 6:** Improving all aspects of the quality of education and ensuring excellence of all so that recognized and measurable learning outcomes are achieved by all, especially in literacy, numeracy and essential life skills.

ICT in education at UNESCO

The expanded list of indicators was developed in line with UNESCO's strategic vision and priorities in the field of ICT use for educational purposes. Given that the use of ICT in and for education is now seen worldwide as both a necessity and an opportunity, it has become a major transversal priority across all UNESCO areas of competence. The UNESCO approach for developing ICT use in and for education is developed through its cross-sectoral thematic platform of "*fostering ICT-enhanced learning*".

In its role as a laboratory of ideas, standard-setter, clearinghouse, capacity builder and neutral broker in international cooperation, UNESCO provides policy advice to countries. These policy recommendations need to be based on sound statistical evidence to support successful and cost-effective practices in the use of both old and new technologies to deliver education.

The concept of 'knowledge societies' at UNESCO covers knowledge acquisition for all segments of society through both education and lifelong learning inside and outside the formal schooling system. However, the ICT indicators presented in this guide are only based on the formal education system in order to be consistent with the annual UIS education survey.

UNESCO's principles on ICT in education can be summarised as follows:

- i) Global education challenges, especially the EFA goals, are greatest in the developing world. The development of a methodology for ICT in education indicators, thus, deliberately places more emphasis on major policy issues for these countries. It is assumed that developed countries have the resources, manpower and knowledge required to address their own emerging policy or research information needs on the integration of ICT into their education systems.
- ii) Old and new technologies need to be used in a balanced way. On-the-air and off-the-air radio/radio-cassette, television and offline video-assisted technologies are still considered valid and cost-effective modes of education delivery, as important as more interactive computer/Internet-based virtual education or online distance learning.
- iii) Meeting the international education goals by 2015 will require huge investments in teacher training institutions (UNESCO-UIS, 2006b). According to experts, this is a major challenge that the conventional face-to-face delivery mode will not be able to address. The frequent need to adapt school curricula also requires huge in-service training for existing teachers, where the support of ICT is likely to play an essential role.
- iv) The demand for higher education cannot be met in both the developed and developing world without distance or virtual modes of learning.
- v) Vocational training needs cannot be met without virtual classes, virtual laboratories, etc.
- vi) Educational goals cannot be met without gender sensitivity. Wherever possible, the proposed indicators will address the need to measure the gender gap.

3. Review of literature on ICT in education

Since the introduction of ICT in education, one of the most discussed policy questions has been its impact on educational outcomes. This explains why almost all existing data on ICT use in education are derived from sample-based international comparative assessments that rely on students, teachers and schools for descriptions and analysis of educational inputs, processes and outcomes.

These types of assessments began in the 1960s and have been focused mainly on core subjects, such as mathematics, science and reading. Over time, assessments began to include the use of ICT in education, such as the "Computers in Education" study conducted in the late 1980s and early 1990s, under the auspices of the International Association for the Evaluation of Educational Achievement (IEA) (Pelgrum and Plomp, 1993).

The types of international comparative assessments which exist currently include:

- i) Projects by international organizations, i.e. projects funded by the European Commission (Eurydice, 2004) and the World Bank (Hepp et al, 2004) and secondary analyses of assessments conducted by the Organisation for Economic Co-operation and Development (OECD, 2006);
- ii) Case studies of selected schools in a number of different countries, e.g. SITES-Module 2, a study looking at innovative pedagogical practices using ICT (Kozma, 2003);
- iii) International assessments (e.g. PISA, IEA-TIMSS and IEA-PIRLS using national representative samples of schools, teachers and/or learners, and focusing on collecting and producing comparative indicators on educational processes and outcomes; and
- iv) Regional assessments such as the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ, n.d.) and the Assessment of Pupils' Skills in English in Eight European Countries (Bonnet, 2004).

With the use of computers in education, ICT was expected to lead to more productive learning. Yet, early studies on the impact of ICT on educational outcomes did not produce very consistent results. Recent meta-analyses (Kulik, 2003; Cox and Abbot, 2004) point to a more positive picture. The overall conclusion of Cox and Abbot is that research has identified positive effects of *specific* ICT uses on pupil's educational attainment. The most substantial effects were observed when ICT was used in mathematics, science and English. This does not mean that the evidence for other subjects is negative; it is only an indication that not enough studies exist for other areas. The authors emphasize the notion of specific ICT uses and point out that the types of uses should match the pedagogical approach (paradigm) of teachers and that the largest effects were observed for teachers who had embedded particular ICT uses in their courses for an extended period of time.

The complexity of constructing good assessment instruments for indicators on ICT in education is related not only to the complexity of this domain in general but also to the current methods of international comparative assessments. It is difficult to isolate the effects of ICT from other influences as there is a lack of quality indicators on measuring digital literacy and skills needed to function adequately in today's information society.

Throughout the world, policy programmes exist that aim to stimulate the use of ICT in education. These programmes vary in scope, focus, budgets and complexity. In wealthy economies, ICT has been used in education for more than 20 years. Despite this long experience, the degree of its impact on education remains unclear for policymakers. It is not surprising that progress in integrating ICT into education has been slow in many countries when the benefits cannot be measured and demonstrated in a sound way.

Although the benefits of ICT use in education cannot be clearly measured, many countries continue to introduce it based on the assumption that citizens should be able to function adequately in a rapidly evolving information society. Nonetheless, it seems reasonable to infer from numerous documentary and data sources that more statistical evidence needs to be gathered on the actual benefits of ICT in education. As InfoDev (2005) concluded, there is an absence of "widely accepted standard methodologies and indicators to assess the impact of ICT in education".

Traditional curriculum-oriented assessments primarily focus on students as the units of data collection and analysis ('primary indicators'), while 'secondary indicators' are collected at school and teacher levels on aspects related to school conditions, teaching and learning processes. IEA has performed international comparative assessments that focus on measuring student achievement in mathematics, science and reading (such as PIRLS 2001, etc). The policy evaluation methodology used in these assessments involves the following steps:

- i) investigating and documenting national policy intentions by conducting curriculum analyses;
- ii) determining the content of the intended curricula of all participating countries (with a strong possibility that the result of this exercise may reflect mostly the opinion of experts on what skills learners should be acquiring);
- iii) conceptualizing the assessment domains and using the agreed concepts for developing and operationalizing indicators for these domains;
- iv) administering standardized tests to national samples of students from a well-defined target population (e.g. "all students in the 8th year of compulsory schooling" or, like in PISA, "all students who are 15 years old");
- v) generating internationally comparable estimates from these tests as primary indicators;

- vi) formulating value judgments to determine where students from participating countries have demonstrated some strengths or weaknesses with regard to the assessed domains;
- vii) providing a first global answer to initial questions of policymakers on how their respective education systems are performing; and
- viii) conducting secondary analyses using explanatory indicators to investigate further the reasons behind the observed weaknesses.

The latter step is referred to as the diagnosis phase. This phase is difficult to realize. The assessments are designed as one-shot operations where primary and secondary indicators need to be measured at the same point in time, but the investigation questions to be addressed in the secondary analyses are not obvious in advance. Moreover, the set of potentially relevant indicators often needs to be restricted due to constraints, such as the time available for administering tests and questionnaires, or the costs associated with developing and piloting new indicators.

The level of sophistication of the tools required for a sample-based assessment presents a number of challenges. These include the rigor of the methodological approach, which could be biased towards perceptions of experts, cost (in terms of time or resources), and cultural and language constraints.

One of the first sample-based assessments aiming at measuring the use of ICT in education was the Second Information Technology in Education Studies (SITES). Initiated in 1997, SITES is a research programme focused on comparative assessment of ICT use in education across many countries. Case studies of innovative pedagogical practices were also undertaken. SITES 2006 is the third project in the series. Countries covered by the various rounds of SITES include:

- SITES M1 (1999): Belgium (Francophone), Bulgaria, Canada, China (Taipei), Cyprus, Czech Republic, Denmark, Finland, France, Hong Kong SAR, Hungary, Iceland, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Norway, New Zealand, Russian Federation, Singapore, Slovakia, Slovenia, South Africa, Thailand.
- SITES M2 (2001): Australia, Canada, Chile, China (Taipei), Czech Republic, Denmark, England, Finland, Germany, Hong Kong Special Administrative Region of China, Israel, Italy, Japan, Korea, Latvia, Lithuania, Netherlands, Norway, Philippines, Portugal, Russian Federation, Singapore, Slovakia, South Africa, Spain (Catalonia), Thailand, the United States.
- SITES M3 (2006): Australia, Canada (Alberta and Ontario), Chile, China (Taipei), Denmark, Estonia, Finland, France, Hong Kong Special Administrative Region of China, Israel, Italy, Japan, Lithuania, Norway, Russian Federation (Moscow), Singapore, Slovakia, Slovenia, South Africa, Spain (Catalonia), Thailand.

As an illustration, the ICT-related concepts that were covered in the school questionnaires from SITES 2006 are presented in **Table 2**.

Table 2. ICT-related concepts covered in the school questionnaires of SITES 2006

Concept(s)	Description
Infrastructure	<ul style="list-style-type: none"> ▪ Availability of ICT hardware (types of computers, local area network, Internet connections, electronic whiteboards, etc.) ▪ Availability of ICT software (general and subject specific software, learning management systems, assessment tools, etc.) ▪ Infrastructure needs and issues
Vision	<ul style="list-style-type: none"> ▪ The vision of the school management with regard to pedagogy and ICT, covering three dimensions: traditional, lifelong learning and connectedness
Staff development	<ul style="list-style-type: none"> ▪ Encouragement or requirements for teachers to acquire knowledge and skills with regard to pedagogical practices and the use of ICT ▪ Ways that teachers in the school have acquired knowledge and skills for using ICT in teaching and learning ▪ Availability (school-based and/or externally) of ICT-related courses
ICT support	<ul style="list-style-type: none"> ▪ Persons involved in providing ICT support and time expenditure ▪ Extent to which pedagogical support for ICT use is available for teachers ▪ Extent to which technical support for ICT use is available for teachers

International comparative educational assessments that have attempted to monitor developments in this area of ICT fall into two categories:

- i) assessments that were dedicated specifically to ICT (that is, in which ICT-related indicators were the primary indicators); and
- ii) assessments in which ICT indicators were secondary.

In summary, **Table 3** presents a number of international assessments by indicator, the organization that carried out the assessment, coverage of ISCED level (UNESCO-UIS, 2006a) and selected ICT in education concepts.

To date, international comparative student assessments remain the predominant sources of information for policy questions regarding ICT use in education. They are essential for identifying variables for monitoring global challenges and trends on the integration of ICT to achieve education goals.

Table 3. Coverage of selected international ICT in education assessments

Survey		Organization	ISCED level coverage	ICT in education concepts			
				Infra-structure access	ICT use	Teacher training	ICT support
Primary indicators	Second Information Technology in Education Study (SITES-M1 1997-1999, SITES-M2 1999-2002, SITES-M3 2006)	University of Twente (Netherlands), the University of Hong Kong and the International Association for the Evaluation of Educational Achievement (IEA)	ISCED 2 ISCED 3	X	X	X	X
Secondary indicators	Programme for International Student Assessment (PISA 2003)	OECD	ISCED 3	X	X		
	Progress in International Reading Literacy Study (PIRLS 2001)	International Association for the Evaluation of Educational Achievement (IEA)	ISCED 1	X	X		X
	Trends in International Mathematics and Science Study (TIMSS 2003)	International Association for the Evaluation of Educational Achievement (IEA)	ISCED 1 ISCED 2	X		X	X

While many of the concepts and underlying themes presented in this document are derived from existing student assessments and experiences in monitoring ICT in education, it is not intended to develop measures to address:

- direct assessment of the impacts of ICT use on student achievement (*see Box 2*);
- direct evaluation of in-country school curricular goals as they may relate to the use of ICT;
- specific policy objectives pertaining to an individual country or selected group of countries that are not sufficiently cross-cutting with major international development challenges or educational goals; and
- sample-based or opinion-based data collection methods on ICT use by teachers and learners within or outside educational institutions.

The recommended ICT-related data items in this guide are meant to be consistent with definitions used for indicator methodologies in existing UIS education questionnaires.

Box 2. Measuring the impact of ICT in education: Expectations and limitations

Measuring the direct impact of ICT in relation to education policy goals presents obvious challenges. For example, to effectively measure the differential return on investment in ICT on student outcomes, a policy analyst must deal with a causal relationship that isolates a single variable, such as “computer use”, from a sea of other factors that may affect student performance. Assuming this causal relationship is expressed as a basic linear model:

$$score_i = \alpha + \beta compuse_i + \varepsilon_i$$

where

$score_i$ = a measure of student performance (e.g. test score) for student i

α = constant term

$compuse_i$ = a measure of computer use (e.g. frequency of student use) for student i

β = coefficient estimate (i.e. marginal contribution of computer use to student performance)

ε_i = residual term or error term for observation i

On the basis of this model and considering that data are obtained from a sample-based student assessment, let us hypothesize that computer use has a positive and statistically significant effect on student outcomes. Nevertheless, the residual term (ε) may still lead the analyst to a potentially biased conclusion simply because of two structural components: i) survey measurement error; and ii) error resulting from excluding other unobserved or hardly measurable explanatory variables from the model. Although there are statistical techniques to minimize the erroneous analysis and interpretation of coefficients due to omitted variables, the problem of directly observing specific characteristics of the abilities of individual students persists. This is known in the literature as “unobserved ability”. Nevertheless, many of the existing international sample-based surveys of schools and student assessments are continuously refining their methods in order to compensate for these deficiencies.

Despite their limitations, sample surveys are useful sources for effective skills testing and impact measurement. In particular, longitudinal surveys that collect items on ICT use and skills acquisitions, together with associated contextual variables, provide analysts with a more fertile basis for rigorous and reliable policy evaluations.

From the perspective of regular monitoring of international goals, the downside of sample-based surveys is that they are limited to a handful of countries due to cost and other operational reasons. Therefore, the few existing international surveys tend to focus on a compressed sample size of students by focusing on a single age or a single grade as the target population (e.g. PISA, PIRLS, TIMSS, SITES, etc.). The UIS, with its global mandate, can neither accommodate the cost nor the logistical implications of such types of surveys for more than 200 countries, even though it can contribute to formulating standards and methodologies towards this end.

The task of measuring the impact of ICT on student performance using administrative data sources on a cross-national basis is neither simple nor more rigorous than the sample-based methodology. However, recent research using detailed school-level characteristics from national school census databases, in combination with average student performance, by school for nationally standardized exams, tend to infer similar conclusions on factors influencing student performance as those drawn from sample-based testing of students for the same countries in the same year.

Certainly, there may be other methodological limitations for data from administrative sources to measure ICT impact. However, the census-based approach has the advantage of being based on an already-existing practice, which is affordable for all countries. Therefore, the UIS must explore sustainable options with its regular respondents from the national statistical units within Ministries of Education regarding operational modalities to generate proxy data items from their regular school censuses. This will help the UIS to devise hypotheses on the potential impact of ICT on education based on a comparable and affordable dataset across countries.

4. Conceptual framework for the development of ICT in education indicators

In order to monitor ICT in education from an international perspective, it is necessary to establish a consensus on the conceptual framework first. However, some operational constraints must be considered as well.

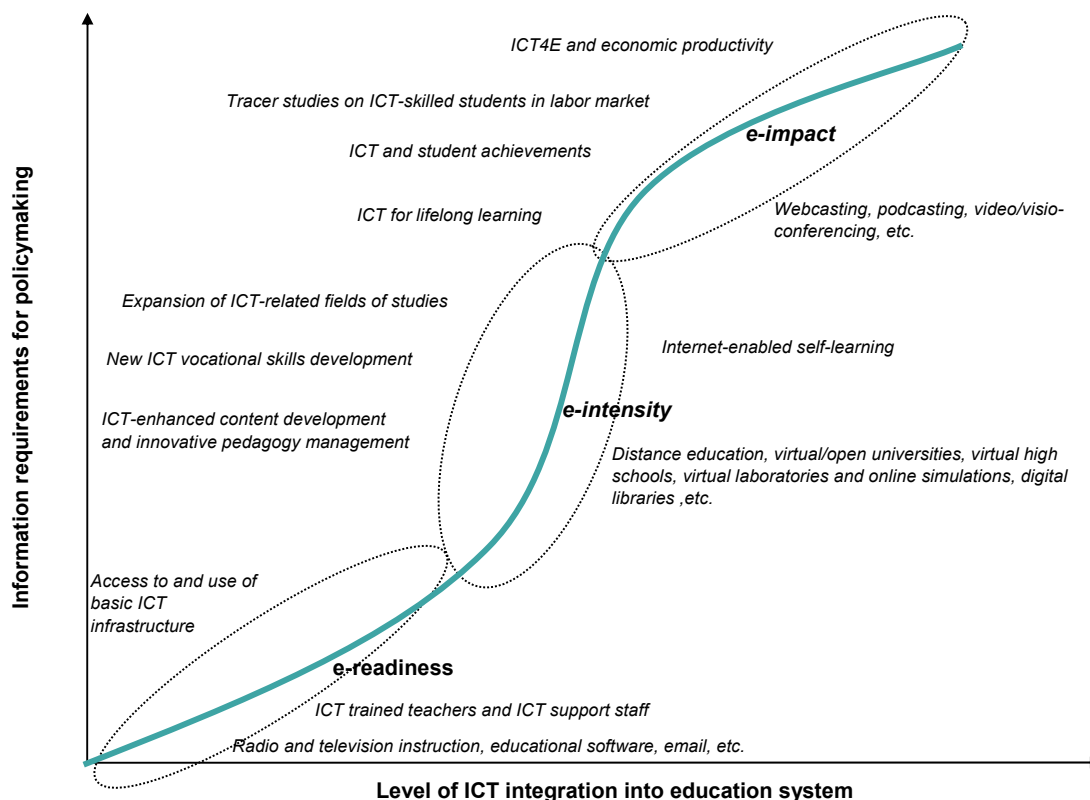
The UIS approach emphasizes educational institutions (or schools) as the main units of data collection, aggregated at the country level. This method of data collection has important consequences for the framework for monitoring access to, use and outcomes of ICT in education. For example, some indicators of interest – such as ICT use by teachers and students (at schools and/or at home) and the impact of ICT on student competencies – cannot be directly measured through such methods. Moreover, it is important to note that countries are at different stages of introducing technology (in various forms) in schools.

Figure 1 illustrates the evolution of information needs with the stages of nationwide implementation of cross-sectoral ICT policies and with the changing levels of ICT penetration in educational systems over time. As ICT permeates education systems, the indicators that are used for monitoring progress in policy implementation change over time. An international instrument that collects administrative data across numerous countries at different stages of development and implementation must be sensitive to such situations. However, as countries reach the later stages of information requirements (e.g. e-impact) and where resources allow, monitoring the impact of ICT can be more effectively achieved through sample-based assessments, labour force surveys and other specialized longitudinal surveys.

Countries that are in the early stages of introducing ICT have different information needs from countries that have longer experience with the technology. For instance, when introducing computers in education, it is important that teachers and students have access to hardware and software and that they acquire basic computer skills. Countries in more advanced stages of ICT use in education have other priorities come to the forefront – such as the management of pedagogical innovation, adaptive and inclusive curriculum, organizational change, sustainable technical support, and continued staff development. As a result, the concerns of policymakers have shifted over time. For some, measuring the impact of the implementation of ICT in education entails information on access, use, and outcomes. For others, in the early days of implementation, the focus is on creating an ICT infrastructure in order to provide schools with access to newer technologies. The subsequent focus is on using ICT in an appropriate way in order to realize intended educational outcomes.

Data on access depend on the provision of infrastructure that can be captured at the school level, whereas the information on the use of ICT for the teaching and learning process can be captured at the teacher and student level. Data on outcomes – which are ultimately of the highest interest for policymakers – need to be gathered at the student level.

Figure 1. Information needs at different levels of ICT penetration in education systems over time



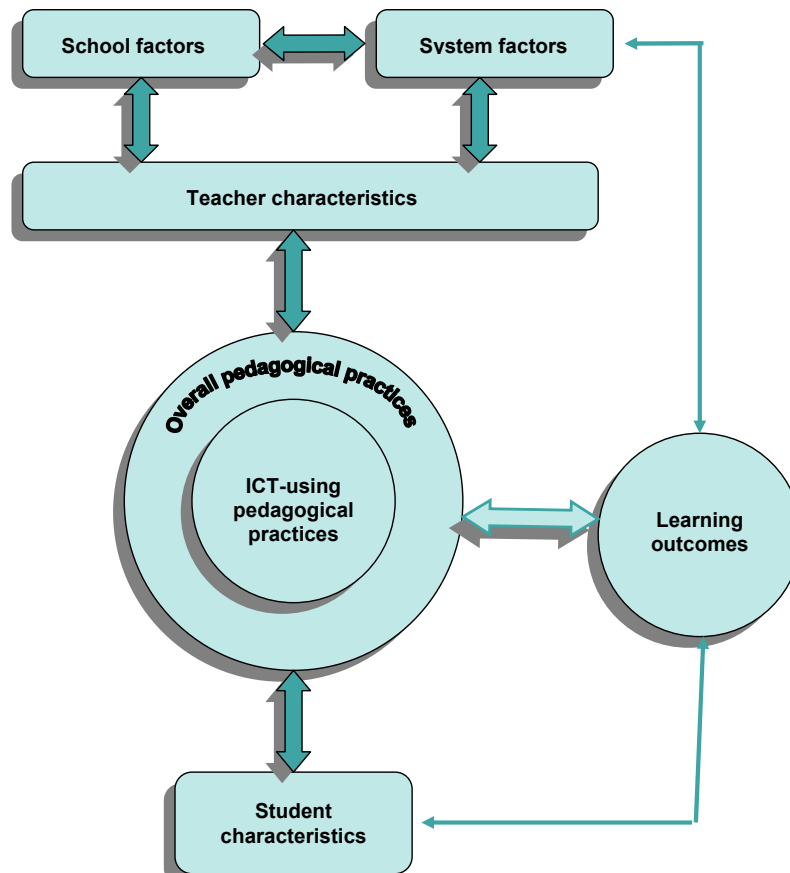
Source: Adapted from UNCTAD (2007).

The literature on ICT in education covers many conceptual frameworks. **Figure 2** provides an example of a common framework for ICT in education. It provides a useful basis for upstream policy monitoring and evaluation mechanisms.

Law et al. (2008) and Pelgrum and Anderson (1999) have noted that SITES 2006 was based on the concept that using ICT forms part of the pedagogical practices of the teacher:

"For teachers, the reasons for and the ways of using ICT in the classroom are underpinned by their overall pedagogical vision and competence. Also, pedagogical practices are not determined solely by the characteristics of the teachers, such as their academic qualifications and ICT-competence, but also by school and system-level factors. While we expect students' learning outcomes to be influenced by the pedagogical practices they experience, we need to acknowledge that the outcomes (whether perceived or actual) influence the subsequent pedagogical decisions of the teacher. This is because teacher-, school- and system-level factors often have to change or be changed to accommodate the expected or actual impact of pedagogical practices on students."

Figure 2. Conceptual framework



Source: SITES 2006 study.

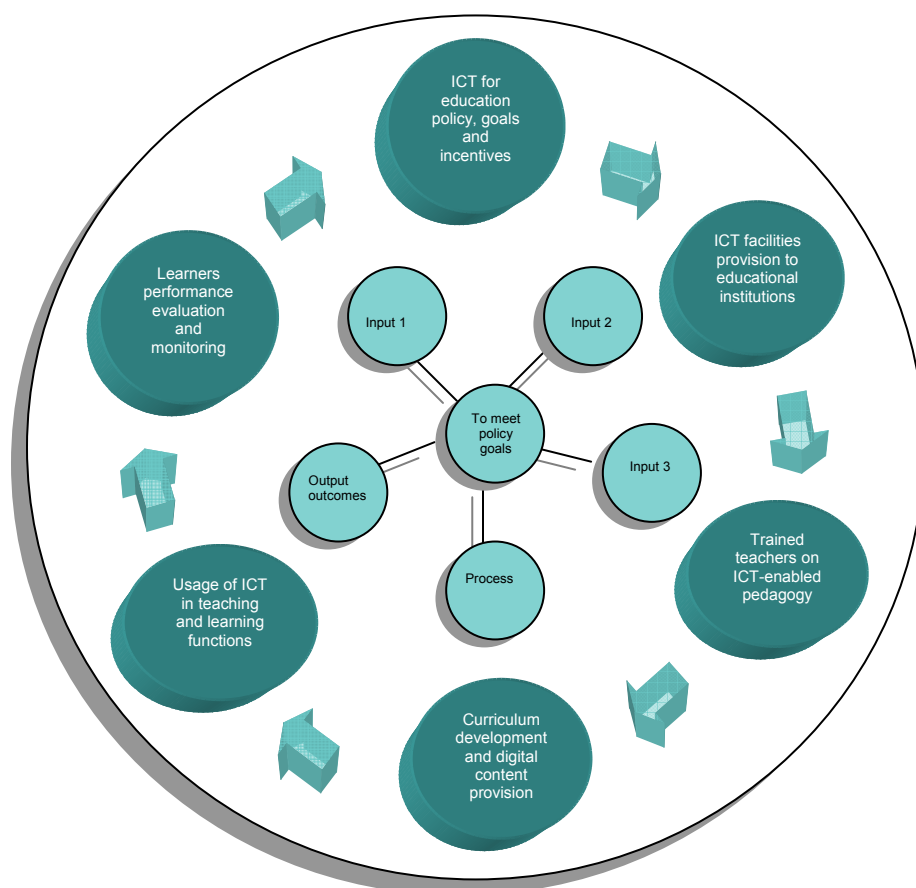
From an operational perspective, a classic approach to an ICT in education framework comprises “policy / strategy-input-process-output / outcomes”. **Figure 3** illustrates the practical nature of the relationships between key areas.

In summary, before ICT integration into national education systems can be effective, an adequate mix of the following policy and operational measures is needed:

- i) Clear goals and a policy environment enabled by national authorities that support the use of ICT in education;
- ii) Support and/or incentives for both public and private educational institutions to purchase ICT facilities (e.g. dedicated government funding, including a budget for maintenance services; tax rebates on ICT hardware and software for educational institutions; investment in or sponsoring of research in developing low-cost ICT hardware and software, etc);
- iii) Adaptation of curricula to ICT integration and development or acquisition of standardized quality-assured digital educational contents and software;

- iv) Deliberate mass teacher training programmes on teaching ICT subjects or using ICT to teach other subjects more effectively;
- v) Favourable and flexible school policies enabling well-planned access by teachers and learners to ICT resources in support of curricula delivery; and
- vi) Appropriate national-level monitoring and evaluation systems that make it possible to perform regular assessments of outcomes and efficiency gains, and to detect early potential shortcomings so that policy implementation can be more effective.

Figure 3. Operational and conceptual framework for ICT integration in education



In order to develop the UIS indicators for measuring ICT in education, the first step was to identify areas of interest for policymakers. By knowing which policy issues are of concern to Member States, the UIS can respond by developing indicators to measure progress in these areas. **Table 4** provides the framework used in developing the UIS core list of ICT in education indicators.

Table 4. Key policy questions addressed in the development of the UIS ICT in education indicators

Conceptual domains	Potential policy questions	Mapping of information requirements
Political commitment	Do countries have deliberate policies and incentives that constitute an enabling environment for ICT integration into their national education system?	Presence of national and/or education sector-specific policy, plan 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?	Quantity and quality of ICT facilities or related resources in schools for educational purposes
Teaching staff development	What proportion of teaching staff is adapting their competencies to an ICT-enabled instruction model or to teach ICT subjects?	Training and deployment of teachers to use ICT in education
Curriculum	Are countries introducing changes in their curriculum delivery using ICT, and to what degree are ICT taught as a subject?	Extent of integration of ICT into the curriculum
Usage	What are the nature and intensity of ICT use in schools?	Access to 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 in basic computer skills and/or graduated in generic and specific ICT-related fields of study
Outcomes and impact	<p>Are ICT transforming education systems' performance or making a difference in:</p> <ul style="list-style-type: none"> ▪ improving conventional teaching and learning processes? ▪ enhancing the quality of student performances? ▪ expanding new skills supply for labour market? ▪ enlarging lifelong learning opportunities? ▪ managing educational institutions? 	<ul style="list-style-type: none"> ▪ Evidence of the reforming role of ICT in the traditional face-to-face education delivery systems (effects on curriculum delivery and contents) ▪ Differential success rates of learners in schools with ICT assisted instruction versus students in schools with conventional pedagogy (as proxy measure for impact) ▪ Increase in the number of computer literates and the range of ICT-related fields of study graduates (ISCDED 4, 5 and 6) ▪ Increased enrolments in ICT-enhanced outreach or on-the-job training programmes and of certifications in new skills obtained by individuals outside the formal education system. ▪ Increased presence of computers in educational administrations or increased use of computers for school management

5. Expanded list of internationally comparable indicators and methodological implications

a) Scope of indicators and rationale

This guide recommends collecting data on ICT in education in line with the UIS main education survey, which is based on official administrative sources and not on sample surveys. This, in turn, presents some methodological and operational limitations for the full scope of indicators needed for measuring access, use and impact of ICT in education.

The rationale behind the UIS approach to ICT in education data collection includes the following:

- i) The UIS collects administrative data annually using established and trained education statisticians in all countries. Consequently, these contacts should not be overburdened by time-consuming and unsustainable sample surveys.
- ii) The UIS submits its education data every year to major clients (including the World Bank, UN Statistical Division, UNICEF, etc.) and to many international reports (including the *Human Development Report*, the *Global Millennium Development Goals Reports*, the *Education for All Global Monitoring Reports*, the World Bank's *World Development Indicators Reports*, and the *UN Statistical Yearbooks*). Data on ICT in education are expected to feed into the same reports, in addition to a wider range of international databases through the WSIS monitoring platform.
- iii) It must be noted that a majority of countries do not have the capacity or financial means required to conduct sample surveys in a comparable fashion and on an annual basis in order to address, without interruption, international needs for information.
- iv) The systematic monitoring of large-scale implementation of ICT in schools is often set by national policy. Given the heterogeneity across countries in terms of policy implementation, collecting administrative data is the most effective way to sustain such policy monitoring operations.
- v) In order to ensure standardization of the calculation of indicators that are disseminated internationally, the UIS only collects raw data and not the indicators directly from countries. In addition, the UIS aims to generate indicators for which the underlying raw data can be obtained from national school records at a minimal cost.
- vi) The target respondents for the future UIS Questionnaire on ICT in Education are expected to be the same as those who complete the annual UIS education questionnaires and are generally in the statistical unit of the Ministries of Education. The data submitted are usually drawn from all schools through a national questionnaire based on administrative registers. Therefore, unlike sample-based surveys that directly target students, teachers and school administrators, the data collected through these questionnaires cover all education institutions for the entire country at the aggregate level.

Indicators presented in this guide cover all ISCED levels (UNESCO-UIS, 2006a) except pre-primary education (ISCED level 0) (see **Appendix III** for a description of ISCED levels). Special attention is given to teacher training (including pre-primary teachers), vocational education and distance education at the tertiary level, in accordance with emerging global priorities identified by UNESCO.

Finally, the scope of the types of ICT will not be restricted solely to newer technologies (e.g. computer, interactive video and Internet) but will also include older technologies (e.g. radio and television).

b) Proposed new indicators on ICT in education

Based on current policy issues (outlined in Table 4), it is suggested to add indicators on ICT in education to the UIS core list in order to adequately monitor developments in this field. The objective is to cover the main gaps in international information requirements for monitoring ICT integration in educational institutions.

The proposed indicators have been developed according to policy relevance, monitoring needs, feasibility in terms of collecting reliable data across countries, and international comparability of the derived indicators. They were defined in parallel to the design and testing in 25 countries of the *Prototype Questionnaire on Statistics of ICT in Education* (see **Appendix I**).

Table 5 presents the additional list of indicators. **Table 6** provides the specifications and collection methodologies for both the core list and additional indicators on ICT in education. It gives detailed information on data requirements, data sources, methods of collection, indicator calculation, interpretation and limitations. More detailed definitions can be found in **Appendix II**.

A majority of these indicators can be used at both the international and national levels for monitoring and supporting policy formulation and decisionmaking. Many of them can also be used at the sub-national and school levels to compare ICT infrastructure, access, usage and outcomes. Most of the quantitative data required can be collected from the educational institutions during school censuses or surveys, while others can be obtained from official government documents on policies, plans and budgets.

A total of 45 new indicators are proposed. Together with the original core set, the total number of indicators would amount to 53, not counting one reference indicator on electricity as a prerequisite for using ICT in schools. Some of the new indicators are presented with two variants in order to capture different analytical perspectives.

Table 5. List of proposed new indicators on ICT in education

Conceptual domains	Indicator label	Indicator
Political commitment	ED9	Proportion of ISCED levels covered by existing national policy, plan or regulatory mechanism for ICT in education (for ISCED levels 1-6)
	ED9 bis	Proportion of grades using ICT-assisted instruction (for ISCED levels 1-3) by subject : <ul style="list-style-type: none"> • Maths • Sciences • Basic computer skills (or computing) • Languages • Arts
	ED10	Average number of hours per week of ICT use in classrooms as recommended in curricula (for ISCED levels 1-3 and by major subjects) <ul style="list-style-type: none"> • Maths • Sciences • Basic computer skills (or computing) • Languages • Arts
	ED11	Average number of hours per week of ICT use in classrooms as recommended in curricula (for ISCED levels 1-3) <ul style="list-style-type: none"> • Exercises on computer using educational software • Exercises on computer using the Internet • Radio (Interactive Radio Instruction) • Television
	ED12	Proportion of total government expenditure on ICT in education for current expenditure on ICT in education (for ISCED levels 1-3, level 4 and levels 5-6)
	ED13	Proportion of total government expenditure on ICT in education for capital expenditure on ICT in education (for ISCED levels 1-3, level 4 and levels 5-6)
	ED14	Proportion of total government expenditure on education for current expenditure on ICT in education (for ISCED levels 1-3, level 4 and levels 5-6)
	ED15	Proportion of total government expenditure on education for capital expenditure on ICT in education (for ISCED levels 1-3, level 4 and levels 5-6)
	ED16	Average government expenditure on ICT in education per learner (for ISCED levels 1-3, level 4 and levels 5-6)
	ED16bis	Average government expenditure on ICT in education per learner enrolled in grades with ICT-assisted instruction (for ISCED levels 1-3)
Public-private partnership	ED17	Proportion of total current expenditure on ICT in education for private current expenditure on ICT in education (for ISCED levels 1-3, level 4 and levels 5-6)
	ED18	Proportion of total capital expenditure on ICT in education for private capital expenditure on ICT in education (for ISCED levels 1-3, level 4 and levels 5-6)
	ED19	Proportion of total current expenditure on ICT in education for foreign current expenditure on ICT in education (for ISCED levels 1-3, level 4 and levels 5-6)
	ED20	Proportion of total capital expenditure on ICT in education for foreign capital expenditure on ICT in education (for ISCED levels 1-3, level 4 and levels 5-6)
	ED21	Ratio of non-governmental to governmental sources of current expenditure on ICT in education (for ISCED levels 1-3, level 4 and levels 5-6)

Infrastructure	EDR1	Proportion of schools with electricity (for ISCED levels 1-3)
	ED1	Proportion of schools with a radio used for educational purposes (for ISCED levels 1-3)
	ED2	Proportion of schools with a television used for educational purposes (for ISCED levels 1-3)
	ED3	Proportion of schools with a telephone communication facility (for ISCED levels 1-3)
	ED4	Learners-to-computer ratio in schools with computer-assisted instruction (for ISCED levels 1-3)
	ED4bis	Learners-to-computer ratio (for ISCED levels 1-3)
	ED5	Proportion of schools with Internet access by type (for ISCED levels 1-3) <ul style="list-style-type: none"> • Any type of Internet access • 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
	ED22	Proportion of schools with computer-assisted instruction (for ISCED levels 1-3)
	ED23	Proportion of schools with Internet-assisted instruction (for ISCED levels 1-3)
	ED24	Proportion of educational institutions owning licence for or subscribing to scientific digital libraries (for ISCED levels 1-3, level 4 and levels 5-6)
	ED24bis	Proportion of educational institutions owning licence for or subscribing to virtual experiment laboratories (for ISCED levels 1-3, level 4 and levels 5-6)
	ED25	Ratio of learners-to-computer connected to Internet (for ISCED level 1-3)
	ED26	Average number of computers per educational institution (for ISCED levels 1-3, level 4 and levels 5-6)
	ED27	Average number of computers connected to the Internet per educational institution (for ISCED levels 1-3, level 4 and levels 5-6)
	ED28	Proportion of student-owned computers available for pedagogical purposes (for ISCED level 4 and levels 5-6)
	ED29	Proportion of all computers available for pedagogical purposes (for ISCED levels 1-3, level 4 and level 5-6)
	ED30	Proportion of all computers available for administrative purposes (for ISCED levels 1-6)
	ED31	Proportion of schools with a website (for ISCED levels 1-3)
	ED32	Proportion of schools with a website hosting students' and teachers' blog pages (for ISCED levels 1-3, level 4 and levels 5-6)
	ED33	Proportion of educational institutions offering ICT-enabled distance education programmes (for ISCED levels 5-6)
Teaching staff development	ED8	Proportion of ICT-qualified teachers in primary and secondary schools (for ISCED levels 1-3)
	ED34	Proportion of schools with ICT support services (for ISCED levels 1-3)
	ED35	Proportion of primary and secondary-school teachers trained via ICT-enabled distance education programmes (for ISCED levels 1-3)
	ED36	Proportion of primary and secondary-school teachers who teach basic computer skills (or computing) (for ISCED levels 1-3)
	ED37	Proportion of primary and secondary-school teachers who currently teach subject(s) using ICT facilities (for ISCED levels 1-3)
	ED38	Proportion of primary and secondary-school teachers trained to teach subject(s) using ICT facilities (for ISCED levels 1-3)
	ED39	Ratio of learners-to-teachers of basic computer skills (or computing) (for ISCED levels 1-3)
	ED40	Ratio of learners-to-teachers using ICT to teach (for ISCED levels 1-3)

Usage	ED6	Proportion of learners who have access to the Internet at school (for ISCED levels 1-3)
	ED41	Proportion of learners entitled to use computer laboratories at school as a pedagogical aid (by gender, by type of institution for ISCED levels 1-3)
	ED42	Proportion of educational institutions providing an email account to all teachers (for ISCED level 4 and levels 5-6)
	ED43	Proportion of educational institutions providing an email account to all learners (for ISCED level 4 and levels 5-6)
Participation, skills and output	ED7	Proportion of learners (by gender) enrolled at the post-secondary non-tertiary and tertiary level in ICT-related fields (for ISCED level 4 and levels 5- 6)
	ED44	Proportion of learners enrolled in grades with ICT-assisted instruction (for ISCED levels 1-3)
	ED45	Proportion of learners enrolled in grades where basic computer skills (or computing) are currently taught (for ISCED levels 1-3)
	ED46	Proportion of learners (by gender) who graduated last academic year in ICT-related fields at the post-secondary non-tertiary and tertiary level (for ISCED level 4 and levels 5-6)
	ED47	Proportion of learners (by gender) enrolled at the tertiary level in ICT-enabled distance education programmes (for ISCED levels 5-6)
	ED48	Proportion of learners who successfully completed basic computer skills (or computing) programme in the last academic year (for ISCED levels 1-3)
Outcomes and impact	ED49	Promotion rate of learners in grades receiving ICT-assisted instruction (by gender, by type of institution and by grade) (for ISCED levels 1-3)
	ED50	Promotion rate of learners in grades not receiving ICT-assisted instruction (by gender, by type of institution and by grade) (for ISCED levels 1-3)
	ED51	ICT-assisted instruction performance ratio (by gender, by type of institution and by grade) (for ISCED levels 1-3)
Equity	ED52	Proportion of rural schools with ICT-assisted instruction (for ISCED levels 1-3)
	ED53	Number of female graduates per 1000 male graduates in ICT-related fields (for ISCED level 4 and levels 5-6)

Table 6. Detailed specifications and collection methodologies

A. Initial UIS core list of ICT in education indicators

ED1 Proportion of schools with a radio used for educational purposes (for ISCED³ levels 1-3)	
<p>Definition: Number of schools which offer radio-assisted instruction, expressed as a percentage of the total number of schools in the country, for ISCED levels 1-3.</p>	<p>Purpose: To measure the overall presence of radio-assisted instruction in schools.</p>
<p>Data requirement: (EIR) Number of educational institutions (public and private) with radio-assisted instruction for ISCED levels 1-3. <i>(refer to questionnaire item C.1.3)</i> (EI) Number of educational institutions (public and private) for ISCED levels 1-3. <i>(refer to questionnaire item C.1)</i></p>	<p>Method of collection: Administrative data collection through annual school census (or extract data from school records).</p> <p>Data source(s): Statistical unit of the Ministry of Education or, alternatively, the national statistical office.</p>
<p>Formula:</p> $\frac{\sum_{h=1}^3 EIR_h^t}{\sum_{h=1}^3 EI_h^t} * 100$ <p>Where: EIR_h^t = Number of educational institutions with radio-assisted instruction at level of education h in school year t EI_h^t = Number of educational institutions at level of education h in school-year t</p>	
<p>Analysis and 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, and vice versa. This reflects only the degree of availability or accessibility of this mode of delivery in schools, and not the actual intensity of use. By comparing this indicator to the proportion of schools providing other modes of education service delivery using ICT facilities, one can assess the relative predominance and accessibility of different technologies used for teaching and learning purposes within the country or across countries. Besides its use for international comparison, this indicator can also be calculated and analysed by ISCED levels, geographical regions, urban/rural areas, and public/private institutions to identify patterns and potential discrepancies.</p>	<p>Methodological and definition issues or operational limitations: Radio-assisted instruction includes both radio broadcast education and interactive radio instruction (IRI) <i>(see Appendix II)</i>. A radio is considered to be a stand-alone device (when 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, radios that are integrated into other devices (such as a Walkman, car radio, clock radio, audio cassette or CD players/recorders) must be excluded from the data provided.</p>

³ ISCED is the International Standard Classification of Education, 1997. For more information on ISCED, please refer to the UIS website: www.uis.unesco.org/publications/ISCED97

ED2 Proportion of schools with a television used for educational purposes (for ISCED levels 1-3)**Definition:**

Number of schools which offer television-assisted instruction, expressed 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.

Data requirement:

(EIT) Number of educational institutions (public and private) with television-assisted instruction for ISCED levels 1-3.

(refer to questionnaire item C.1.4)

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

(refer to questionnaire item C.1)

Method of collection:

Administrative data collection through annual school census (or extract data from school records).

Data source(s):

Statistical unit of the Ministry of Education or, alternatively, the national statistical office.

Formula:

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

Where:

EIT_h^t = Number of educational institutions with television-assisted instruction at level of education h in school-year t

EI_h^t = Number of educational institutions at level of education h in school-year t

Analysis and 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, or vice versa. This reflects only the degree of availability or accessibility of this mode of delivery in schools, and not the actual intensity of use.

By comparing this indicator to the proportion of schools providing other modes of education service delivery using ICT facilities, one can know the relative predominance and accessibility of different ICT used for teaching and learning purposes within the country or across countries.

Besides its use for international comparison, this indicator can also be calculated and analysed by ISCED levels, geographical regions, urban/rural areas, and public/private institutions to identify patterns and potential discrepancies.

Methodological and definition issues or operational limitations:

A **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). Television 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 levels 1-3)	
<p>Definition:</p> <p>Number of schools with a telephone communication facility expressed as a percentage of the total number of schools in the country for ISCED levels 1-3.</p>	<p>Purpose:</p> <p>To measure the availability of telephone in schools as a pre-requisite condition for accessing the Internet.</p>
<p>Data requirement:</p> <p>(EIP) Number of educational institutions (public and private) with a telephone communication facility for ISCED levels 1-3. (refer to questionnaire item C. 1.2)</p> <p>(EI) Number of educational institutions (public and private) for ISCED levels 1-3. (refer to questionnaire item C. 1)</p>	<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records).</p> <p>Data source(s):</p> <p>Statistical unit of the Ministry of Education or, alternatively, the national statistical office.</p>
<p>Formula :</p> $\frac{\sum_{h=1}^3 EIP_h^t}{\sum_{h=1}^3 EI_h^t} * 100$ <p>Where:</p> <p>EIP_h^t = Number of educational institutions with a telephone communication facility at level of education h in school-year t</p> <p>EI_h^t = Number of educational institutions at level of education h in school-year t</p>	
<p>Analysis and interpretation:</p> <p>A high percentage or value for this indicator shows that a high proportion of schools have telephone communication facilities as well as a potential for implementing Internet-assisted instruction. Since such values reflect only the potential for expanding access to the Internet at school, they should be analysed in conjunction with the proportion of schools which already have access to the Internet, so as to compare such potentials with existing Internet access among schools. This will help policymakers to determine how to expand Internet access to other schools with telephone facilities.</p> <p>Besides its use for international comparison, this indicator can also be calculated and analysed by ISCED levels, geographical regions, urban/rural areas, and public/private institutions to identify gaps and priorities requiring action.</p>	<p>Methodological and definition issues or operational limitations:</p> <p>This indicator refers to telephone facilities which are directly owned by the school. Personal mobile phones owned by individuals working or learning at the school do not constitute a school <i>telephone communication facility</i>.</p> <p>In some schools, the telephone facilities may be mainly used for administrative purposes. As far as the telephone facilities at the school can enable connection to the Internet for pedagogical purposes, they should be included in the data.</p>

ED4 Learners-to-computer ratio in schools with computer-assisted instruction (for ISCED levels 1-3)

Definition:

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

Purpose:

To indirectly measure against “acceptable norms”, the “adequacy” of the number of computers in relation to the number of learners in schools that offer CAI.

Data requirement:

(LC) Number of learners entitled to use computer laboratories at school as a pedagogical aid for ISCED levels 1-3.

(refer to questionnaire item E.1.1)

(CP) Number of computers available for pedagogical use for ISCED levels 1-3.

(refer to questionnaire items C.2.1 + C.2.3)

Method of collection:

Administrative data collection through annual school census (or extract data from school records).

Data source(s):

Statistical unit of the Ministry of Education or, alternatively, the national statistical office.

Formula:

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

Where:

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

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

Analysis and interpretation:

A higher ratio of learners-to-computer signals that higher numbers of learners have to share the use of each computer at school. Pedagogically speaking, this may imply that the available computers are inadequate to serve the learning and practising needs of the learners.

In the absence of nationally defined norms by pedagogues, a ratio of 1 learner to 1 computer reveals a perfect adequacy in the provision of a computer to all learners officially entitled to benefit from it in schools that offer computer-assisted instruction (CAI). However, except in cases of 100% privately owned computers, an “adequate” 1:1 ratio does not necessarily mean an ideal target since sharing a school-owned computer might equally reflect cost-efficient management of the resource. Not all subjects in curricula require the support of computers during 100% of class time scheduled in a week, a month or a year. This indicator needs to be analysed also in the context of coexisting use of other non-computer ICT in schools.

At international level, a median value for this indicator across a statistically representative sample of countries across the world may provide a reference of best practice to countries with obviously inadequate ratios.

Where national standards exist, a learner-to-computer ratio higher than the officially set norms implies that more efforts are required from policymakers to equip schools with computers in order to ensure equitable opportunity for all entitled learners across the country. By frequently updating this indicator, one can monitor and ensure that all schools attain such norms.

Besides its use for international comparison, this indicator can also be calculated and analysed by ISCED levels, geographical regions, urban/rural areas, by school and by CAI or computer skills class, in order to inform policies and decisionmakers to equip all schools with an adequate number of computers.

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.

Only computers in working condition for use in teaching and learning should be included. Other additional criteria may be applied, such as the age of the computer, its configuration and capacity, kinds of software available, etc. The criteria for “working condition” of computers are left to the countries’ discretion, taking into consideration their own pedagogical requirements for schools, their technological environment and their financial capacities.

ED4bis Learners-to-computer ratio (for ISCED levels 1-3)	
<p>Definition:</p> <p>Average number of learners per computer enrolled in ALL schools for ISCED levels 1-3.</p>	<p>Purpose:</p> <p>To explore the opportunities or limits for using computers in schools to promote or expand computer-assisted instruction.</p>
<p>Data requirement:</p> <p>(L) Number of learners for ISCED levels 1- 3. (refer to questionnaire item E.1)</p> <p>(CP) Number of computers available for pedagogical use in all schools for ISCED levels 1-3. (refer to questionnaire item C.2.1 + C.2.3)</p>	<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records).</p> <p>Data source(s):</p> <p>Statistical unit of the Ministry of Education or, alternatively, the national statistical office.</p>
<p>Formula:</p> $\frac{\sum_{h=1}^3 L_h^t}{\sum_{h=1}^3 CP_h^t} * 100$ <p>Where:</p> <p>L_h^t = Number of learners enrolled at level of education h in school-year t</p> <p>CP_h^t = Number of computers available for pedagogical use in all schools at level of education h in school-year t</p>	
<p>Analysis and interpretation:</p> <p>A high value for this ratio indicates a situation where, on average, there are many learners for each available computer in the schools. This may signal either an overall low level of computer availability in schools in a country where there is, in theory full scale implementation of CAI, or the existence of digital gaps among schools, which can be identified when calculating and analysing this indicator by geographical regions and individual schools.</p>	<p>Methodological and definition issues or operational limitations:</p> <p>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.</p> <p>This ratio is neither a measure of actual use of computers in schools nor of time spent by learners to use computers.</p> <p>Only computers in working condition for use in teaching and learning should be included. Other additional criteria may be applied, such as the age of the computer, its configuration and capacity, kinds of software available, etc.</p> <p>The criteria for “working condition” of computers are left to the countries’ discretion, taking into consideration their own pedagogical requirements for schools, their technological environment and their financial capacities.</p>

ED5 Proportion of schools with Internet access, by type (for ISCED levels 1-3)

- Any type of Internet access
- 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:

Number of schools with access to the Internet expressed as a percentage of the total number of schools in the country for ISCED levels 1-3, by type of Internet access.

Purpose:

To measure the overall level of access to the Internet in schools, the opportunities or limits for the use of computers in primary and secondary schools, by type of Internet access.

Data requirement:

(EII) Number of educational institutions (public and private) with access to the Internet by type of Internet access for ISCED levels 1-3.

(refer to questionnaire item C.1.9, C.1.9.1, C.1.9.2, C.1.9.3)

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

(refer to questionnaire item C.1)

Method of collection:

Administrative data collection through annual school census (or extract data from school records).

Data source(s):

Statistical unit of the Ministry of Education or, alternatively, the national statistical office.

Formula :

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

Where:

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

EI_h^t = Number of educational institutions at level of education h in school-year t

Analysis and interpretation:

A high percentage or value for this indicator shows a high degree of access to the Internet among the schools in a given country, and vice versa. The percentages by type of Internet access can inform policies and decisionmakers to expand and/or upgrade Internet connections in schools.

This indicator can also be calculated and analysed by ISCED levels, geographical regions, and urban/rural areas to identify issues and priorities.

Methodological and definition issues or operational limitations:

This ratio measures only the availability of Internet access in schools, and not the intensity of use or the time that learners spend on the Internet for educational purposes.

The type of Internet connection and access in schools may also depend on existing national and sub-national telecommunication infrastructures and may sometimes be constrained by technological limitations.

ED6 Proportion of learners who have access to the Internet at school (for ISCED levels 1-3)**Definition:**

Number of learners with access to the Internet in school expressed as a percentage of the total number of learners in school for ISCED levels 1-3.

Purpose:

To measure Internet accessibility among learners for educational purposes.

Data requirement:

(LI) Number of learners entitled to use Internet laboratories at school as a pedagogical aid for ISCED levels 1-3.

(refer to questionnaire item E.1.2)

(L) Number of learners for ISCED levels 1- 3.

(refer to questionnaire item E.1)

Method of collection:

- Administrative data collection through annual school census (or extract data from school records); or alternatively
- Sample school survey or household survey (self-reported responses by household members attending school at ISCED levels 1 to 3).

Data source(s):

Statistical unit of the Ministry of Education or, alternatively, the national statistical office.

Formula :

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

Where:

LI_h^t = Number of learners entitled to use Internet at school as pedagogical aid at education level **h** in school-year **t**

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

Analysis and interpretation:

A high percentage or value for this indicator suggests a high degree of access to the Internet in school for learners. By matching the number of learners with Internet access entitlement with the number of computers for pedagogical purposes connected to the Internet in schools, one can have a better sense of the potential effectiveness of Internet-assisted instruction.

Depending on the pedagogical need, 100% access to the Internet for all learners may not be a crucial educational target for all grades at ISCED levels 1-3. For the time being, even in developed countries, Internet access for learners at the early grades of ISCED level 1 tend not to be a systematic or mandatory pedagogical requirement, although few exceptions exist.

Besides its use for international comparison, this indicator can also be calculated and analysed by ISCED levels and grades, geographical regions, urban/rural areas, and by public/private schools.

Methodological and definition issues or operational limitations:

- Distortion may be possible with some private (or even public) or specialised institutions offering Internet access at a 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.
- The number of computers connected to the Internet available for pedagogical use will largely determine the ability of learners to access the Internet.
- This indicator does not account for the actual use or frequency of use of the Internet by learners.

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

Definition:

Number of learners (by gender) enrolled in ICT-related fields⁴ expressed as a percentage of all learners (by gender) enrolled in educational institutions in a given country for ISCED level 4 and levels 5-6.

Purpose:

To measure the share of learners (by gender) in ICT-related fields of study in post-secondary non-tertiary and tertiary educational institutions.

Data requirement:

(LIT) Number of learners (by gender) enrolled in ICT-related fields for ISCED level 4 and levels 5-6.

(refer to questionnaire item E.1.5)

(L) Number of learners (by gender) enrolled in educational institutions regardless of their fields of study for ISCED level 4 and levels 5-6.

(refer to questionnaire item E.1 for ISCED level 4 and levels 5-6)

Method of collection:

Administrative data collection through annual census or surveys of educational institutions at ISCED levels 4, 5 and 6 (or extract data from records of educational institutions).

Data source(s):

Statistical unit of the ministries/departments/agencies responsible for education at ISCED levels 4, 5 and 6, or alternatively, the national statistical office.

Formula:

$$\frac{LIT_{h=4}^t}{L_{h=4}^t} * 100, \frac{\sum_{h=5}^6 LIT_h^t}{\sum_{h=5}^6 L_h^t} * 100$$

Where:

LIT_h^t = Number of learners (by gender) enrolled in ICT-related fields at level of education h in school-year t

L_h^t = Number of learners (by gender) enrolled at level of education h in school-year t

Analysis and interpretation:

A high percentage or value for this indicator may indicate a strong demand for ICT-related studies by learners in relation to other fields of study. By comparing this indicator by gender, one can observe the patterns of demand and participation in ICT-related studies at ISCED level 4 and levels 5-6 among female and male learners. When analysed over time, a rapidly increasing percentage may suggest a fast adaptation to the new information age by a country through the provision of more training opportunities in ICT-related fields.

Besides its use for international comparison, this indicator can also be calculated at national and sub-national levels by key sub-fields to monitor more adequately the patterns of participation in specific sub-fields of ICT-related studies by gender.

Methodological and definition issues or operational limitations:

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

Enrolment in ICT-related fields may be constrained by existing capacities at educational institutions, and hence may not fully represent actual demand; such demand can however be partially met via distance education.

⁴ See Appendix III for definition of ICT-related fields.

ED8 Proportion of ICT-qualified teachers in primary and secondary schools (for ISCED levels 1-3)**Definition:**

Number of teachers trained to teach basic computer skills (or computing) in primary and secondary schools, 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 have the required ICT training to teach basic computer skills (or computing) classes.

Data requirement:

(TTB) Number of teachers in primary and secondary schools who have been trained to teach basic computer skills (or computing) at ISCED levels 1-3.

(refer to questionnaire item D.1.3)

(T) Number of teachers in primary and secondary schools regardless of subject(s) taught at ISCED levels 1-3.

(refer to questionnaire item D.1)

Method of collection:

Administrative data collection through annual school census (or extract data from school records).

Data source(s):

Statistical unit of the Ministry of Education or, alternatively, the national statistical office.

Formula:

$$\frac{\sum_{h=1}^3 TTB_h^t}{\sum_{h=1}^3 T_h^t} * 100$$

Where:

TTB_h^t = Number of teachers trained to teach basic computer skills (or computing) at level of education h in school-year t

T_h^t = Number of teachers at level of education h in school-year t

Analysis and interpretation:

A high percentage of ICT-qualified teachers among the overall teaching staff in primary and secondary schools of a country suggests that it aims to provide learners with basic ICT skills and to meet emerging and evolving skills requirements in the information economy and society.

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

Besides its use for international comparison, this indicator can also be calculated and analysed at national and sub-national levels (by ISCED levels and grades, geographical regions, urban/rural areas, and by public/private schools) in order to inform policies and help implement measures for training and deploying adequate numbers of ICT-trained teachers in schools.

Methodological and definition issues or operational limitations:

- All teachers trained specifically in pre-service or in-service schemes in ICT according to **nationally defined qualification standards** are counted as qualified.
- This indicator only presents the skilled teaching force available to deliver basic ICT skills (or computing) classes. This does not necessarily mean that each of the teachers recorded as qualified does actually teach a basic ICT skills (or computing) course. Furthermore, in schools where there is 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 levels 1-3)	
<p>Definition:</p> <p>Number of schools with electricity expressed as a percentage of the total number of schools in the country for ISCED levels 1-3.</p>	<p>Purpose:</p> <p>To measure the availability of electricity as a minimum necessary condition for ICT to be introduced to schools.</p>
<p>Data requirement:</p> <p><i>(EIE)</i> Number of educational institutions (public and private) with electricity for ISCED levels 1-3. <i>(refer to questionnaire item C.1.1)</i></p> <p><i>(EI)</i> Number of educational institutions (public and private) for ISCED levels 1-3. <i>(refer to questionnaire item C.1)</i></p>	<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records).</p> <p>Data source(s):</p> <p>Statistical unit of the Ministry of Education or, alternatively, the national statistical office.</p>
<p>Formula:</p> $\frac{\sum_{h=1}^3 EIE_h^t}{\sum_{h=1}^3 EI_h^t} * 100$ <p>Where:</p> <p>EIE_h^t = Number of educational institutions with electricity at level of education h in school-year t</p> <p>EI_h^t = Number of educational institutions at level of education h in school-year t</p>	
<p>Analysis and interpretation:</p> <p>A low percentage or value for this indicator means that the potential implementation of ICT in education is constrained by a disadvantaged infrastructural condition. It suggests that policymakers should aim first at improving the provision of electricity to schools before introducing ICT, or linking electricity provision as a co-requisite to any investment in ICT for education.</p> <p>It should be noted, however, that not all technologies which support teaching and learning (e.g. radio broadcast classes or lessons) require permanent and sustainable sources of electricity.</p>	<p>Methodological and definition issues or operational limitations:</p> <ul style="list-style-type: none"> 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.

B. Additional ICT in education indicators

<p>ED9 Proportion of ISCED levels covered by existing national policy, plan or regulatory mechanism for ICT in education (for ISCED levels 1-6)</p> <p>ED9 bis Proportion of grades using ICT-assisted instruction (for ISCED levels 1-3) by subject :</p> <ul style="list-style-type: none"> • Mathematics • Sciences • Basic computer skills (or computing) • Languages • Arts 	
<p>Definition:</p> <p>ED9. Number of ISCED levels covered by the national policy, plan or regulatory mechanism for ICT in education, expressed as a percentage of the total number of ISCED levels.</p> <p>ED9bis. Number of grades where ICT-assisted instruction forms part of subject delivery in the education curriculum, expressed as a percentage of the total number of grades for ISCED levels 1-3.</p>	<p>Purpose:</p> <p>To measure the scope of national policies and plans regarding the use of ICT to support education service delivery in terms of education levels and grades covered.</p>
<p>Data requirement:</p> <p>(NICT) Number of ISCED levels covered by the national policy, plan or regulatory mechanism for ICT in education.</p> <p><i>(refer to questionnaire item A.1)</i></p> <p>(G) Number of grades where ICT-assisted instruction forms part of subject delivery in the education curriculum.</p> <p><i>(refer to questionnaire item A.6a-e)</i></p>	<p>Method of collection:</p> <p>Extract information from official national policy and plan documents.</p> <p>Data source(s):</p> <p>Department within the Ministry of Education in charge of policy and plans.</p>
<p>Formula ED9:</p> $\frac{NICT^t}{6} * 100$ <p>Where:</p> <p>$NICT^t$ = Number of ISCED levels covered by the national policy, plan or regulatory mechanism for ICT in education in school-year t</p>	<p>Formula ED9 bis:</p> $\frac{G_{h,s}^t}{n} * 100$ <p>Where:</p> <p>$G_{h,s}^t$ = Number of grades in ISCED levels 1-3 where ICT-assisted instruction forms part of subject delivery in the education curriculum by subject s in school-year t</p> <p>n = Total number of grades in ISCED levels 1-3</p>
<p>Analysis and interpretation:</p> <p>A high percentage or value for these two variant indicators demonstrates a strong political commitment to integrate ICT in education across all levels (or across all grades in primary and secondary education) of the education system.</p>	<p>Methodological and definition issues or operational limitations:</p> <p>These indicators do not measure the extent of policy implementation.</p> <p>This indicator does not account for variances in the nature and scope of ICT in education policies implemented within and across countries at different ISCED levels or different target grades.</p>

ED10 Average number of hours per week of ICT use in classrooms as recommended in curricula (for ISCED levels 1-3 and by major subjects) <ul style="list-style-type: none"> • Maths • Sciences • Basic computer skills (or computing) • Languages • Arts 	
Definition: Total number of hours per week of ICT use in teaching and learning as recommended in curricula, divided by the total number of grades concerned (for ISCED levels 1-3 and by major subjects).	Purpose: To measure the degree of inclusion of ICT-assisted teaching and learning in primary and secondary school curricula by major subject.
Data requirement: (H) Number of hours per week of ICT use in teaching and learning as recommended in curricula (for ISCED levels 1-3 and by major subjects). (G) Total number of grades concerned (for ISCED levels 1-3 and by major subjects). <i>(refer to questionnaire item A.7a – A.7e)</i>	Method of collection: Extract information from official documents on primary and secondary school curricula. Data source(s): Department/agency under the Ministry of Education in charge of policy and/or primary and secondary school curricula.
Formula: $\frac{\sum_{g=1}^n H_{g,s}^t}{G_s^t}$	
Where: $H_{g,s}^t$ = Number of hours per week recommended in the official curricula for teaching and learning using ICT to support subjects s for ISCED levels 1-3 at grade g in school-year t G_s^t = Total number of grades in the official curricula for teaching and learning using ICT to support subjects s for ISCED levels 1-3 in school-year t s = Subjects: <ul style="list-style-type: none"> • Maths • Science • Basic computer skills (or computing) • Languages • Arts 	
Analysis and interpretation: In using the median value as a benchmark for all countries in the world, this indicator permits an assessment and comparison of national practices and potential discrepancies in the average number of hours per week devoted to ICT-assisted instruction in supporting the teaching of various key subjects in primary and secondary education.	Methodological and definition issues or operational limitations: This indicator does not measure the actual level and intensity of implementation of existing policies and curricula.

ED11 Average number of hours per week of ICT use in classrooms as recommended in curricula (for ISCED levels 1-3) <ul style="list-style-type: none"> • Exercises on computer using educational software • Exercises on computer using the Internet • Radio (Interactive Radio Instruction) • Television 	
Definition: Total number of hours per week devoted to ICT use for practical exercises as recommended in the primary and secondary school curricula, divided by the total number of grades concerned (by type of use and for ISCED levels 1-3).	Purpose: To measure the degree of inclusion of practical ICT-assisted exercises in support of teaching and learning process in primary and secondary school curricula.
Data requirement: (H) Number of hours per week devoted to ICT use for practical exercises as recommended in the primary and secondary school curricula (by type of use and for ISCED levels 1-3). (G) Total number of grades concerned (by type of use and for ISCED levels 1-3). <i>(refer to questionnaire item A.8.a – A. 8.e)</i>	Method of collection: Extract information from official documents on primary and secondary school curricula. Data source(s): Department/agency under the Ministry of Education in charge of policy and/or primary and secondary school curricula.
Formula: $\frac{\sum_{g=1}^n H_{g,x}^t}{G_x^t}$	
Where: $H_{g,x}^t$ = Number of hours per week recommended in official curricula for individual ICT use by learners for practical exercise x for ISCED levels 1-3 at grade g in school-year t G_x^t = Total number of grades g in official curricula for individual ICT use by learners for practical exercise x for ISCED levels 1-3 in school-year t x = ICT practical exercise types: <ul style="list-style-type: none"> • Exercises on computer using educational software • Exercises on computer using the Internet • Radio (Interactive Radio Instruction) • Television 	
Analysis and interpretation: In comparing against the median value used as a benchmark for all countries in the world, this indicator permits an assessment of national practices and potential discrepancies in the average number of hours per week devoted to practical ICT-assisted exercises in support of the teaching and learning process in primary and secondary education.	Methodological and definition issues or operational limitations: This indicator does not measure the actual level and intensity of implementation of existing policies and curricula.

ED12 Proportion of total government expenditure on ICT in education for current expenditure on ICT in education (for ISCED levels 1-3, level 4 and levels 5-6)

Definition:

Government current expenditure on ICT in education expressed as a percentage of total government expenditure on ICT in education.

Purpose:

To measure allocated government financial resources in terms of recurrent expenditure on ICT in education as a proportion of its total contribution to fund ICT in education.

Data requirement:

(PCUI) Government current expenditure on ICT in education in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.1.1.1)

(PEI) Total government capital and current expenditure on ICT in education in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.1.3)

Method of collection:

Extract data from financial account statements or budget documents.

Data source(s):

Budget or accounts of the finance department of the ministries of education or, alternatively, the national statistical office or Finance Ministry.

Formula:

$$\frac{\sum_{h=1}^3 PCUI_h^t}{\sum_{h=1}^3 PEI_h^t} * 100, \frac{PCUI_{h=4}^t}{PEI_{h=4}^t} * 100, \frac{\sum_{h=5}^6 PCUI_h^t}{\sum_{h=5}^6 PEI_h^t} * 100$$

Where:

$PCUI_h^t$ = Government current expenditure on ICT in education (in national currency) at level of education h in school-year t

PEI_h^t = Total government capital and current expenditure on ICT in education (in national currency) at level of education h in school-year t

Analysis and interpretation:

This indicator helps to monitor the relative share of current expenditure in total government expenditure on ICT in education. In comparison to the proportion of capital expenditure, a higher percentage or value for this indicator suggests that more of government spending on ICT in education is devoted to recurrent costs.

Methodological and definition issues or operational limitations:

Data on expenditure figures are sometimes not available in a timely manner to meet international requirements. In such situations, countries may provide data on allocated budgets in place of the expenditure figures. Metadata to explain the distinction between allocated budgets and actual expenditures should be given together with an indication of the currency denomination.

ED13 Proportion of total government expenditure on ICT in education for capital expenditure on ICT in education (for ISCED levels 1-3, level 4 and levels 5-6)

Definition:

Government capital expenditure on ICT in education expressed as a percentage of total government expenditure on ICT in education.

Purpose:

To measure allocated government financial resources in terms of capital expenditure on ICT in education as a proportion of its total contribution to fund ICT in education.

Data requirement:

(PCAI) Government capital expenditure on ICT in education in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.1.2.1)

(PEI) Total government capital and current expenditure on ICT in education in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.1.3)

Method of collection:

Extract data from financial account statements or budget documents.

Data source(s):

Budget or accounts of the finance department of the ministries of education or, alternatively, the national statistical office or Finance Ministry.

Formula:

$$\frac{\sum_{h=1}^3 PCAI_h^t}{\sum_{h=1}^3 PEI_h^t} * 100, \frac{PCAI_{h=4}^t}{PEI_{h=4}^t} * 100, \frac{\sum_{h=5}^6 PCAI_h^t}{\sum_{h=5}^6 PEI_h^t} * 100$$

Where:

$PCAI_h^t$ = Government capital expenditure on ICT in education (in national currency) at level of education h in school-year t

PEI_h^t = Total government capital and current expenditure on ICT in education (in national currency) at level of education h in school-year t

Analysis and interpretation:

This indicator helps to monitor the relative share of capital expenditure in total government expenditure on ICT in education. In comparison to the proportion of current expenditure, a higher percentage or value for this indicator suggests that more of government spending on ICT in education is devoted to capital costs.

Methodological and definition issues or operational limitations:

Data on expenditure figures are sometimes not available in a timely manner to meet international requirements. In such situations, countries may provide data on allocated budgets in place of the expenditure figures. Metadata to explain the distinction between allocated budgets and actual expenditures should be given together with an indication of the currency denomination.

ED14 Proportion of total government current expenditure on education for current expenditure on ICT in education (for ISCED levels 1-3, level 4 and levels 5-6)

Definition:

Government current expenditure on ICT in education expressed as a percentage of total government current expenditure on education.

Purpose:

To measure the level of government efforts to allocate financial resources (in terms of current expenditure) to ICT in education out of its total recurrent spending for the entire education sector.

Data requirement:

(PCUI) Government current expenditure on ICT in education in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.1.1.1)

(PCU) Total government current expenditure on education in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.1.1)

Method of collection:

Extract data from financial account statements or budget documents.

Data source(s):

Budget or accounts of the finance department of the ministries of education or, alternatively, the national statistical office or Finance Ministry.

Formula:

$$\frac{\sum_{h=1}^3 PCUI_h^t}{\sum_{h=1}^3 PCU_h^t} * 100, \frac{PCUI_{h=4}^t}{PCU_{h=4}^t} * 100, \frac{\sum_{h=5}^6 PCUI_h^t}{\sum_{h=5}^6 PCU_h^t} * 100$$

Where:

$PCUI_h^t$ = Government current expenditure on ICT in education (in national currency) at level of education h in school-year t

PCU_h^t = Total government current expenditure on education (in national currency) at level of education h in school-year t

Analysis and interpretation:

This indicator helps to monitor the relative share of current expenditure on ICT in education within total government current expenditure on education. In comparison to the proportion of total government current spending on non-ICT education related activities, a higher percentage or value for this indicator implies a bigger share of government current expenditure has been devoted to ICT in education.

Methodological and definition issues or operational limitations:

Data on expenditure figures are sometimes not available in a timely manner to meet international requirements. In such situations, countries may provide data on allocated budgets in place of the expenditure figures. Metadata to explain the distinction between allocated budgets and actual expenditures should be given together with an indication of the currency denomination.

ED15 Proportion of total government capital expenditure on education for capital expenditure on ICT in education (for ISCED levels 1-3, level 4 and levels 5-6)

Definition:

Government capital expenditure on ICT in education expressed as a percentage of total government capital expenditure on education.

Purpose:

To measure the level of government efforts to allocate financial resources (in terms of capital expenditure) to ICT in education out of its total capital spending for the entire education sector

Data requirement:

(PCAI) Government capital expenditure on ICT in education in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.1.2.1)

(PCA) Total government capital expenditure on education in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.1.2)

Method of collection:

Extract data from financial account statements or budget documents.

Data source(s):

Budget or accounts of the finance department of the ministries of education or, alternatively, the national statistical office or Finance Ministry.

Formula:

$$\frac{\sum_{h=1}^3 PCAI_h^t}{\sum_{h=1}^3 PCA_h^t} * 100, \frac{PCAI_{h=4}^t}{PCA_{h=4}^t} * 100, \frac{\sum_{h=5}^6 PCAI_h^t}{\sum_{h=5}^6 PCA_h^t} * 100$$

Where:

$PCAI_h^t$ = Government capital expenditure on ICT in education (in national currency) at level of education h in school-year t

PCA_h^t = Total government capital expenditure on education (in national currency) at level of education h in school-year t

Analysis and interpretation:

This indicator helps to monitor the relative share of capital expenditure on ICT in education within total government capital expenditure on education. In comparison to the proportion of total government capital spending on non-ICT education related activities, a higher percentage or value for this indicator implies a bigger share of government capital expenditure has been devoted to ICT in education.

Methodological and definition issues or operational limitations:

Data on expenditure figures are sometimes not available in a timely manner to meet international requirements. In such situations, countries may provide data on allocated budgets in place of the expenditure figures. Metadata to explain the distinction between allocated budgets and actual expenditures should be given together with an indication of the currency denomination.

<p>ED16 Average government current expenditure on ICT in education per learner (for ISCED levels 1-3, level 4 and levels 5-6)</p> <p>ED16bis Average government current expenditure on ICT in education per learner enrolled in grades with ICT-assisted instruction (for ISCED levels 1-3)</p>	
<p>Definition:</p> <p>ED16: Total government current expenditure on ICT in education divided by the number of learners enrolled for ISCED levels 1-3, level 4 and levels 5-6.</p> <p>ED16bis: Total government current expenditure on ICT in education divided by the number of learners enrolled in grades with ICT-assisted instruction for ISCED levels 1-3.</p>	<p>Purpose:</p> <p>To measure the average government recurrent financial support for ICT in education per learner enrolled in educational institutions and in grades with ICT-assisted instruction.</p>
<p>Data requirement:</p> <p>(PCUI) Total government current expenditure on ICT in education in national currency for ISCED levels 1-3, level 4 and levels 5-6. (refer to questionnaire item B.5.1.1.1)</p> <p>(L) Total number of learners for ISCED levels 1-3, level 4 and levels 5-6. (refer to questionnaire item E.1)</p> <p>(LICT) Number of learners enrolled in grades with ICT-assisted instruction for ISCED levels 1-3. (refer to questionnaire item E.1.3)</p>	<p>Method of collection:</p> <p>Administrative data collection through annual school census or surveys of educational institutions at ISCED levels 4, 5 and 6 (or extract data from the records of educational institutions).</p> <p>Data source(s):</p> <p>Statistical units of the ministries/departments/ agencies responsible for education at ISCED levels 1-6, or, alternatively, the national statistical office.</p>
<p>Formula ED16:</p> $\frac{\sum_{h=1}^3 PCUI_h^t}{\sum_{h=1}^3 L_h^t} * 100$ $\frac{PCUI_{h=4}^t}{L_{h=4}^t} * 100$ $\frac{\sum_{h=5}^6 PCUI_h^t}{\sum_{h=5}^6 L_h^t} * 100$ <p>Where:</p> <p>$PCUI_h^t$ = Total government current expenditure on ICT in education (in national currency) at level of education h in school-year t</p> <p>L_h^t = Enrolment of learners at level of education h in school-year t</p>	<p>Formula ED16bis:</p> $\frac{\sum_{h=1}^3 PCUI_h^t}{\sum_{h=1}^3 LICT_h^t} * 100$ <p>Where:</p> <p>$PCUI_h^t$ = Total government current expenditure on ICT in education (in national currency) at level of education h in school-year t</p> <p>$LICT_h^t$ = Number of learners enrolled in grades with ICT-assisted instruction at level of education h in school-year t</p>
<p>Analysis and interpretation:</p> <p>A high percentage or value for these two indicators shows a high level of government recurrent financial support for the use of ICT in education to complement conventional delivery of educational services. Whereas indicator ED16 provides a broad indication of the recurrent cost per learner for all levels of education independent of whether the learner enrolls in ICT-related programmes or not, indicator ED16bis gives a more precise estimate of the recurrent cost per learner enrolled in ICT-assisted instruction in ISCED levels 1-3. This latter indicator will be particularly useful for budgeting and monitoring the expansion of ICT in education.</p>	<p>Methodological and definition issues or operational limitations:</p> <p>Data on expenditure figures are sometimes not available in a timely manner to meet international requirements. In such situations, countries may provide data on allocated budgets in place of the expenditure figures. Metadata to explain the distinction between allocated budgets and actual expenditures should be given together with an indication of the currency denomination.</p>

ED17 Proportion of total current expenditure on ICT in education for private current expenditure on ICT in education (for ISCED levels 1-3, level 4 and levels 5-6)

Definition:

Private current expenditure on ICT in education expressed as a percentage of total current expenditure on ICT in education.

Purpose:

To measure the private sector financial contribution in terms of current expenditure on ICT in education compared to total recurrent spending on ICT in education from all sources.

Data requirement:

(FCUI) Total current expenditure on ICT in education from international (foreign) sources in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.3.1)

(PCUI) Total government current expenditure on ICT in education in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.1.1.1)

(PRCI) Total private current expenditure on ICT in education in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.2.1)

Method of collection:

Extract data from financial account statements or budget documents.

Data source(s):

Budget or accounts of the finance department of the ministries of education or, alternatively, the national statistical office or Finance Ministry.

Formula:

$$\frac{\sum_{h=1}^3 PRCI_h^t}{\sum_{h=1}^3 FCUI_h^t + \sum_{h=1}^3 PCUI_h^t + \sum_{h=1}^3 PRCI_h^t} * 100'$$

$$\frac{PRCI_{h=4}^t}{FCUI_{h=4}^t + PCUI_{h=4}^t + PRCI_{h=4}^t} * 100,$$

$$\frac{\sum_{h=5}^6 PRCI_h^t}{\sum_{h=5}^6 FCUI_h^t + \sum_{h=5}^6 PCUI_h^t + \sum_{h=5}^6 PRCI_h^t} * 100$$

Where:

$PRCI_h^t$ = Total private current expenditure on ICT in education (in national currency) at level of education h in school-year t

$PCUI_h^t$ = Total government current expenditure on ICT in education (in national currency) at level of education h in school-year t

$FCUI_h^t$ = Total current expenditure on ICT in education from international (foreign) sources (in national currency) at level of education h in school-year t

Analysis and interpretation:

This indicator helps to monitor the relative share of current expenditure on ICT in education contributed by the private sector compared to total current expenditure on ICT in education. In comparison with the proportion of total current spending on ICT in education from government and international (foreign) sources, a higher percentage or value for this indicator implies a greater contribution of the private sector to overall current expenditure on ICT in education.

Methodological and definition issues or operational limitations:

Data on expenditure figures are sometimes not available in a timely manner to meet international requirements. In such situations, countries may provide data on allocated budgets in place of the expenditure figures. Metadata to explain the distinction between allocated budgets and actual expenditures should be given together with an indication of the currency denomination.

ED18 Proportion of total capital expenditure on ICT in education for private capital expenditure on ICT in education (for ISCED levels 1-3, level 4 and levels 5-6)

Definition:

Private capital expenditure on ICT in education expressed as a percentage of total capital expenditure on ICT in education.

Purpose:

To measure the private sector financial contribution in terms of capital expenditure on ICT in education compared to total capital spending on ICT in education from all sources.

Data requirement:

(FCAI) Total capital expenditure on ICT in education from international (foreign) sources in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.3.2)

(PCAI) Total government capital expenditure on ICT in education in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.1.2.1)

(PRKI) Total private capital expenditure on ICT in education in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.2.2)

Method of collection:

Extract data from financial account statements or budget documents.

Data source(s):

Budget or accounts of the finance department of the ministries of education or, alternatively, the national statistical office or Finance Ministry.

Formula:

$$\frac{\sum_{h=1}^3 PRKI_h^t}{\sum_{h=1}^3 FCAI_h^t + \sum_{h=1}^3 PCAI_h^t + \sum_{h=1}^3 PRKI_h^t} * 100 ,$$

$$\frac{PRKI_{h=4}^t}{FCAI_{h=4}^t + PCAI_{h=4}^t + PRKI_{h=4}^t} * 100 ,$$

$$\frac{\sum_{h=5}^6 PRKI_h^t}{\sum_{h=5}^6 FCAI_h^t + \sum_{h=5}^6 PCAI_h^t + \sum_{h=5}^6 PRKI_h^t} * 100$$

Where:

$PRKI_h^t$ = Total private capital expenditure on ICT in education (in national currency) at level of education h in school-year t

$PCAI_h^t$ = Total government capital expenditure on ICT in education (in national currency) at level of education h in school-year t

$FCAI_h^t$ = Total capital expenditure on ICT in education from international (foreign) sources (in national currency) at level of education h in school-year t

Analysis and interpretation:

This indicator helps to monitor the relative share of capital expenditure on ICT in education contributed by the private sector compared to total capital expenditure on ICT in education. In comparison with the proportion of total capital spending on ICT in education from government and international (foreign) sources, a higher percentage or value for this indicator implies a greater contribution of the private sector to overall capital expenditure on ICT in education.

Methodological and definition issues or operational limitations:

Data on expenditure figures are sometimes not available in a timely manner to meet international requirements. In such situations, countries may provide data on allocated budgets in place of the expenditure figures. Metadata to explain the distinction between allocated budgets and actual expenditures should be given together with an indication of the currency denomination.

ED19 Proportion of total current expenditure on ICT in education for foreign current expenditure on ICT in education (for ISCED levels 1-3, level 4 and levels 5-6)

Definition:

Foreign current expenditure on ICT in education expressed as a percentage of total current expenditure on ICT in education

Purpose:

To measure international (foreign) donors' financial contribution in terms of current expenditure on ICT in education compared to total recurrent spending on ICT in education from all sources.

Data requirement:

(FCUI) Total current expenditure on ICT in education from international (foreign) sources in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.3.1)

(PCUI) Total government current expenditure on ICT in education in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.1.1.1)

(PRCI) Total private current expenditure on ICT in education in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.2.1)

Method of collection:

Extract data from financial account statements or budget documents.

Data source(s):

Budget or accounts of the finance department of the ministries of education or, alternatively, the national statistical office or Finance Ministry.

Formula:

$$\frac{\sum_{h=1}^3 FCUI^t_h}{\sum_{h=1}^3 PCUI^t_h + \sum_{h=1}^3 PRCI^t_h + \sum_{h=1}^3 FCUI^t_h} * 100'$$

$$\frac{FCUI^t_{h=4}}{PCUI^t_{h=4} + PRCI^t_{h=4} + FCUI^t_{h=4}} * 100,$$

$$\frac{\sum_{h=5}^6 FCUI^t_h}{\sum_{h=5}^6 PCUI^t_h + \sum_{h=5}^6 PRCI^t_h + \sum_{h=5}^6 FCUI^t_h} * 100$$

Where:

$PRCI^t_h$ = Total private current expenditure on ICT in education (in national currency) at level of education h in school-year t

$PCUI^t_h$ = Total government current expenditure on ICT in education (in national currency) at level of education h in school-year t

$FCUI^t_h$ = Total current expenditure on ICT in education from international (foreign) sources (in national currency) at level of education h in school-year t

Analysis and interpretation:

This indicator helps to monitor the relative share of current expenditure on ICT in education contributed by international (foreign) partners compared to total current expenditure on ICT in education. In comparison with the proportion of total recurrent spending on ICT in education from government and private sources, a higher percentage or value for this indicator implies a greater contribution of international (foreign) funds to overall current expenditure on ICT in education.

Methodological and definition issues or operational limitations:

Data on expenditure figures are sometimes not available in a timely manner to meet international requirements. In such situations, countries may provide data on allocated budgets in place of the expenditure figures. Metadata to explain the distinction between allocated budgets and actual expenditures should be given together with an indication of the currency denomination.

ED20 Proportion of total capital expenditure on ICT in education for foreign capital expenditure on ICT in education (for ISCED levels 1-3, level 4 and levels 5-6)

Definition:

Foreign capital expenditure on ICT in education expressed as a percentage of total capital expenditure on ICT in education

Purpose:

To measure international (foreign) donors financial contribution in terms of capital expenditure on ICT in education compared to total capital spending for ICT in education from all sources

Data requirement:

(FCAI) Total capital expenditure on ICT in education from international (foreign) sources in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.3.2)

(PCAI) Total government capital expenditure on ICT in education in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.1.2.1)

(PRKI) Total private capital expenditure on ICT in education in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.2.2)

Method of collection:

Extract data from financial account statements or budget documents.

Data source(s):

Budget or accounts of the finance department of the ministries of education or, alternatively, the national statistical office or Finance Ministry.

Formula:

$$\frac{\sum_{h=1}^3 FCAI_h^t}{\sum_{h=1}^3 PCAI_h^t + \sum_{h=1}^3 PRKI_h^t + \sum_{h=1}^3 FCAI_h^t} * 100 ,$$

$$\frac{FCAI_{h=4}^t}{PCAI_{h=4}^t + PRKI_{h=4}^t + FCAI_{h=4}^t} * 100 ,$$

$$\frac{\sum_{h=5}^6 FCAI_h^t}{\sum_{h=5}^6 PCAI_h^t + \sum_{h=5}^6 PRKI_h^t + \sum_{h=5}^6 FCAI_h^t} * 100$$

Where:

$PRKI_h^t$ = Total private capital expenditure on ICT in education (in national currency) at level of education h in school-year t

$PCAI_h^t$ = Total government capital expenditure on ICT in education (in national currency) at level of education h in school-year t

$FCAI_h^t$ = Total capital expenditure on ICT in education from international (foreign) sources (in national currency) at level of education h in school-year t

Analysis and interpretation:

This indicator helps to monitor the relative share of capital expenditure on ICT in education contributed by international (foreign) partners compared to total capital expenditure on ICT in education. In comparison with the proportion of total capital spending on ICT in education from government and private sources, a higher percentage or value for this indicator implies a greater contribution of international (foreign) funds to overall capital expenditure on ICT in education.

Methodological and definition issues or operational limitations:

Data on expenditure figures are sometimes not available in a timely manner to meet international requirements. In such situations, countries may provide data on allocated budgets in place of the expenditure figures. Metadata to explain the distinction between allocated budgets and actual expenditures should be given together with an indication of the currency denomination.

ED21 Ratio of non-governmental to governmental sources of current expenditure on ICT in education (for ISCED levels 1-3, level 4 and levels 5-6)

Definition:

Ratio of the sum of total private current expenditure and total current foreign expenditure on ICT in education to total government current expenditure on ICT in education.

Purpose:

To measure the degree of government partnership with the private sector and international (foreign) donors in financing ICT in education.

Data requirement:

(PCUI) Total government current expenditure on ICT in education in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.1.1.1)

(FCUI) Total current expenditure on ICT in education from international (foreign) sources in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.3.1)

(PRCI) Total private current expenditure on ICT in education in national currency (for ISCED levels 1-3, level 4 and levels 5-6).

(refer to questionnaire item B.5.2.1)

Method of collection:

Extract data from financial account statements or budget documents.

Data source(s):

Budget or accounts of the finance department of the ministries of education or, alternatively, the national statistical office or Finance Ministry.

Formula:

$$\frac{\sum_{h=1}^3 FCUI_h^t + \sum_{h=1}^3 PRCI_h^t}{\sum_{h=1}^3 PCUI_h^t} \cdot \frac{FCUI_{h=4}^t + PRCI_{h=4}^t}{PCUI_{h=4}^t}$$

$$\frac{\sum_{h=5}^6 FCUI_h^t + \sum_{h=5}^6 PRCI_h^t}{\sum_{h=5}^6 PCUI_h^t}$$

Where:

$PCUI_h^t$ = Total government current expenditure on ICT in education (in national currency) at level of education h in school-year t

$PRCI_h^t$ = Total private current expenditure on ICT in education (in national currency) at level of education h in school-year t

$FCUI_h^t$ = Total current expenditure on ICT in education from international (foreign) sources (in national currency) at level of education h in school-year t

Analysis and interpretation:

A value of 1 for this indicator shows that the contribution of government resources in overall current expenditure on ICT in education is equal to private and international (foreign) funding combined together. A value below 1 indicates a larger contribution of governmental sources to the overall current expenditure on ICT in education, and vice versa.

Methodological and definition issues or operational limitations:

Data on expenditure figures are sometimes not available in a timely manner to meet international requirements. In such situations, countries may provide data on allocated budgets in place of the expenditure figures. Metadata to explain the distinction between allocated budgets and actual expenditures should be given together with an indication of the currency denomination.

ED22 Proportion of schools with computer-assisted instruction (for ISCED levels 1-3)**Definition:**

Number of schools offering computer-assisted instruction expressed as a percentage of the total number of schools in the country for ISCED levels 1-3.

Purpose:

To measure the overall presence and availability of computer-assisted instruction in primary and secondary schools.

Data requirement:

(EICI) Number of educational institutions (public and private) with computer-assisted instruction for ISCED levels 1-3.

(refer to questionnaire item C.1.5)

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

(refer to questionnaire item C.1)

Method of collection:

Administrative data collection through annual school census (or extract data from school records).

Data source(s):

Statistical unit of the Ministry of Education or, alternatively, the national statistical office.

Formula:

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

Where:

$EICI_h^t$ = Number of educational institutions with computer-assisted instruction at level of education h in school-year t

EI_h^t = Number of educational institutions at level of education h in school-year t

Analysis and interpretation:

A high percentage or value for this indicator demonstrates that computer-assisted instruction is widely used in schools in a given country, and vice versa.

Besides its use for international comparison, this indicator can be calculated and analyzed by ISCED levels, geographical regions, urban/rural areas, and by public/private schools in order to identify digital gaps and priorities.

Methodological and definition issues or operational limitations:

See Appendix II for a more detailed definition of computer-assisted instruction.

This indicator only reflects the presence and accessibility of computer-assisted instruction in schools, but not the actual intensity of use.

ED23 Proportion of schools with Internet-assisted instruction (for ISCED levels 1-3)	
<p>Definition:</p> <p>Number of schools offering Internet-assisted instruction expressed as a percentage of the total number of schools in the country for ISCED levels 1-3.</p>	<p>Purpose:</p> <p>To measure the overall presence and availability of Internet-assisted instruction in primary and secondary schools.</p>
<p>Data requirement:</p> <p>(EIIA) Number of educational institutions (public and private) with Internet-assisted instruction for ISCED levels 1-3.</p> <p><i>(refer to questionnaire item C.1.6)</i></p> <p>(EI) Number of educational institutions (public and private) for ISCED levels 1-3.</p> <p><i>(refer to questionnaire item C.1)</i></p>	<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records).</p>
	<p>Data source(s):</p> <p>Statistical unit of the Ministry of Education or, alternatively, the national statistical office.</p>
<p>Formula:</p> $\frac{\sum_{h=1}^3 EIIA_h^t}{\sum_{h=1}^3 EI_h^t} * 100$ <p>Where:</p> <p>$EIIA_h^t$ = Number of educational institutions with Internet-assisted instruction at level of education h in school-year t</p> <p>EI_h^t = Number of educational institutions at level of education h in school-year t</p>	
<p>Analysis and interpretation:</p> <p>A high percentage or value for this indicator shows that Internet-assisted instruction is widely used in schools in a given country.</p> <p>Besides its use for international comparison, this indicator can be calculated and analysed by ISCED levels, geographical regions, urban/rural areas, and public/private schools in order to identify digital gaps and priorities.</p>	<p>Methodological and definition issues or operational limitations:</p> <p>See Appendix II for a more detailed definition of Internet-assisted instruction.</p> <p>This indicator only reflects the presence and accessibility of Internet-assisted instruction in schools, but not the actual intensity of use.</p>

<p>ED24 Proportion of educational institutions owning licences or subscribing to scientific digital libraries (for ISCED levels 1-3, ISCED level 4 and levels 5-6)</p> <p>ED24bis Proportion of educational institutions owning licences or subscribing to virtual experiment laboratories (for ISCED levels 1-3, ISCED level 4 and levels 5-6)</p>	
<p>Definition:</p> <p>Number of educational institutions owning licences or subscribing to scientific digital libraries and virtual experiment laboratories, expressed as a percentage of the total number of educational institutions for ISCED levels 1-3, level 4 and levels 5-6 (as applicable).</p>	<p>Purpose:</p> <p>To measure “accessibility” to scientific digital libraries and virtual experiment laboratories in educational institutions.</p>
<p>Data requirement:</p> <p>(EDR) Number of educational institutions owning licences or having paid or free subscriptions to scientific digital libraries for ISCED levels 1-3, level 4 and levels 5-6.</p> <p>(refer to questionnaire item C.1.13.1)</p> <p>(EVR) Number of educational institutions owning licences or having paid or free subscriptions to virtual experiment laboratories for ISCED levels 1-3, level 4 and levels 5-6.</p> <p>(refer to questionnaire item C.1.13.2)</p> <p>(EI) Number of educational institutions (public and private) for ISCED levels 1-3, level 4 and levels 5-6.</p> <p>(refer to questionnaire item C.1)</p>	<p>Method of collection:</p> <p>Administrative data collection through annual census or surveys of educational institutions (or extract data from the records of educational institutions).</p> <p>Data source(s):</p> <p>Statistical units of the ministries/departments /agencies responsible for educational institutions at ISCED levels 1-3, 4, 5-6, or alternatively, the national statistical office.</p>
<p>Formula:</p> $\frac{\sum_{h=1}^3 EDR_h^t}{\sum_{h=1}^3 EI_h^t} * 100$ $\frac{EDR_{h=4}^t}{EI_{h=4}^t} * 100, \quad \frac{\sum_{h=5}^6 EDR_h^t}{\sum_{h=5}^6 EI_h^t} * 100$ <p>Where:</p> <p>EDR_h^t = Number of educational institutions owning licences or having paid or free subscriptions to scientific digital libraries at education level h in school-year t</p> <p>EI_h^t = Number of educational institutions at level of education h in school-year t</p>	<p>Formula:</p> $\frac{\sum_{h=1}^3 EVR_h^t}{\sum_{h=1}^3 EI_h^t} * 100$ $\frac{EVR_{h=4}^t}{EI_{h=4}^t} * 100, \quad \frac{\sum_{h=5}^6 EVR_h^t}{\sum_{h=5}^6 EI_h^t} * 100$ <p>Where:</p> <p>EVR_h^t = Number of educational institutions owning licences or having paid or free subscriptions to virtual experiment laboratories at education level h in school-year t</p> <p>EI_h^t = Number of educational institutions at level of education h in school-year t</p>
<p>Analysis and interpretation:</p> <p>A high percentage or value for these indicators suggests better access to scientific digital libraries and virtual experiment laboratories in educational institutions. However, online access to such resources may be hindered if the download speed on the Internet is slow within countries. This could restrain the actual use of the resources for educational purposes. In qualitative terms, analysing these indicators in relation to the level of broadband connectivity in educational institutions might illustrate one aspect of the “digital divide” among countries.</p>	<p>Methodological and definition issues or operational limitations:</p> <p>See Appendix II for more detailed definitions of scientific digital libraries and virtual experiment laboratories.</p> <p>The typical measure for a Gini Coefficient might reveal a spatial inequality in the distribution of scientific digital libraries across the entire country in favour of some elite or private educational institutions where a greater number of scientific digital libraries are available to learners.</p>

ED25 Ratio of learners-to-computer connected to Internet (for ISCED levels 1-3)

Definition:

Average number of learners per computer connected to Internet in schools that offer Internet-assisted instruction for ISCED levels 1-3.

Purpose:

To measure the extent of provision of computers connected to the Internet in schools that offer Internet-assisted instruction in relation to an "acceptable norm" that guarantees effective use of Internet-connected computers in such schools.

Data requirement:

(CI) Number of available computers connected to the Internet for ISCED levels 1-3.

(refer to questionnaire item C.2.4)

(LI) Number of learners entitled to use Internet laboratories at school as pedagogical aid for ISCED levels 1-3.

(refer to questionnaire item E.1.2)

Method of collection:

Administrative data collection through annual school census (or extract data from school records).

Data source(s):

Statistical unit of the Ministry of Education or, alternatively, the national statistical office.

Formula:

$$\frac{\sum_{h=1}^3 LI_h^t}{\sum_{h=1}^3 CI_h^t} * 100$$

Where:

LI_h^t = Number of learners entitled to use Internet laboratories at school as pedagogical aid at level of education h in school-year t

CI_h^t = Number of available computers connected to the Internet at education level h in school-year t

Analysis and interpretation:

A high value for this indicator signals that many learners have to share the use of a computer connected to the Internet at school; hence there will be difficulties in implementing Internet-assisted instruction and deficiencies in its effectiveness in serving the learning and practicing needs of the learners.

In the absence of nationally defined norms by pedagogues, a ratio of 1 to 1 would represent a perfect adequacy in the provision of Internet access facilities to all learners officially entitled to benefit from it in schools that offer Internet-assisted instruction (IAI). However, except in cases where all students use privately owned computers connected to the Internet, an "adequate" 1:1 ratio is not necessarily an ideal target, since the sharing of a school-owned computer might equally reflect cost-efficient management of computers in schools. Not all subjects in curricula require Internet support for 100% of class time scheduled in a week, a month or a year. This indicator needs to be analysed also in a context where non-Internet-related technologies are used in schools along with Internet-based resources.

At international level, a median value for this indicator across a statistically representative sample of countries across the world could provide a reference of best practice to countries with obviously inadequate ratios. Where national standards exist, a value for this indicator that is higher than the officially set norms implies that more efforts are required from policymakers to connect schools with the Internet in order to ensure equitable opportunities for all entitled learners across the country. By frequently updating this indicator, one can monitor the progress that schools are making to attain these norms.

Besides its use for international comparison, this indicator can also be calculated and analysed by ISCED levels, geographical regions, urban/rural areas, and by public/private schools in order to identify the digital gaps that are hindering learners in accessing the Internet at school.

Methodological and definition issues or operational limitations:

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

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

Metadata should be provided for this indicator to distinguish between data that reflect broad-based nationwide implementation as opposed to a number of small pilot projects within selected educational institutions.

ED26 Average number of computers per educational institution (for ISCED levels 1-3, level 4 and levels 5-6)	
<p>Definition:</p> <p>Number of computers in use in educational institutions divided by the total number of educational institutions (for ISCED levels 1-3, level 4 and levels 5-6).</p>	<p>Purpose:</p> <p>To measure the overall availability of computers in educational institutions.</p>
<p>Data requirement:</p> <p>(C) Number of available computers for ISCED levels 1-3, level 4 and levels 5-6. <i>(refer to questionnaire item C.2)</i></p> <p>(EI) Number of educational institutions (public and private) for ISCED levels 1-3, level 4 and levels 5-6. <i>(refer to questionnaire item C.1)</i></p>	<p>Method of collection:</p> <p>Administrative data collection through annual census or survey of educational institutions (or extract data from records of educational institutions).</p> <p>Data source(s):</p> <p>Statistical unit of the relevant ministries/departments of education or, alternatively, the national statistical office.</p>
<p>Formula:</p> $\frac{\sum_{h=1}^3 C_h^t}{\sum_{h=1}^3 EI_h^t} * 100, \frac{C_{h=4}^t}{EI_{h=4}^t} * 100, \frac{\sum_{h=5}^6 C_h^t}{\sum_{h=5}^6 EI_h^t} * 100$ <p>Where:</p> <p>C_h^t = Number of available computers at education level h in school-year t</p> <p>EI_h^t = Number of educational institutions at level of education h in school-year t</p>	
<p>Analysis and interpretation:</p> <p>A higher value for this indicator implies greater availability of computers on average in educational institutions, hence a higher level of e-readiness. A greater variance between countries may signal a degree of “digital divide” among countries.</p> <p>When calculated and analysed by ISCED levels, geographical regions, urban/rural areas and for individual educational institutions, this indicator can reflect the “digital divide” in terms of the availability of computers in schools within countries.</p> <p>More precise indications of e-readiness can be obtained by calculating this indicator based on the number of computers used for pedagogical purposes.</p>	<p>Methodological and definition issues or operational limitations:</p> <p>See Appendix II for a more detailed definition of computer (where applicable, student-owned laptops or PDAs used as part of recommended pedagogical kits must be counted).</p> <p>Only computers in working condition for use in teaching and learning should be included. Other criteria may also be applied, such as the age of the computer, its configuration and capacity, kinds of software available, etc. The criteria for “working condition” of computers are left to the countries’ discretion, taking into consideration their own pedagogical requirements for schools, their technological environment and their financial capacities.</p> <p>The typical measure for a Gini Coefficient might reveal a spatial inequality in the distribution of computers across the entire country in favour of some elite or private educational institutions where a greater number (or even 100%) of computers are available to learners.</p>

ED27 Average number of computers connected to the Internet per educational institution (for ISCED levels 1-3, level 4 and levels 5-6)

Definition:

The number of computers connected to the Internet in educational institutions divided by the total number of educational institutions (for ISCED levels 1-3, level 4 and levels 5-6).

Purpose:

To measure the overall availability of Internet-connected computers in educational institutions.

Data requirement:

(CI) Number of available computers connected to the Internet for ISCED levels 1-3, level 4 and levels 5-6.

(refer to questionnaire item C.2.4)

(EI) Number of educational institutions (public and private) for ISCED levels 1-3, level 4 and levels 5-6.

(refer to questionnaire item C.1)

Method of collection:

Administrative data collection through annual census or survey of educational institutions (or extract data from the records of educational institutions).

Data source(s):

Statistical unit of the relevant ministries/ departments of education or, alternatively, the national statistical office.

Formula:

$$\frac{\sum_{h=1}^3 CI_h^t}{\sum_{h=1}^3 EI_h^t} * 100 \quad , \quad \frac{CI_{h=4}^t}{EI_{h=4}^t} * 100 \quad , \quad \frac{\sum_{h=5}^6 CI_h^t}{\sum_{h=5}^6 EI_h^t} * 100$$

Where:

CI_h^t = Number of available computers connected to the Internet at education level h in school-year t

EI_h^t = Number of educational institutions at level of education h in school-year t

Analysis and interpretation:

A higher value for this indicator implies greater availability of computers connected to the Internet on average in educational institutions, hence a higher level of e-readiness. A greater variance between countries may signal a certain degree of “digital divide” among countries.

When calculated and analysed by ISCED levels, geographical regions, urban/rural areas and for individual educational institutions, this indicator can reflect the “digital divide” in terms of the availability of computers connected to the Internet in schools within countries.

More precise indications of e-readiness can be obtained by calculating this indicator based on the number of computers connected to the Internet used for pedagogical purposes.

Methodological and definition issues or operational limitations:

See Appendix II for a more detailed definition of computer (where applicable, student-owned laptops or PDAs with wired or wireless Internet connectivity used as part of recommended pedagogical kits must be counted).

The typical measure for a Gini Coefficient might reveal a spatial inequality in the distribution of computers connected to the Internet across the entire country in favour of some elite or private educational institutions where a greater number (or even 100%) of computers are available to learners.

ED28 Proportion of student-owned computers available for pedagogical purposes (for ISCED level 4 and levels 5-6)

Definition:

Number of student-owned computers expressed as a percentage of the total number of computers available for educational purposes for ISCED level 4 and levels 5-6.

Purpose:

To measure the extent of personal ownership of computers (i.e. learner-owned) used for educational purposes in post-secondary non-tertiary and tertiary institutions.

Data requirement:

(CPO) Number of student-owned computers as part of their mandatory pedagogical kits for ISCED level 4 and levels 5-6.

(refer to questionnaire item C.2.1.2)

(CP) Number of available computers for pedagogical use for ISCED level 4 and level 5-6.

(refer to questionnaire item C.2.1 and C.2.3)

Method of collection:

Administrative data collection through annual census or survey of educational institutions (or extract data from the records of these educational institutions).

Data source(s):

Statistical unit of the relevant ministries/departments of education or, alternatively, the national statistical office.

Formula:

$$\frac{CPO_{h=4}^t}{CP_{h=4}^t} * 100, \frac{\sum_{h=5}^6 CPO_h^t}{\sum_{h=5}^6 CP_h^t} * 100$$

Where:

CPO_h^t = Number of computers owned by learners as part of their mandatory pedagogical kits at education level **h** in school-year **t**

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

Analysis and interpretation:

Irrespective of the socio-economic background of learners' families, a high percentage or value for this indicator simply reflects widespread deliberate policies and/or incentives to encourage learners to own computers as part of their pedagogical kits.

A greater variance between countries may signal a certain degree of "digital divide" among countries.

When calculated and analysed by ISCED levels, geographical regions, urban/rural areas and for individual educational institutions, this indicator can reveal potential inequalities among learners' within countries in relation to private ownership of computers at school.

Methodological and definition issues or operational limitations:

See Appendix II for a more detailed definition of student-owned computers.

Personal ownership of computers may not necessarily imply intensive and effective use of computers, including for pedagogical purposes.

ED29 Proportion of all computers available for pedagogical purposes (for ISCED levels 1-3, level 4 and levels 5-6)

Definition:

Number of computers available for pedagogical purposes expressed as a percentage of the total number of computers for ISCED levels 1-3, level 4 and levels 5-6.

Purpose:

To indicate the share of computers used in schools for pedagogical purposes as compared to other uses.

Data requirement:

(CP) Number of available computers for pedagogical use for ISCED levels 1-3, level 4 and levels 5-6.

(refer to questionnaire item C.2.1 and C.2.3)

(C) Total number of available computers for ISCED levels 1-3, level 4 and levels 5-6.

(refer to questionnaire item C.2)

Method of collection:

Administrative data collection through annual census or survey of educational institutions (or extract data from the records of these educational institutions).

Data source(s):

Statistical unit of the relevant ministries/departments of education or, alternatively, the national statistical office.

Formula:

$$\frac{\sum_{h=1}^3 CP_h^t}{\sum_{h=1}^3 C_h^t} * 100, \frac{CP_{h=4}^t}{C_{h=4}^t} * 100, \frac{\sum_{h=5}^6 CP_h^t}{\sum_{h=5}^6 C_h^t} * 100$$

Where:

CP_h^t = Number of available computers for pedagogical purposes at education level h in school-year t

C_h^t = Number of available computers at education level h in school-year t

Analysis and interpretation:

A higher value for this indicator implies greater availability of computers for pedagogical purposes in educational institutions, hence a higher level of e-readiness for computer-assisted instruction.

When calculated and analysed by ISCED levels, geographical regions, urban/rural areas and by public/private educational institutions, this indicator can measure the “digital divide” in terms of e-readiness for computer-assisted instruction in schools within countries.

Methodological and definition issues or operational limitations:

See Appendix II for more detailed definitions of computers and pedagogical use.

ED30 Proportion of all computers available for administrative purposes (for ISCED levels 1-3, level 4 and levels 5-6)

Definition:

Number of computers available for administrative purposes expressed as a percentage of total number of computers for ISCED levels 1-3, level 4 and levels 5-6.

Purpose:

To indicate the share of computers used in schools for administrative purposes versus other uses.

Data requirement:

(CAD) Number of available computers for administrative use for ISCED levels 1-3, level 4 and levels 5-6.

(refer to questionnaire item C.2.2 and C.2.3)

(C) Total number of available computers for ISCED levels 1-3, level 4 and levels 5-6.

(refer to questionnaire item C.2)

Method of collection:

Administrative data collection through annual census or survey of educational institutions (or extract data from the records of these educational institutions).

Data source(s):

Statistical unit of the relevant ministries/departments of education or, alternatively, the national statistical office.

Formula:

$$\frac{\sum_{h=1}^3 CAD_h^t}{\sum_{h=1}^3 C_h^t} * 100, \frac{CAD_{h=4}^t}{C_{h=4}^t} * 100, \frac{\sum_{h=5}^6 CAD_h^t}{\sum_{h=5}^6 C_h^t} * 100$$

Where:

CAD_h^t = Total number of available computers for administrative use at education level h in school-year t

C_h^t = Total number of available computers at education level h in school-year t

Analysis and interpretation:

A high percentage or value for this indicator suggests that the computers in educational institutions are predominantly used for administrative purposes. It could also indicate the degree of computerization of school management.

When calculated and analysed by ISCED levels, geographical regions, urban/rural areas and by public/private educational institutions, this indicator can measure the “digital divide” in terms of the degree of use of computers for administrative purposes in schools.

Methodological and definition issues or operational limitations:

See Appendix II for a more detailed definition of computers for administrative use.

ED31 Proportion of schools with a website (for ISCED levels 1-3)	
<p>Definition:</p> <p>Number of schools with a website expressed as a percentage of all schools for ISCED levels 1-3.</p>	<p>Purpose:</p> <p>To measure the presence of primary and secondary schools on the Internet.</p>
<p>Data requirement:</p> <p><i>(EIW)</i> Number of educational institutions (public and private) with a website for ISCED levels 1-3.</p> <p><i>(refer to questionnaire item C.1.10)</i></p> <p><i>(EI)</i> Total number of educational institutions (public and private) for ISCED levels 1-3.</p> <p><i>(refer to questionnaire item C.1)</i></p>	<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records).</p> <p>Data source(s):</p> <p>Statistical unit of the Ministry of Education or, alternatively, the national statistical office.</p>
<p>Formula:</p> $\frac{\sum_{h=1}^3 EIW_h^t}{\sum_{h=1}^3 EI_h^t} * 100$ <p>Where:</p> <p>EIW_h^t = Number of educational institutions with a website at level of education h in school-year t</p> <p>EI_h^t = Number of educational institutions at level of education h in school-year t</p>	
<p>Analysis and interpretation:</p> <p>A high percentage or value for this indicator shows a high level of presence of primary and secondary schools on the web. It reveals awareness of the importance of websites as a means to disseminate information about the school, and to communicate. It also demonstrates the school's capability to maintain and update the information on the website. This indicator, however, does not provide any indication of the content of the web pages or online services available to students, teachers and the broader school-related community.</p>	<p>Methodological and definition issues or operational limitations:</p> <p>See Appendix II for a more detailed definition of website.</p> <p>This indicator should cover all school websites that are operational and can be accessed on the Internet. These can include websites designed and maintained by the school's own staff, or by a body other than the school.</p>

ED32 Proportion of schools with a website hosting students' and teachers' blog pages (for ISCED levels 1-3, level 4 and levels 5-6)

Definition:

Number of schools with a website hosting students' and teachers' blog pages expressed as a percentage of all schools for ISCED levels 1-3, level 4 and levels 5-6.

Purpose:

To measure the presence of educational institutions on the Internet that promote collaborative and interactive learning environments for learners and teachers.

Data requirement:

(EIB) Number of educational institutions (public and private) with a website hosting students' and teachers' blog pages for ISCED levels 1-3, level 4 and levels 5-6.

(refer to questionnaire item C.1.10.1)

(EI) Number of educational institutions (public and private) for ISCED levels 1-3, level 4 and levels 5-6.

(refer to questionnaire item C.1)

Method of collection:

Administrative data collection through annual school census and surveys of educational institutions at ISCED levels 4, 5 and 6 (or extract data from the records of these educational institutions).

Data source(s):

Statistical unit of the ministries/departments/ agencies responsible for education at ISCED levels 1-3, 4 and 5-6 or, alternatively, the national statistical office.

Formula:

$$\frac{\sum_{h=1}^3 EIB_h^t}{\sum_{h=1}^3 EI_h^t} * 100, \frac{EIB_{h=4}^t}{EI_{h=4}^t} * 100, \frac{\sum_{h=5}^6 EIB_h^t}{\sum_{h=5}^6 EI_h^t} * 100$$

Where:

EIB_h^t = Number of educational institutions with a website hosting students' and teachers' blog pages at level of education h in school-year t

EI_h^t = Number of educational institutions at level of education h in school-year t

Analysis and interpretation:

A high value for this indicator shows a high proportion of educational institutions using the cyberspace to promote collaborative and interactive learning environments among students and teachers. This indicator, however, does not provide any indication of the content of blog pages or intensity of use by students, teachers and others affiliated with the institution.

Methodological and definition issues or operational limitations:

See Appendix II for more detailed definitions of website and blog.

This indicator does not take into account how many teachers and learners have blog pages hosted on the school website, nor how regularly these blog pages are updated.

ED33 Proportion of educational institutions offering ICT-enabled distance education programmes (for ISCED levels 5-6)	
<p>Definition:</p> <p>Number of educational institutions that offer ICT-enabled distance education programmes at tertiary level, expressed as a percentage of all educational institutions at the corresponding level (for ISCED levels 5-6).</p>	<p>Purpose:</p> <p>To measure the presence and extent of integration of ICT-enabled distance education programmes in tertiary education.</p>
<p>Data requirement:</p> <p><i>(EID)</i> Number of educational institutions (public and private) that offer ICT-enabled distance education programmes for ISCED levels 5-6.</p> <p><i>(refer to questionnaire item C.1 – Distance education programmes)</i></p> <p><i>(EI)</i> Number of educational institutions (public and private) for ISCED levels 5-6.</p> <p><i>(refer to questionnaire item C.1)</i></p>	<p>Method of collection:</p> <p>Administrative data collection through annual census or surveys of educational institutions at ISCED levels 4, 5 and 6 (or extract data from the records of these educational institutions).</p> <p>Data source(s):</p> <p>Statistical units of ministries/departments/agencies responsible for education at ISCED levels 4, 5 and 6, or, alternatively, the national statistical office.</p>
<p>Formula:</p> $\frac{\sum_{h=5}^6 EID_h^t}{\sum_{h=5}^6 EI_h^t} * 100$ <p>Where:</p> <p>EID_h^t = Number of educational institutions that offer distance education programmes at level of education h in school-year t</p> <p>EI_h^t = Number of educational institutions at level of education h in school-year t</p>	
<p>Analysis and interpretation:</p> <p>A high percentage or value for this indicator shows a high degree of presence of ICT-enabled distance education programmes in tertiary education. It indirectly reflects good capacity of tertiary educational institutions to deliver such programmes.</p> <p>This indicator, however, does not indicate the type and the extent of ICT use for the delivery of distance education programmes.</p>	<p>Methodological and definition issues or operational limitations:</p> <p>Any educational institution that makes systematic and comprehensive use of distance education programmes either to alleviate a shortage of teachers or to embrace innovative teaching practices should be included.</p> <p>See Appendix II for a more detailed definition of distance education programmes.</p>

ED34 Proportion of schools with ICT support services (for ISCED levels 1-3)

Definition:

Total number of educational institutions having ICT support services expressed as a percentage of the total number of schools providing ICT-assisted instruction for ISCED levels 1-3.

Purpose:

To measure the availability of sustained technical support services for ICT-assisted instruction activities in primary and secondary schools to ensure appropriate use and maintenance of ICT equipment.

Data requirement:

(EIS) Number of educational institutions having ICT support services for ISCED levels 1-3.

(refer to questionnaire item C.1.14)

(EICT) Total number of educational institutions with ICT-assisted instruction for ISCED levels 1-3.

(refer to questionnaire item C.1.7)

Method of collection:

Administrative data collection through annual school census (or extract data from school records).

Data source(s):

Statistical unit of the Ministry of Education or, alternatively, the national statistical office.

Formula:

$$\frac{\sum_{h=1}^3 EIS_h^t}{\sum_{h=1}^3 EICT_h^t} * 100$$

Where:

EIS_h^t = Number of educational institutions having ICT support services at education level h in school-year t

$EICT_h^t$ = Number of educational institutions with ICT-assisted instruction at education level h in school-year t

Analysis and interpretation:

Given the cost that is involved with the rapidly changing performances of technologies applicable in education, ICT support services are critical for each school offering ICT-assisted instruction. A proportion of 100% availability of ICT support services for all educational institutions offering ICT-assisted instruction would constitute an ideal condition to ensure continuity of ICT-assisted instruction functions. It can be considered that the more this proportion falls below 100%, the more overall ICT deployment in support of teaching and learning activities is put at risk.

When calculated and analysed by ISCED levels, geographical regions, urban/rural areas and for individual educational institutions, this indicator can help to identify schools which do not have ICT support services so that appropriate measures can be taken to assist them in establishing such services.

Methodological and definition issues or operational limitations:

ICT support services may take diverse forms across countries, but the key principle here is to measure the presence or provision of such services in institutions that use ICT-assisted instruction irrespective of the approach adopted. The presence of ICT support services in schools may help to identify or predict areas for future improvement of ICT use in school curricula delivery, as well as ensure the coordination of the purchase, maintenance and renewal of equipment, software licences, cyber-patrol (for filtering and monitoring unsafe and disruptive online non-educational contents for learners), spyware, and virus protection software. To some extent, ICT support service providers may audit and project regularly staff training needs and provide suitable training plans/opportunities. Sharing relevant best practices on the integration of ICT into planning the curriculum could also be an aspect attached to the presence of ICT support services in schools.

See Appendix II for a more detailed definition and description of the typical functions of ICT support services.

ED35 Proportion of primary and secondary school teachers trained via ICT-enabled distance education programmes (for ISCED levels 1-3)

Definition:

Total number of primary and secondary school teachers who were trained via ICT-enabled distance education programmes, expressed as a percentage of the total number of teachers.

Purpose:

To measure the degree of use and outcomes of ICT-enabled distance education programmes for training teachers who currently teach in primary and secondary schools.

Data requirement:

(TDE) Number of teachers trained via ICT-enabled distance education programmes for ISCED levels 1-3.

(refer to questionnaire item D.1.1)

(T) Total number of teachers for ISCED levels 1-3.

(refer to questionnaire item D.1)

Method of collection:

Administrative data collection through annual school census (or extract data from school records).

Data source(s):

Statistical unit of the Ministry of Education or, alternatively, the national statistical office.

Formula:

$$\frac{\sum_{h=1}^3 TDE_h^t}{\sum_{h=1}^3 T_h^t} * 100$$

Where:

TDE_h^t = Number of teachers at education level h in school-year t who are trained via ICT-enabled distance education programmes -y

T_h^t = Number of teachers at education level h in school-year t

Analysis and interpretation:

A high percentage or value for this indicator reflects a high degree of use and outcomes of ICT-enabled distance education programme for supplementing conventional training of primary and secondary school teachers.

This indicator can also be calculated by ISCED levels, geographical regions, urban/rural areas and for individual educational institutions, and analysed in conjunction with other indicators regarding the percentage of teachers trained by modes of teacher-training in order to identify the contribution of the ICT-enabled distance education delivery approach to teacher development programmes.

Methodological and definition issues or operational limitations:

See Appendix II for a more detailed definition of ICT-enabled distance education programmes.

Additional data may be collected to derive corollary indicators that distinguish between teachers trained in pre-service or in-service ICT-enabled distance education programmes.

ED36 Proportion of primary and secondary school teachers who teach basic computer skills (or computing) (for ISCED levels 1-3)

Definition:

Total number of teachers who teach basic computer skills (or computing) in primary and secondary schools expressed as a percentage of all teachers.

Purpose:

To measure the availability of teachers delivering basic computer skills (or computing) courses in primary and secondary schools.

Data requirement:

(TBCL) Number of primary and secondary school teachers who teach basic computer skills (or computing) for ISCED levels 1- 3.

(refer to questionnaire item D.1.2)

(T) Total number of teachers for ISCED levels 1-3.

(refer to questionnaire item D.1)

Method of collection:

Administrative data collection through annual school census (or extract data from school records).

Data source(s):

Statistical unit of the Ministry of Education or, alternatively, the national statistical office.

Formula:

$$\frac{\sum_{h=1}^3 TBCL_h^t}{\sum_{h=1}^3 T_h^t} * 100$$

Where:

$TBCL_h^t$ = Number of teachers who teach basic computer skills (or computing) as a subject at education level h in school-year t

T_h^t = Number of teachers at education level h in school-year t

Analysis and interpretation:

This indicator measures the proportion or stock of teachers who teach basic computer skills (or computing) courses.

When calculated by ISCED levels, geographical regions, urban/rural areas and for individual educational institutions, and analysed in conjunction with other indicators regarding the percentage of teachers trained to teach basic computer skills, this indicator can indicate discrepancies so that appropriate policy measures can be taken to better deploy trained teachers or to train untrained teachers.

Methodological and definition issues or operational limitations:

This indicator does not measure the quality of teaching staff according to national qualification standards.

See Appendix II for a more detailed definition of basic computer skills (or computing).

ED37 Proportion of primary and secondary school teachers who currently teach subject(s) using ICT facilities (for ISCED levels 1-3)

Definition:

Number of teachers who currently teach subject(s) using ICT facilities in primary and secondary schools, expressed as a percentage of all teachers for ISCED levels 1-3.

Purpose:

To measure the proportion of teachers who use ICT to teach subject(s) in primary and secondary schools.

Data requirement:

(TI) Number of primary and secondary school teachers currently teaching subject(s) using ICT facilities for ISCED levels 1-3.

(refer to questionnaire item D.1.4)

(T) Total number of teachers for ISCED levels 1-3.

(refer to questionnaire item D.1)

Method of collection:

Administrative data collection through annual school census (or extract data from school registers).

Data source(s):

Statistical unit of the Ministry of Education or, alternatively, the national statistical office.

Formula:

$$\frac{\sum_{h=1}^3 TI_h^t}{\sum_{h=1}^3 T_h^t} * 100$$

Where:

TI_h^t = Number of teachers teaching subject(s) using ICT facilities at education level h in school-year t

T_h^t = Number of teachers at education level h in school-year t

Analysis and interpretation:

A high percentage or value for this indicator means that a high proportion of teachers use ICT facilities to teach in primary and secondary schools. This suggests widespread delivery of ICT-enabled courses to primary and secondary education learners.

When calculated and analysed by ISCED levels, geographical regions, urban/rural areas and for individual educational institutions, this indicator can measure some relative degree of “e-density” and help identify priority areas or schools where more teachers could be supported or trained to use ICT to assist teaching and learning.

Methodological and definition issues or operational limitations:

This indicator does not capture the quality of teaching nor the frequency or nature of ICT use in delivering courses.

ED38 Proportion of primary and secondary school teachers trained to teach subject(s) using ICT facilities (for ISCED levels 1-3)

Definition:

Number of teachers trained to use ICT to teach subject(s) in primary and secondary schools, expressed as a percentage of all teachers for ISCED levels 1-3.

Purpose:

To measure the availability of teachers trained to use ICT to teach subject(s) in primary and secondary schools.

Data requirement:

(TTI) Number of primary and secondary school teachers trained to teach subject(s) using ICT facilities for ISCED levels 1-3.

(refer to questionnaire item D.1.5)

(T) Total number of teachers for ISCED levels 1-3.

(refer to questionnaire item D.1)

Method of collection:

Administrative data collection through annual school census (or extract data from school records).

Data source(s):

Statistical unit of the Ministry of Education or, alternatively, the national statistical office.

Formula:

$$\frac{\sum_{h=1}^3 TTI_h^t}{\sum_{h=1}^3 T_h^t} * 100$$

Where:

TTI_h^t = Number of teachers trained to teach subject(s) using ICT facilities at education level h in school-year t

T_h^t = Number of teachers at education level h in school-year t

Analysis and interpretation:

A high percentage or value for this indicator can be interpreted as good e-readiness in terms of teachers being trained to use ICT to teach subject(s) in primary and secondary schools.

When calculated by ISCED levels, geographical regions, urban/rural areas and for individual educational institutions, and analysed in conjunction with other indicators regarding the proportion of teachers currently using ICT to teach subject(s), this indicator can show discrepancies so that appropriate policy measures can be taken to better deploy trained teachers and to train untrained teachers.

Methodological and definition issues or operational limitations:

Trained teachers are counted according to nationally defined qualification standards. See Appendix II for a more detailed definition of teachers trained to teach subject(s) using ICT facilities.

ED39 Ratio of learners-to-teachers of basic computer skills (or computing) (for ISCED levels 1-3)

Definition:

Number of learners enrolled in grades where basic computer skills (or computing) are currently taught divided by the number of teachers who teach basic computer skills (or computing) for ISCED levels 1-3.

Purpose:

To measure the workload of teachers of basic computer skills (or computing) programmes in order to assess if the number of teachers is adequate for the size of the target group of learners.

Data requirement:

(LBCL) Number of learners enrolled in grades where basic computer skills (or computing) are currently taught for ISCED levels 1-3.

(refer to questionnaire item E.1.4)

(TBCL) Number of teachers who teach basic computer skills (or computing) for ISCED levels 1-3.

(refer to questionnaire item D.1.2)

Method of collection:

Administrative data collection through annual school census (or extract data from school records).

Data source(s):

Statistical unit of the Ministry of Education or, alternatively, the national statistical office.

Formula:

$$\frac{\sum_{h=1}^3 LBCL_h^t}{\sum_{h=1}^3 TBCL_h^t}$$

Where:

$LBCL_h^t$ = Number of learners enrolled in grades where basic computer skills (or computing) are currently taught at education level **h** in school-year **t**

$TBCL_h^t$ = Number of teachers who teach basic computer skills (or computing) at education level **h** in school-year **t**

Analysis and interpretation:

A high value for this ratio suggests that each teacher has to be responsible for a large number of learners. It is generally assumed that a low ratio signifies smaller classes, which enables the teacher to pay more attention to individual learners, which may in turn result in better learning and performance of the learners.

When calculated and analysed by ISCED levels, geographical regions, urban/rural areas, by school and by basic computer skills grades, this indicator can help to measure discrepancies in the ratio between teachers of basic computer skills programmes and learners.

Methodological and definition issues or operational limitations:

This indicator is a very rough measure of teachers' workload and teaching conditions. For this indicator to be accurate and meaningful, the number of part-time teachers should be converted, where feasible, into 'full-time equivalent' teachers. Also, this indicator does not take into account differences in teachers' experience and status, teaching style, teaching materials, and variations in classroom conditions (class size, teaching hours, etc.), all factors that could affect the quality of teaching/learning.

ED40 Ratio of learners-to-teachers using ICT to teach (for ISCED levels 1-3)	
<p>Definition:</p> <p>Number of learners enrolled in grades with ICT-assisted instruction divided by the number of teachers currently teaching subject(s) using ICT-facilities in school for ISCED levels 1-3.</p>	<p>Purpose:</p> <p>To measure the workload of teachers using ICT to teach in order to assess if the number of teachers is adequate for the size of the target group of learners.</p>
<p>Data requirement:</p> <p>(LICT) Number of learners enrolled in grades with ICT-assisted instruction for ISCED levels 1-3. <i>(refer to questionnaire item E.1.3)</i></p> <p>(TI) Number of teachers currently teaching subject(s) using ICT facilities for ISCED levels 1-3. <i>(refer to questionnaire item D.1.4)</i></p>	<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records).</p> <p>Data source(s):</p> <p>Statistical unit of the Ministry of Education or, alternatively, the national statistical office.</p>
<p>Formula:</p> $\frac{\sum_{h=1}^3 LICT_h^t}{\sum_{h=1}^3 TI_h^t}$ <p>Where:</p> <p>$LICT_h^t$ = Number of learners enrolled in grades with ICT-assisted instruction at education level h in school-year t</p> <p>TI_h^t = Number of teachers currently teaching subject(s) using ICT facilities at education level h in school-year t</p>	
<p>Analysis and interpretation:</p> <p>A high learner-to-teacher ratio suggests that each teacher has to be responsible for a large number of learners. It is generally assumed that a low ratio signifies smaller classes, which enables the teacher to pay more attention to individual learners, which may in turn result in a better performance of the learners.</p> <p>When calculated and analysed by ISCED levels, geographical regions, urban/rural areas, by school and by basic computer skills classes, this indicator can help to measure potential discrepancies in the ratio between learners and teachers in different ICT-assisted instruction programmes.</p>	<p>Methodological and definition issues or operational limitations:</p> <p>This indicator is a very rough measure of teachers' workload and teaching conditions. For this indicator to be accurate and meaningful, the number of part-time teachers should be converted, where feasible, into 'full-time equivalent' teachers. Also, this indicator does not take into account differences in teachers' experience and status, teaching style, teaching materials and variations in classroom conditions, etc. all factors that could affect the quality of teaching/learning.</p>

ED41 Proportion of learners entitled to use computer laboratories at school as a pedagogical aid (by gender, and by type of institution for ISCED levels 1-3)	
<p>Definition:</p> <p>Number of learners with access to computer laboratories in schools expressed as a percentage of the total number of learners in schools for ISCED levels 1-3.</p>	<p>Purpose:</p> <p>To measure accessibility of learners to computer laboratories for educational purposes.</p>
<p>Data requirement:</p> <p>(LC) Number of learners (by gender, and by public or private institution) entitled to use computer laboratories at school as a pedagogical aid for ISCED levels 1-3.</p> <p><i>(refer to questionnaire item E.1.1)</i></p> <p>(L) Number of learners (by gender, and by public or private institution) for ISCED levels 1-3.</p> <p><i>(refer to questionnaire item E.1)</i></p>	<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records).</p> <p>Data source(s):</p> <p>Statistical unit of the Ministry of Education or, alternatively, the national statistical office.</p>
<p>Formula:</p> $\frac{\sum_{h=1}^3 LC_{h,p,s}^t}{\sum_{h=1}^3 L_{h,p,s}^t} * 100$ <p>Where:</p> <p>$LC_{h,p,s}^t$ = Number of learners entitled to use computer laboratories at school as a pedagogical aid at education level h, by gender s, by type of institution (private or public) p, and in school-year t</p> <p>$L_{h,p,s}^t$ = Number of learners at education level h, by gender s, by type of institution (private or public) p, and in school-year t</p>	
<p>Analysis and interpretation:</p> <p>Access to computer laboratories in school is a pre-requisite for learning through computer-assisted instruction. A high percentage or value for this indicator suggests that a greater number of learners with access to computer laboratories, and hence a higher degree of implementation of computer-assisted instruction.</p> <p>It may be noted that depending on pedagogical needs and personal capabilities, 100% access to computer laboratories by all learners may not be a crucial educational goal for all grades.</p> <p>When calculated and analysed by ISCED levels, geographical regions, urban/rural areas, type of educational institutions and by gender of learners, this indicator can help to measure the 'digital divide' and identify schools where learners have no or very low access to computer laboratories.</p>	<p>Methodological and definition issues or operational limitations:</p> <p>Distortion may be possible with some private (or public) or specialized institutions offering computer laboratory access at grades or ages that are different from nationally defined grades or ages of learners.</p> <p>This ratio does not account for the actual use, or frequency and duration of use, of computer laboratories by learners.</p>

ED42 Proportion of educational institutions providing an email account to all teachers (for ISCED level 4 and levels 5-6)

Definition:

Number of educational institutions providing an email account to all teachers expressed as a percentage of all educational institutions for ISCED level 4 and levels 5-6.

Purpose:

To measure the extent of efforts made by educational institutions to facilitate teachers' access to electronic communication (email) for pedagogical needs.

Data requirement:

(EIMT) Number of educational institutions (public and private) providing an email account to all teachers for ISCED level 4 and levels 5-6.

(refer to questionnaire item C.1.12)

(EI) Number of educational institutions (public and private) for ISCED level 4 and levels 5-6.

(refer to questionnaire item C.1)

Method of collection:

Administrative data collection through annual census or surveys of educational institutions at ISCED levels 4 and 5-6 (or extract data from the records of these educational institutions).

Data source(s):

Statistical units of the ministries/departments/agencies responsible for education at ISCED levels 4 and 5-6, or, alternatively, the national statistical office.

Formula:

$$\frac{EIMT_{h=4}^t}{EI_{h=4}^t} * 100, \quad \frac{\sum_{h=5}^6 EIMT_h^t}{\sum_{h=5}^6 EI_h^t} * 100$$

Where:

$EIMT_h^t$ = Number of educational institutions providing an email account to all teachers at level of education h in school-year t

EI_h^t = Number of educational institutions at level of education h in school-year t

Analysis and interpretation:

A high percentage or value for this indicator demonstrates a high level of efforts made by educational institutions to facilitate teachers' access to electronic communication (email) for pedagogical purposes. In this context, the indicator only reflects a high accessibility of teachers to email accounts in educational institutions but not the actual intensity of use.

Methodological and definition issues or operational limitations:

Although an educational institution may provide universal access to email accounts to all teachers, there is no guarantee that every teacher will register for an account or use their existing account. Therefore, universal access does not imply universal use. An educational institution that has a policy to provide email accounts to any teacher who wishes to have one, irrespective of use, is counted.

See Appendix II for a more detailed definition of email account.

ED43 Proportion of educational institutions providing an email account to all learners (for ISCED level 4 and levels 5-6)

Definition:

Number of educational institutions providing an email account to all learners expressed as a percentage of all educational institutions for ISCED level 4 and levels 5-6.

Purpose:

To measure the extent of efforts made by educational institutions to facilitate learners' access to electronic communication (email) for pedagogical needs.

Data requirement:

(EIM) Number of educational institutions (public and private) providing an email account to all learners for ISCED level 4 and levels 5-6.

(refer to questionnaire item C.1.11)

(EI) Number of educational institutions (public and private) for ISCED level 4 and levels 5-6.

(refer to questionnaire item C.1)

Method of collection:

Administrative data collection through annual census or surveys of educational institutions at ISCED levels 4 and 5-6 (or extract data from the records of these educational institutions).

Data source(s):

Statistical units of the ministries/departments/agencies responsible for education at ISCED levels 4 and 5-6, or, alternatively, the national statistical office.

Formula:

$$\frac{EIM_{h=4}^t}{EI_{h=4}^t} * 100, \quad \frac{\sum_{h=5}^6 EIM_h^t}{\sum_{h=5}^6 EI_h^t} * 100$$

Where:

EIM_h^t = Number of educational institutions providing an email account to all learners at level of education h in school-year t

EI_h^t = Number of educational institutions at level of education h in school-year t

Analysis and interpretation:

A high percentage or value for this indicator demonstrates a high level of efforts made by educational institutions to facilitate learners' access to electronic communication (email) for pedagogical purposes. In this context, the indicator only reflects a high accessibility to email accounts among learners in educational institutions but not the actual intensity of use.

Methodological and definition issues or operational limitations:

Although an educational institution may provide universal access to email accounts to all enrolled learners, there is no guarantee that every learner will register for an account or use their existing account. Therefore, universal access does not imply universal use. An educational institution that has a policy to provide email accounts to any learner who wishes to have one, irrespective of use, is counted.

See Appendix II for a more detailed definition of email account.

ED44 Proportion of learners enrolled in grades with ICT-assisted instruction (for ISCED levels 1-3)**Definition:**

Number of learners enrolled in grades where ICT are used for teaching and learning, expressed as a percentage of the total number of learners for ISCED levels 1-3.

Purpose:

To measure learners' participation in ICT-assisted education and the degree of implementation of national policies and plans for ICT use in primary and secondary education.

Data requirement:

(LICT) Number of learners enrolled in grades with ICT-assisted instruction for ISCED levels 1-3.

(refer to questionnaire item E.1.3)

(L) Number of learners enrolled at ISCED levels 1-3.

(refer to questionnaire item E.1)

Method of collection:

Administrative data collection through annual school census (or extract data from school records).

Data source(s):

Statistical unit of the Ministry of Education or, alternatively, the national statistical office.

Formula:

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

Where:

$LICT_h^t$ = Number of learners enrolled in grades with ICT-assisted instruction at level of education h in school-year t

L_h^t = Number of learners enrolled at education level h in school-year t

Analysis and interpretation:

A high percentage or value for this indicator reveals a high degree of learner participation in ICT-assisted instruction in primary and secondary schools, which also indicates strong implementation of national ICT in education policies and plans.

This indicator can also be calculated and analysed by geographical regions, urban/rural areas, and by school.

Methodological and definition issues or operational limitations:

In counting learners, caution must be exercised in order to avoid double-counting learners who are benefiting from more than one type of ICT service (radio, television, computer or Internet) in support of their learning activities.

ED45 Proportion of learners enrolled in grades where basic computer skills (or computing) are currently taught (for ISCED levels 1-3)

Definition:

Number of learners enrolled in grades where basic computer skills (or computing) are taught during the current academic year, expressed as a percentage of the total number of learners for ISCED levels 1-3.

Purpose:

To measure learners' participation in basic computer skills (or computing) programmes in primary and secondary education

Data requirement:

(LBCL) Number of learners enrolled in grades where basic computer skills (or computing) are currently taught for ISCED levels 1-3.

(refer to questionnaire item E.1.4)

(L) Number of learners enrolled at ISCED levels 1-3.

(refer to questionnaire item E.1)

Method of collection:

Administrative data collection through annual school census (or extract data from school records).

Data source(s):

Statistical unit of the Ministry of Education or, alternatively, the national statistical office.

Formula:

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

Where:

$LBCL_h^t$ = Number of learners enrolled in grades where basic computer skills (or computing) were taught at level of education **h** in school-year **t**

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

Analysis and interpretation:

A high percentage or value for this indicator reveals a high degree of learner participation in basic computer skills (or computing) programmes in primary and secondary schools, and of countries' achievements in integrating basic computer skills in primary and secondary school curricula.

Besides its use in international comparison, this indicator can be calculated and analysed by ISCED levels and grades, geographical regions, urban/rural areas and public/private schools.

Methodological and definition issues or operational limitations:

Whereas indicator ED9 and ED9bis informs about existing policies and curricula to introduce basic computer skills in various grades of primary and secondary education, ED45 reflects the current state of implementation of this policy goal.

ED46 Proportion of learners (by gender) who graduated last academic year in ICT-related fields at the post-secondary non-tertiary and tertiary level (for ISCED level 4 and levels 5-6)

Definition:

Number of last year's graduates (by gender) in ICT-related fields expressed as a percentage of the total number of learners enrolled last academic year in these fields of study.

Purpose:

To measure (by gender) the output of programmes in ICT-related fields at educational institutions at the post-secondary non-tertiary and tertiary levels.

Data requirement:

(LGI) Number of graduates (by gender) from ICT-related fields in the last academic year for ISCED level 4 and levels 5-6.

(refer to questionnaire item E.2.1)

(LITL) Number of learners (by gender) enrolled last academic year in ICT-related fields for ISCED level 4 and levels 5-6.

(refer to questionnaire item E.2)

Method of collection:

Administrative data collection through annual census or survey of educational institutions (or extract data from the records of these educational institutions).

Data source(s):

Statistical unit of the ministries/departments/agency responsible for education at ISCED levels 4 and 5-6 or, alternatively, the national statistical office.

Formula :

$$\frac{LGI_{h=4}^{t-1}}{LITL_{h=4}^{t-1}} * 100, \frac{\sum_{h=5}^6 LGI_h^{t-1}}{\sum_{h=5}^6 LITL_h^{t-1}} * 100$$

Where:

LGI_h^{t-1} = Number of graduates (by gender) in ICT-related fields at level **h** in school-year **t-1**

$LITL_h^{t-1}$ = Number of learners (by gender) enrolled in ICT-related fields last academic year at education level **h** in school-year **t-1**

Analysis and interpretation:

A high percentage or value for this indicator suggests a high level of output in terms of new skills formation by the training of qualified human resources in ICT-related fields to meet the growing demand of the information economy.

When calculated separately for male and female learners by ISCED levels and by ICT-related sub-fields, this indicator may reflect gender imbalances that require policy measures to promote gender parity. Comparison of the graduation rates in ICT-related and non-ICT related fields of study over time can reflect the trends in the outcomes of the post-secondary non-tertiary and tertiary education system.

Methodological and definition issues or operational limitations:

This indicator requires complete and reliable data on the number of graduates in ICT-related fields of study and a clear distinction from non-ICT fields of study. Cross-country comparisons rely heavily on how far countries have used consistent definitions and classifications of fields of study.

Detailed or aggregated information may not be fully comparable at the international level due to exclusions, double counting of students, partial data, etc.

Furthermore, differences in duration, in the degree of theoretical and applied contents can distort comparisons between countries.

ED47 Proportion of learners (by gender) enrolled at the tertiary level in ICT-enabled distance education programmes (for ISCED levels 5-6)	
<p>Definition:</p> <p>Number of learners (by gender) enrolled in ICT-enabled distance education programmes expressed as a percentage of the total number of learners enrolled in tertiary education for ISCED levels 5-6.</p>	<p>Purpose:</p> <p>To measure the extent to which learners (by gender) participate in ICT-enabled distance education programmes at tertiary education level.</p>
<p>Data requirement:</p> <p>(L) Number of learners (by gender) for ISCED levels 5-6.</p> <p>(refer to questionnaire item E.1)</p> <p>(LD) Number of learners (by gender) enrolled in ICT-enabled distance education programmes for ISCED levels 5-6.</p> <p>(refer to questionnaire item E.1 under 'Distance education programmes')</p>	<p>Method of collection:</p> <p>Administrative data collection through annual census or survey of tertiary educational institutions (or extract data from the records of tertiary educational institutions).</p>
	<p>Data source(s):</p> <p>Statistical unit of the ministry/department/agency responsible for tertiary education at ISCED levels 5 and 6, or, alternatively, the national statistical office.</p>
<p>Formula:</p> $\frac{\sum_{h=5}^6 LD_h^t}{\sum_{h=5}^6 L_h^t} * 100$	
<p>Where:</p> <p>LD_h^t = Number of learners (by gender) enrolled in distance education programmes D at education level h in school-year t</p> <p>L_h^t = Number of learners (by gender) enrolled at education level h in school-year t</p>	
<p>Analysis and interpretation:</p> <p>A high percentage or value for this indicator signals a high proportion of learners in tertiary education participating in ICT-enabled distance education programmes, and widespread use of the distance mode of learning.</p> <p>When calculated and analysed by gender and by disaggregated fields of study, this indicator may reflect the availability of more diversified patterns of participation in ICT-enabled distance education opportunities.</p>	<p>Methodological and definition issues or operational limitations:</p> <p>Further operational mechanisms are required to develop a reliable approach for recording foreign individuals enrolled in ICT-enabled distance education programmes who have no locally based institution that serves as intermediary for registration of national citizens in foreign distance education programmes.</p>

ED48 Proportion of learners who successfully completed a basic computer skills (or computing) course at the end of the last academic year (for ISCED levels 1-3)

Definition:

Number of learners who successfully completed a basic computer skills (or computing) course at the end of the last academic year, expressed as a percentage of the total number of learners enrolled in corresponding grades where basic computer skills (or computing) were taught during the last academic year for ISCED levels 1-3.

Purpose:

To measure the levels of output of basic computer skills (or computing) programmes in primary and secondary schools, and their potential impact on the national stock of qualifications in basic computer skills.

Data requirement:

(LBCP) Number of learners who successfully completed a basic computer skills course in previous grades at the end of the last academic year (*t-1*) (by gender, by type of institution and by grade) for ISCED levels 1-3.

(refer to questionnaire item E.4.2)

(LBCL) Number of learners enrolled in grades where basic computer skills (or computing) were taught during the last academic year (*t-1*) (by gender, by type of institution and by grade) for ISCED levels 1-3.

(refer to questionnaire item E.3.2)

Method of collection:

Administrative data collection through annual school census (or extract data from school records).

Data source(s):

Statistical unit of the Ministry of Education or, alternatively, the national statistical office.

Formula:

$$\frac{LBCP_g^t}{LBCL_{g-1}^{t-1}} * 100$$

Where:

$LBCP_g^t$ = Number of learners who successfully completed a basic computer skills course in previous grade **g-1** and who were promoted to the next grade **g** (by gender and by type of institution).

$LBCL_{g-1}^{t-1}$ = Number of learners enrolled in grade **g-1** where basic computer skills (or computing) were taught during the last academic year **t-1** (by gender and by type of institution).

Analysis and interpretation:

A high percentage or value for this indicator can be interpreted as a high level of output of basic computer skills (or computing) programmes in primary and secondary schools. It also suggests the potential positive impact of these programmes on the number of people with basic computer skills, making a greater stock of them available for the economy.

When calculated and analysed by grade, by gender, by type of institution, by geographical regions, by urban/rural areas, and by school, this indicator can help to measure gaps in the stock of people with basic computer skills, and to identify policy issues and priorities in this area.

Methodological and definition issues or operational limitations:

Depending on the content and country practices, basic computer skills (or computing) certification might occur either at a single terminal grade, or spread cumulatively over several grades and/or years. Metadata explaining such situations and describing the data should be given when reporting related data to the UIS.

ED49 Promotion rate of learners in grades receiving ICT-assisted instruction (by gender, by type of institution and by grade) (for ISCED levels 1-3)	
<p>Definition:</p> <p>Percentage of learners enrolled only in grades with ICT-assisted instruction during the last academic year who were promoted to the next higher grade for ISCED levels 1-3.</p>	<p>Purpose:</p> <p>To measure the promotion rate of learners enrolled in grades where ICT are used as a pedagogical aid.</p>
<p>Data requirement:</p> <p>(LPI) Number of learners promoted only from previous grades with ICT-assisted instruction at the end of the last academic year (<i>t-1</i>) (by gender, by type of institution and by grade) for ISCED levels 1-3.</p> <p><i>(refer to questionnaire item E.4.1)</i></p> <p>(LEI) Number of learners enrolled only in grades with ICT-assisted instruction during the last academic year (by gender, by type of institution and by grade) for ISCED levels 1-3.</p> <p><i>(refer to questionnaire item E.3.1)</i></p>	<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records).</p> <p>Data source(s):</p> <p>Statistical unit of the Ministry of Education or, alternatively, the national statistical office.</p>
<p>Formula:</p> $\frac{LPI_g^t}{LEI_{g-1}^{t-1}} * 100$ <p>Where:</p> <p>LPI_g^t = Number of learners enrolled only in grade g-1 with ICT-assisted instruction during the last academic year who were promoted to the next grade g (by gender and type of institution) in school-year t</p> <p>LEI_{g-1}^{t-1} = Number of learners enrolled only in grade g-1 with ICT-assisted instruction (by gender and type of institution) during the last academic year in school-year t-1</p>	
<p>Analysis and interpretation:</p> <p>A high promotion rate implies a high proportion of learners successfully passing from a lower grade to a higher grade.</p> <p>By comparing the promotion rate of learners who enrolled in grades with ICT-assisted instruction with those who attended the same grades without ICT-assisted instruction, one can verify if there are differences. If so, further investigation, using testing methods, may be needed to determine the degree to which these differences can be attributed to the impact of ICT on teaching and learning.</p>	<p>Methodological and definition issues or operational limitations:</p> <p>One must be cautious not to attribute higher promotion rates solely to the impact of ICT use in teaching and learning, as there are other factors contributing to successful passage from one grade to another.</p> <p>In countries where learners are automatically promoted to the next grade for levels ISCED 1-3 or in terminal grades where a quota system may directly or indirectly affect promotion rates, this indicator becomes meaningless.</p>

ED50 Promotion rate of learners in grades not receiving ICT-assisted instruction (by gender, by type of institution and by grade) (for ISCED levels 1-3)	
<p>Definition:</p> <p>Percentage of learners enrolled only in grades with NO ICT-assisted instruction during the last academic year who were promoted to the next higher grade for ISCED levels 1-3.</p>	<p>Purpose:</p> <p>To measure the promotion rate of learners enrolled in grades where ICT are <u>not</u> used as a pedagogical aid.</p>
<p>Data requirement:</p> <p>(LPI) Number of learners promoted only from previous grades with ICT-assisted instruction at the end of the last academic year (<i>t-1</i>) (by gender, by type of institution and by grade) for ISCED levels 1-3.</p> <p><i>(refer to questionnaire item E.4.1)</i></p> <p>(LEI) Number of learners enrolled only in grades with ICT-assisted instruction during the last academic year (by gender, by type of institution and by grade) for ISCED levels 1-3.</p> <p><i>(refer to questionnaire item E.3.1)</i></p> <p>(LP) Number of learners promoted from the previous grades at the end of the last academic year (<i>t-1</i>) (by gender, by type of institution and by grade) for ISCED levels 1-3.</p> <p><i>(refer to questionnaire item E.4)</i></p> <p>(L) Number of learners enrolled during the last academic year (by gender, by type of institution and by grade) for ISCED levels 1-3.</p> <p><i>(refer to questionnaire item E.3)</i></p>	<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records).</p> <p>Data source(s):</p> <p>Statistical units of the ministries of education or, alternatively, national statistical offices.</p>
<p>Formula:</p> $\frac{LP_g^t - LPI_g^t}{L_{g-1}^{t-1} - LEI_{g-1}^{t-1}} * 100$ <p>Where:</p> <p>LPI_g^t = Number of learners enrolled only in grade g-1 with ICT-assisted instruction during the last academic year who were promoted to the next grade g (by gender and type of institution) in school-year t</p> <p>LEI_{g-1}^{t-1} = Number of learners enrolled only in grades g-1 with ICT-assisted instruction during the last academic year (by gender and type of institution) in school-year t-1</p> <p>LP_g^t = Number of learners enrolled during the last academic year in grade g-1 who were promoted to the next grade g (by gender and type of institution) in school-year t</p> <p>L_{g-1}^{t-1} = Number of learners enrolled during the last academic year (by gender and type of institution) in grades g-1 in school-year t-1</p>	
<p>Analysis and interpretation:</p> <p>A high promotion rate implies a high proportion of learners successfully passing from a lower grade to a higher grade.</p> <p>By comparing the promotion rate of learners who enrolled in grades without ICT-assisted instruction with those who attended the same grades with ICT-assisted instruction, one can verify if there are differences. If so, further investigation, using testing methods, may be needed to determine the degree to which these differences can be attributed to the impact of ICT on teaching and learning.</p>	<p>Methodological and definition issues or operational limitations:</p> <p>One must be cautious not to attribute low promotion rates solely to the non-use of ICT in teaching and learning, as there are other factors contributing to successful passage from one grade to another.</p> <p>In countries where learners are automatically promoted to the next grade for ISCED levels 1-3 or in terminal grades where a quota system may directly or indirectly affect promotion rates, this indicator becomes meaningless.</p>

ED51 ICT-assisted instruction performance ratio (by gender, by type of institution, and by grade) (for ISCED levels 1-3)	
<p>Definition:</p> <p>Promotion rate of learners in grades with ICT-assisted instruction divided by the promotion rate of learners in grades with NO ICT-assisted instruction in primary and secondary education</p>	<p>Purpose:</p> <p>To derive a proxy measure of differential performance of ICT assisted instruction versus non-ICT assisted instruction.</p>
<p>Data requirement:</p> <p><i>Indicator ED49 and Indicator ED50</i></p>	<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records).</p>
	<p>Data source(s):</p> <p>Statistical unit of the Ministry of Education or, alternatively, the national statistical office.</p>
<p>Formula:</p> $\frac{\text{Indicator ED49}}{\text{Indicator ED50}}$ <p>Where:</p> <p><i>Indicator ED49</i> = Promotion rate of learners in grades receiving ICT-assisted instruction</p> <p><i>Indicator ED50</i> = Promotion rate of learners in grades not receiving ICT-assisted instruction</p>	
<p>Analysis and interpretation:</p> <p>A value close to 1 for this indicator implies no significant 'incidence' of ICT use on the promotion rate of learners.</p> <p>A value below 1 signal that learners do not necessarily 'benefit' from ICT-assisted instruction.</p> <p>A value above 1 for this indicator implies that, at least, ICT-assisted instruction does not have a negative impact on the learning process.</p> <p>Observing the time series for the same indicator over several years is likely to convey a more convincing argument as to whether or not ICT use in education can potentially have a significant impact on the performance of learners.</p> <p>Cost-efficiency assessment coupled with contextual analysis of both education delivery modes (conventional and ICT-assisted) can help to draw additional conclusions.</p>	<p>Methodological and definition issues or operational limitations:</p> <p>In countries where learners are automatically promoted, this indicator cannot be interpreted. Countries that apply a quota system for promoting students in terminal grades which use (or not) ICT for teaching will also make this indicator meaningless.</p>

ED52 Proportion of rural schools with ICT-assisted instruction (for ISCED levels 1-3)	
<p>Definition:</p> <p>Total number of both public and private schools with ICT-assisted instruction in rural areas as percentage of all schools in rural areas for ISCED levels 1-3.</p>	<p>Purpose:</p> <p>To determine the extent to which equity measures for favouring the development of ICT in education has been implemented in rural poor or deprived zones.</p>
<p>Data requirement:</p> <p><i>(EIRI)</i> Number of educational institutions (public and private) in rural areas with ICT-assisted instruction for ISCED levels 1-3. <i>(refer to questionnaire item C.1.8.1)</i></p> <p><i>(EIR)</i> Number of educational institutions (public and private) in rural areas for ISCED levels 1-3. <i>(refer to questionnaire item C.1.8)</i></p>	<p>Method of collection:</p> <p>Administrative data collection through annual school census and surveys of educational institutions at ISCED levels 1-3 (or extract data from school records).</p> <p>Data source(s):</p> <p>Statistical unit of the ministries/departments/agencies responsible for education at ISCED 1-3 or, alternatively, the national statistical office.</p>
<p>Formula:</p> $\frac{\sum_{h=1}^3 EIRI_h^t}{\sum_{h=1}^3 EIR_h^t} * 100$ <p>Where:</p> <p>$EIRU_h^t$ = Number of educational institutions in rural areas with ICT-assisted instruction at level of education h in school-year t</p> <p>EIR_h^t = Number of educational institutions in rural areas at level of education h in school-year t</p>	
<p>Analysis and interpretation:</p> <p>In comparison to the corresponding proportion of schools with ICT-assisted instruction in all areas, this indicator can show potential discrepancies in the provision of ICT-assisted instruction in rural areas.</p> <p>A percentage or value for this indicator that is lower for rural areas than for all areas will indicate that rural areas do not enjoy equal privileges in terms of ICT-assisted instruction. This shows that rural areas do not follow the overall national pattern and suggests that pro-equity measures have not been satisfactorily implemented. It could also be possible that these rural areas are already well served by the conventional education service delivery mode.</p>	<p>Methodological and definition issues or operational limitations:</p> <p>Definitions of rural areas in national classifications may not be comparable across countries.</p>

ED53 Number of female graduates per 1000 male graduates in ICT-related fields (for ISCED level 4 and levels 5-6)

Definition:

Total number of female graduates from ICT-related fields for ISCED level 4 and levels 5-6 at the end of the last academic year divided by the corresponding number of male graduates and multiplied by 1000.

Purpose:

To measure gender equity in the skilled ICT labour force produced for the labour market by post-secondary non-tertiary education and tertiary education.

Data requirement:

(MG) Number of male graduates in ICT-related fields at the end of the last academic year for ISCED level 4 and levels 5-6.

(FG) Number of female graduates in ICT-related fields at the end of the last academic year for ISCED level 4 and levels 5-6.

(refer to questionnaire item E.2.1)

Method of collection:

Administrative data collection through annual census or surveys of educational institutions at ISCED level 4 and levels 5-6 (or extract data from school records).

Data source(s):

Statistical unit of the ministries/departments/agencies responsible for education at ISCED level 4 and levels 5-6, or, alternatively, the national statistical office.

Formula:

$$\frac{FG_{h=4}^{t-1}}{MG_{h=4}^{t-1}} * 1000, \quad \frac{\sum_{h=5}^6 FG_h^{t-1}}{\sum_{h=5}^6 MG_h^{t-1}} * 1000$$

Where:

FG_h^{t-1} = Number of female graduates in ICT-related fields at the end of the last academic year at level of education **h** in school-year **t-1**

MG_h^{t-1} = Number of male graduates in ICT-related fields at the end of the last academic year at level of education **h** in school-year **t-1**

Analysis and interpretation:

A ratio of 1000 implies gender equality. A ratio below 1000 implies inequality in favour of males, whereas a ratio above 1000 implies inequality in favour of females.

Methodological and definition issues or operational limitations:

The number of learners enrolled in ICT-related fields at ISCED level 4 and levels 5-6 may differ between male and female, which may influence the number of graduates by gender. A measure of gender parity index calculated on the basis of graduation rates that take into account the original ‘inequality’ among both sexes at the stage of enrolment in the ICT-related fields of study is likely to be more comparable. However, with the advent of distance education or other forms of ICT-enabled learning, measuring graduation rates at higher levels of education is complicated by the fact that certification paths are increasingly tailored to the pace of individual learners over several academic years. Also, different certification methods are used (e.g. accumulation of credits as opposed to a conventional one-off examination). This distorts the classical notion of a homogenous cohort of learners, graduating the same year at the same pace and within a thin age group span.

c) **Supplementary indicators on ICT in education**

A wide range of information is needed by various stakeholders, such as policymakers, administrators, teachers, parents, employers and learners, in order to monitor, understand and support the ongoing expansion of ICT integration in education. In response, a number of supplementary indicators on ICT in education have been identified for testing.

Further methodological development will be required in order to operationalize and standardize the underlying concepts for many of these indicators. In addition, further work needs to be done on the definitions and purpose, the feasibility for collecting reliable data, and the international comparability.

Some of these optional indicators may use alternative channels of data collection – other than the annual school censuses/surveys – such as household surveys, labour force surveys, household-based time-use surveys and sample surveys of learners, teachers and school managers. Such indicators will test people's ICT knowledge and skills, while tracer studies of former learners will monitor the outcomes and impact.

A selection of supplementary indicators is presented in **Table 7**. Proposals for these indicators were compiled from: UNESCO Bangkok⁵, the UNESCO International Institute for Technology of Education (IITE)⁶, the Observatory for the Information Society in Latin America and the Caribbean (OSILAC) at the United Nations Economic Commission for Latin America and the Caribbean (UN ECLAC) and the Inter-American Development Bank (IADB). Proposals from WISE national focal points are also included from the following countries: Belarus, Costa Rica, Dominican Republic, Egypt, Estonia, Ethiopia, Ghana, Guatemala, Jordan, Malaysia, Oman, Paraguay, Republic of Korea, Russian Federation, Tunisia and Uruguay.

⁵ See <http://www.unescobkk.org/education/ict/ict-in-education-projects/monitoring-and-measuring-change/performance-indicators-on-ict-use-in-education-project/consultative-workshop/proposed-set-of-indicators/>

⁶ See IITE (2002a and 2002b).

Table 7. Supplementary indicators on ICT in education

Conceptual domains		Indicator	Sources (or adapted from)
Political commitment		Average expenditure per learner for the purchase of educational software (for ISCED levels 1-3)	Republic of Korea
		Proportion of public schools with government-sponsored support for Internet connection (for ISCED levels 1-3)	UNESCO Bangkok
		Proportion of public expenditure on ICT in education by programme aimed at (for ISCED levels 1-3, level 4 and levels 5-6): <ul style="list-style-type: none"> o Infrastructure (computer labs, networking) o Teaching software o Computer-based equipment o Non computer-based equipment (radio, television) o Capacity building (pre/in-service training) 	Malaysia
		Proportion of schools with policies concerning author's rights, copyright policies, privacy, etc. (for ISCED levels 1-3, level 4 and levels 5-6)	IADB
Infrastructure		Average monthly expenditure for broadband internet connection (for ISCED levels 1-3)	IADB
		Average number of subscriptions of educational and research digital resources per educational institutions (for ISCED levels 1-3, level 4 and levels 5-6)	Republic of Korea
		Proportion of schools with a plan to maintain and renew ICT equipment (for ISCED levels 1-3, level 4 and levels 5-6)	Republic of Korea
		Proportion of schools with computers connected via Local Area Network (LAN) (for ISCED levels 1-3)	IITE, UN ECLAC (OSILAC), UNESCO Bangkok
		Proportion of schools connected via Wide Area Network (WAN) (for ISCED levels 1-3)	UN ECLAC (OSILAC)
		Proportion of schools with wireless (open or restricted) telecommunication facilities (for ISCED levels 1-3)	Oman, IADB
		Proportion of schools with a firewall as part of their computer network (for ISCED levels 1-3)	IADB
		Proportion of schools with a VPN (virtual private networks) (for ISCED levels 1-3)	IADB
		Proportion of schools with computer laboratories (for ISCED levels 1-3)	UN ECLAC (OSILAC), Republic of Korea, Egypt
		Proportion of all computers used for teaching (for ISCED levels 1-3)	Tunisia
		Proportion of all computers in use for teaching for four years or less (for ISCED levels 1-3)	IADB
		Proportion of schools with a computer laboratory (for ISCED levels 1-3)	UN ECLAC (OSILAC), Republic of Korea
		Proportion of schools with computer-assisted instruction (for ISCED levels 1-3)	UN ECLAC (OSILAC)
		Proportion of computers NOT in working condition (for ISCED levels 1-3)	Ethiopia
		Proportion of all computers that are (for ISCED levels 1-3): <ul style="list-style-type: none"> o IBM-compatible o Apple o Other 	Russian Federation, Belarus, UNESCO Bangkok

Conceptual domains	Indicator	Sources (or adapted from)
	Proportion of schools with specific types of operating system (MS Windows, Apple Mac OS, UNIX etc) (for ISCED levels 1-3, level 4 and levels 5-6)	IITE, Republic of Korea, UNESCO Bangkok
	Proportion of schools with Very Small Aperture Terminal (VSAT) satellite dish (for ISCED levels 1-3)	Ethiopia
	Proportion of schools with technical facilities and software capabilities to prevent learners from accessing inappropriate content (for ISCED levels 1-3)	Republic of Korea
	Proportion of schools with computers having licensed software (for ISCED levels 1-3)	Russian Federation
	Proportion of schools with Human Resources Management software (for ISCED levels 1-3, level 4 and levels 5-6)	IADB
	Proportion of schools with financial management software (for ISCED levels 1-3, level 4 and levels 5-6)	IADB
	Proportion of schools with an internal or external student tracking management software (record keeping, promotion, attendance, etc) (for ISCED levels 1-3, level 4 and levels 5-6)	IADB
	Proportion of schools with an online student services accessible to parents and/or guardians (for ISCED levels 1-3, level 4 and levels 5-6)	IADB
	Proportion of schools sharing ICT facilities (for ISCED levels 1-3, level 4 and levels 5-6)	Paraguay
	Proportion of schools with an audiovisual laboratory or centre (for ISCED levels 1-3)	Dominican Republic
	Teachers-to-computer ratio (for ISCED levels 1-3)	Republic of Korea
Teaching staff development	Proportion of teachers delivering subjects via internet-assisted distance education programmes (for ISCED levels 1-3, level 4 and levels 5-6)	Estonia
	Proportion of teachers having ICT competencies by type (for ISCED levels 1-3) <ul style="list-style-type: none"> ○ Basic ICT skills ○ Advanced ICT skills ○ ICT integration skills ○ Troubleshooting skills ○ Networking skills ○ Content development skills 	Ghana, UNESCO Bangkok
	Proportion of teachers registered in national or local ICT-related professional associations (for ISCED levels 1-3, level 4 and levels 5-6)	Republic of Korea
	Proportion of ICT trained administrators (for ISCED levels 1-3, level 4 and levels 5-6)	IADB, IITE
	Proportion of schools with in-house pedagogical-support for teachers to incorporate ICT in their curriculum (for ISCED levels 1-3)	IADB
Public-private partnership	Proportion of private schools having government incentives to support their ICT in education initiatives (for ISCED levels 1-3)	UNESCO Bangkok
	Proportion of schools participating in corporate alliances to deliver ICT-assisted instruction (for ISCED levels 1-3, level 4 and levels 5-6)	Costa Rica, Guatemala

Conceptual domains		Indicator	Sources (or adapted from)
Curriculum	Average number of yearly hours dedicated to student training on (for ISCED levels 1-3):	<ul style="list-style-type: none"> o Word-processing, o Spreadsheets, o Presentations, etc. 	IADB, UNESCO Bangkok
	Proportion of educational institutions specialized in ICT fields or ICT training (for ISCED level 4 and levels 5-6)		Republic of Korea, Egypt
	Proportion of schools with nationally produced content of educational software for teaching subject(s) (for ISCED levels 1-3, level 4 and levels 5-6)		UNESCO Bangkok
	Proportion of schools with externally produced content of educational software for teaching basic computer skills (for ISCED levels 1-3, level 4 and levels 5-6)		UNESCO Bangkok
	Proportion of schools with at least one unit of special software for (for ISCED levels 1-3, level 4 and levels 5-6):	<ul style="list-style-type: none"> o administrative use o school library o psychological monitoring o teaching at elementary school o teaching natural sciences o teaching humanitarian subjects 	Belarus
	Proportion of schools offering the International Computer Driving Licence standardized test (ICDL) (for ISCED levels 1-3)		Egypt, Jordan
	Usage	Average number of weekly hours of computer use by learners Average number of weekly hours of computer use by teachers Average number of weekly hours of Internet use by learners Average number of weekly hours of Internet use by teachers	
Proportion of schools offering access to computers for their learners after school hours (for ISCED levels 1-3)			UNESCO Bangkok
Proportion of schools offering access to ICT equipment on established schedules to their communities, parents, and guardians (for ISCED levels 1-3, level 4 and levels 5-6)			IADB, Republic of Korea
Proportion of learners who use the internet for their school assignments (for ISCED levels 1-3)			Malaysia
Proportion of teachers exchanging information with parents on the school website (for ISCED levels 1-3)			Republic of Korea
Participation, skills and output		Proportion of total enrolment in ICT-related fields (for ISCED level 4 and levels 5-6)	
	Proportion of schools that participated in public initiatives promoting the use of ICT for education (for ISCED levels 1-3)		IADB
	Proportion of schools that offer ICT-related training to their communities, parents and guardians (for ISCED levels 1-3)		IADB, Republic of Korea, Uruguay
	Proportion of parents and guardians trained by schools in the basic use of ICT (for ISCED levels 1-3)		IADB

Outcomes and impact	Proportion of school directors/managers with a favourable opinion on the incremental impact of ICT on the overall performance of schools (by type of school: those currently using and those not using ICT-assisted instruction) (for ISCED levels 1-3)	UNESCO Bangkok
	Proportion of teachers with a favourable opinion on the incremental impact of ICT on the overall performance of their learners (by type of school: those currently using and those not using ICT-assisted instruction) (for ISCED levels 1-3)	UNESCO Bangkok
	Proportion of teachers with a favourable opinion on the incremental positive impact of ICT on teaching methods (by type of school: those currently using and those not using ICT-assisted instruction) (for ISCED levels 1-3)	IADB, UNESCO Bangkok
	Proportion of students not using ICT as pedagogical aids by type of school (public or private) and gender (for ISCED levels 1-3)	IADB
	Promotion rate of learners in subjects taught using ICT as pedagogical aid (for ISCED levels 1-3): <ul style="list-style-type: none"> o Mathematics o Science 	Malaysia
Equity	Annual percentage change in enrolment in ICT-related fields by gender (for ISCED level 4 and levels 5-6)	UIS
	Proportion of schools that collect fees from learners for the use of ICT (for ISCED levels 1-3, level 4 and levels 5-6)	UNESCO Bangkok
	Proportion of schools that use specialized software for learners with special needs (for ISCED levels 1-3, level 4 and levels 5-6)	Republic of Korea
	Proportion of female ICT-qualified teachers (for ISCED levels 1-3)	Republic of Korea
	Proportion of female teachers currently teaching subject(s) using ICT facilities (for ISCED levels 1-3)	Republic of Korea

d) Criteria for prioritizing indicators

Selecting indicators for monitoring international goals through comparable statistics, collected for a large number of countries, entails a complex decisionmaking process. This is particularly true in the case of ICT use in education when countries are at different stages of implementation and the information needs of policymakers may vary substantially.

The methodology used by the UIS for data collection restricts the list of indicators to those that can be obtained from school censuses. The proposed list of new indicators is most likely too extensive when considering operational, cost and methodological constraints. Therefore, users of this guide at cross-national, national and sub-national levels are invited to prioritize the key set of indicators based on the most strategic information needs of policymakers, after evaluating logistical considerations and operational implications.

Setting priorities in selecting ICT-related indicators for an internationally comparable statistical monitoring system requires:

- i) Knowledge of the information needs of major international stakeholders and policymakers who have committed to cross-national monitoring and evaluation. The two main WSIS goals (B6b: to connect universities, colleges, secondary schools and primary schools with ICTs and B6g: to adapt all primary and secondary school curricula to meet the challenges of the Information Society, taking into account national circumstances), including the MDGs, EFA and UNESCO policy frameworks, provide a good basis as a starting point for prioritization.
- ii) Minimizing the burden on respondents in order to guarantee a high response rate (ideally 80% or higher as with IEA or OECD surveys). In other words, the maximum allowable time and data compilation efforts needed for respondents to complete an international questionnaire have to be factored into the item selection. This restriction may limit the length of questionnaires and consequently the number of indicators that can be used.
- iii) Ensuring the quality of responses by minimizing the complexity of questionnaire content and layout in order to avoid potential misinterpretations of items. Translations may make it difficult to guarantee the consistency of concepts across languages.
- iv) Consideration of the statistical capacity of countries and factoring in the training needs of data providers.

Selecting indicators for an international monitoring system is often the result of a process of trade-offs and negotiations among stakeholders, national respondents and international experts, with consideration given to the policy relevance and feasibility of the exercise. This process can be greatly enhanced if, from the start of the selection process, there is a comprehensive review that provides a mapping of the conceptual framework, indicators and candidate questionnaire items, as well as dummy tables, showing what tables and/or figures in a final report will look like and what are the implications for countries in terms of data collection and processing steps.

On the basis of this information, countries can indicate in a pilot phase which questionnaire items are feasible, what implications the removal of certain questionnaire items may have, and on the basis of the required data processing procedures, whether certain questionnaire items should be simplified. One dilemma that is usually faced in this process is that one group of countries may perceive certain indicators as very policy-relevant and unproblematic, while other countries may judge the same indicators as irrelevant or too complex.

6. Conclusion

There is a need to monitor and evaluate ICT in education from its implementation to learning outcomes. There is also a concurrent demand to compare the expansion of ICT use in education and its impact on learning achievements across countries. Global monitoring of the integration, use and impact of ICT in education will allow countries to evaluate their progress towards international development goals, such as MDGs, WSIS and EFA.

Based on a review of the literature, the UIS identified key concepts from assessments where ICT usage in education was the focus either in a primary or a secondary role. The UIS also explored various conceptual frameworks in the existing assessments as a main source for establishing an operational framework that can be applied across countries to produce internationally standardized statistics on ICT use in education. The proposed framework also builds on the UIS regular education data collection methodology and mechanism with established and regularly trained national statisticians.

In addition to the above logical process, a comprehensive review and mapping of the major global policy issues as they relate to ICT use in education formed the basis for identifying the expanded list of ICT in education indicators to complement the current UIS core list. Detailed information has been provided on the definition, purpose, measurement, data source, interpretation and methodological limitations for these indicators.

Some practical considerations were outlined to prioritize the final selection of the proposed indicators. Operational considerations, such as respondent burden, cost and time required for data collection and processing, limit the type of indicators which can be readily produced.

Supplementary indicators have been suggested by UIS partners and pilot countries to further monitor developments in this field. Once these supplementary indicators are fully specified, experimented and proven robust for comparison within a cross-national context, they will be further updated and refined through this guide.

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APPENDIX I

Prototype Questionnaire on Statistics of ICT in Education

The prototype questionnaire presents potential candidate items for the new UIS ICT in education questionnaire to be rolled out in 2010 after thorough pilot testing. Once it has been reviewed in consultation with various experts and focal points in pilot countries, all non-applicable items will be tagged and the questionnaire will be amended to the professional design standards of all UIS regular questionnaires.

Country: _____

QUESTIONNAIRE ON STATISTICS OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT) IN EDUCATION

Through this pilot questionnaire, the UNESCO Institute for Statistics (UIS) seeks to collect recent data on information and communication technologies (ICTs) in education in order to produce an expanded set of indicators on key aspects in this field. As a member of the International Working Group on ICT Statistics in Education (WISE), your participation in the pilot phase will contribute to examining the feasibility of a worldwide rollout of the current questionnaire.

Please use the following symbols in the tables if you do not have the data requested:

a = category is not applicable

m = data missing (or not available)

n = quantity nil

x = data included in another category (to be indicated with a footnote)

Please indicate any provisional or estimated figures with an asterisk (*).

Data reported in this questionnaire should refer to the school year ending in 2008; otherwise use the latest year available. Please indicate the reference year below.

Data reference year: _____

For consistency and comparability, all data reported in this questionnaire should refer to the same reference year. In the case that certain data refer to another year, please place a footnote to indicate the year referenced.

NB: Please refer to the Instruction Manual before completing the tables.

- Please return the completed questionnaire before **31 August 2009** to:

UNESCO Institute for Statistics
(Ref.: Communication Statistics)
P.O. Box 6128, Succursale Centre-Ville
Montreal, Quebec H3C 3J7
CANADA

E-mail:

Fax:

- If you have any queries concerning the questionnaire, please contact the UIS by e-mail, fax (indicated above) or telephone: (1 514) 343-6880.

RESPONDENT INFORMATION

Please provide details below of the person responsible for completing this questionnaire.

Respondent 1:

Family name: First name: Male Female
Job title (or position):
Department, division or sector (if any):
Organization:
Mailing address:
City: Postal code:
Country: Fax: ()
Telephone: () Email:
Mobile phone: () Institutional website:

If another ministry or department also plays a major role in providing data on ICT in education, please provide the details below.

Respondent 2:

Family name: First name: Male Female
Job title (or position):
Department, division or sector (if any):
Organization:
Mailing address:
City: Postal code:
Country: Fax: ()
Telephone: () Email:
Mobile phone: () Institutional website:

SECTION A. GENERAL INFORMATION

POLICY

A.1 Does your country have a national policy, plan or regulatory mechanism for ICT in education?

Yes No

If the answer to Question A.1 is **yes**, please tick all ISCED levels that are covered:

ISCED 1	ISCED 2	ISCED 3	ISCED 4	ISCED 5 and 6
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

A.2 Irrespective of the existence of ICT policies covered in Questions A.1, are there any independent initiatives to introduce ICT in educational institutions from the following entities? (Please tick all cases that apply.)

Local government authorities (provincial, district, etc.)	Bilateral or multilateral donors	School management board or parent-teacher associations	Foundations or private institutions	INGOs or NGOs	Others
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If 'Others' is ticked, please specify: _____

A.3 Please indicate which of the following government incentives exist to support ICT in education: (Please tick all cases that apply.)

Tax waivers on ICT equipment	Free license for educational software	Salary bonuses for teachers of ICT courses	Tuition rebates for students registered in ICT fields	Others
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If 'Others' is ticked, please specify: _____

A.4 Please indicate if any existing policies on ICT in education contain pro-equity provisions in favour of: (Please tick all cases that apply.)

Gender	Poor groups	Rural areas	Persons with special needs	HIV-affected target groups	Others
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If 'Others' is ticked, please specify: _____

A.5 Please indicate if any existing policies on ICT in education contain provisions for priority in favour of any of the following types of education: (Please tick all cases that apply.)

Teacher education	Vocational training	Distance education in tertiary	Others
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If 'Others' is ticked, please specify: _____

CURRICULUM

A.6 Does your country's educational curriculum recommend ICT-assisted instruction to form part of subject delivery at specific grade(s)?

Yes No

If the answer to Question A.6 is **yes**, please tick all grades that apply by subject:

		Primary and secondary grades (ISCED 1, 2 and 3)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A.6a	Mathematics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A.6b	Sciences	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A.6c	Basic computer skills (or computing)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A.6d	Languages	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A.6e	Arts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

A.7 Does your country's educational curriculum recommend an average number of hours per week for the delivery of classes using ICT?

Yes No

If the answer to Question A.7 is **yes**, please indicate the average number of hours per week of ICT-assisted training at each grade by subject:

		Primary and secondary grades (ISCED 1, 2 and 3)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A.7a	Mathematics															
A.7b	Sciences															
A.7c	Basic computer skills (or computing)															
A.7d	Languages															
A.7e	Arts															

A.8 Does your country's educational curriculum recommend an average number of hours per week for individual usage by learners of the following ICT services?

Yes No

If the answer to Question A.8 is **yes**, please indicate the average number of hours per week of individual ICT usage at each grade and for each service:

		Primary and secondary grades (ISCED 1, 2 and 3)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A.8a	Exercises on computer using educational software															
A.8b	Exercises on computer using the Internet															
A.8c	Radio (Interactive Radio Instruction)															
A.8d	Television															
A.8e	Others															

For 'Others', please specify: _____

SECTION B. FINANCE

B.1 Finance data should be reported in the national currency. Please specify the national currency: _____

B.2 Please indicate the monetary unit used in Table B.5 by ticking one box below:

Units Hundreds Thousands Millions Billions

B.3 Finance data should refer to the financial year ending in 2008; otherwise use the latest year available. Please indicate the reference period for the reported data:

Financial year ended in (month/year) 200.....

B.4 Data provided in Table B.5 should refer to actual expenditure. If actual expenditure is not available, please provide budget allocations. Please tick one box below to indicate which kind of data are reported:

Actual expenditure Budget allocation

B.5 Please indicate expenditure in national currency by ISCED grouping.

Expenditure by source		Primary and secondary education (ISCED 1, 2 and 3)	Post-secondary non-tertiary education (ISCED 4)	Tertiary education (ISCED 5 and 6)
B.5.1	Total government expenditure on education (current and capital)			
B.5.1.1	of which: Total government current expenditure on education			
B.5.1.1.1	of which: Total government current expenditure on ICT in education			
B.5.1.2	of which: Total government capital expenditure on education			
B.5.1.2.1	of which: Total government capital expenditure on ICTs in education			
B.5.1.3	of which: Total government expenditure (capital and current) on ICTs in education (B.5.1.1.1 + B.5.1.2.1)			
B.5.2	Total private expenditure (current and capital) on ICTs in education			
B.5.2.1	of which: Total private current expenditure on ICTs in education			
B.5.2.2	of which: Total private capital expenditure on ICTs in education			
B.5.3	Total expenditure on ICTs in education from international (foreign) sources			
B.5.3.1	of which: Total current expenditure on ICTs in education from international (foreign) sources			
B.5.3.2	of which: Total capital expenditure on ICTs in education from international (foreign) sources			

SECTION C. INSTITUTIONS AND ICT FACILITIES

C.1 Please provide data on all national educational institutions by ISCED level and programme orientation.

ISCED level		Primary and secondary (ISCED 1-3)		Post-secondary non-tertiary (ISCED 4)		All technical and vocational programmes (ISCED 2C, 3C, 4B)	Tertiary (ISCED 5 & 6)		
		All programmes	of which: technical / vocational	All programmes	of which: technical / vocational		All programmes (5A, 5B, & 6)	of which:	
Programme orientation							ISCED 5 (A&B)	Teacher education programmes	Distance education programmes
C.1	Number of educational institutions	Total							
		Public							
C.1.1	Number of educational institutions with electricity	Total							
		Public							
C.1.2	Number of educational institutions with a telephone communication facility	Total							
		Public							
C.1.3	Number of educational institutions with radio-assisted instruction	Total							
		Public							
C.1.4	Number of educational institutions with television-assisted instruction	Total							
		Public							
C.1.5	Number of educational institutions with computer-assisted instruction	Total							
		Public							
C.1.6	Number of educational institutions with Internet-assisted instruction	Total							
		Public							
C.1.7	Number of educational institutions with ICT-assisted instruction	Total							
		Public							
C.1.8	Number of educational institutions located in rural areas	Total							
		Public							
C.1.8.1	of which: Number of educational institutions in rural areas with ICT-assisted instruction	Total							
		Public							

ISCED level		Primary and secondary (ISCED 1-3)		Post-secondary non-tertiary (ISCED 4)		All technical and vocational programmes (ISCED 2C, 3C, 4B)	Tertiary (ISCED 5 & 6)			
		All programmes	of which: technical / vocational	All programmes	of which: technical / vocational		All programmes (5A, 5B, & 6)	of which:		Distance education programmes
Programme orientation								ISCED 5 (A&B)	Teacher education programmes	
C.1.9	Number of educational institutions with access to the Internet	Total								
		Public								
C.1.9.1	of which: Number of educational institutions with fixed narrowband Internet only	Total								
		Public								
C.1.9.2	of which: Number of educational institutions with fixed broadband Internet only	Total								
		Public								
C.1.9.3	of which: Number of educational institutions with both fixed narrowband and fixed broadband Internet	Total								
		Public								
C.1.10	Number of educational institutions with a website	Total								
		Public								
C.1.10.1	of which: Number of educational institutions with a website hosting students' and teachers' blog pages	Total								
		Public								
C.1.11	Number of educational institutions providing an email account to all learners	Total								
		Public								
C.1.12	Number of educational institutions providing an email account to all teachers	Total								
		Public								
C.1.13	Number of educational institutions owning licences or having paid or free subscriptions to educational and research digital resources	Total								
		Public								
C.1.13.1	of which: scientific digital libraries	Total								
		Public								
C.1.13.2	of which: virtual experiment laboratories	Total								
		Public								
C.1.14	Number of educational institutions having ICT support services	Total								
		Public								

ISCED level		Primary and secondary (ISCED 1-3)		Post-secondary non-tertiary (ISCED 4)		All technical and vocational programmes (ISCED 2C, 3C, 4B)	Tertiary (ISCED 5 & 6)		
		All programmes	of which: technical / vocational	All programmes	of which: technical / vocational		All programmes (5A, 5B, & 6)	of which:	
Programme orientation						ISCED 5 (A&B)		Teacher education programmes	Distance education programmes
C.2	Number of computers available	Total							
		Public							
C.2.1	of which: Number of computers strictly for pedagogical use	Total							
		Public							
C.2.1.1	of which: Number of computers strictly owned by educational institutions for pedagogical use	Total							
		Public							
C.2.1.2	of which: Number of student-owned computers (owned by learners) as part of their mandatory pedagogical kits	Total							
		Public							
C.2.2	of which: Number of computers strictly for administrative use	Total							
		Public							
C.2.3	of which: Number of computers for both pedagogical and administrative use	Total							
		Public							
C.2.4	of which: Number of computers connected to the Internet	Total							
		Public							

SECTION D. TEACHERS

D.1 Please provide actual headcounts of teachers by ISCED level and programme orientation.

ISCED level		Primary and secondary (ISCED 1-3)		Post-secondary non-tertiary (ISCED 4)		All technical and vocational programmes (ISCED 2C, 3C, 4B)	Tertiary (ISCED 5 & 6)		
		All programmes	of which: technical / vocational	All programmes	of which: technical / vocational		All programmes (5A, 5B, & 6)	of which:	
Programme orientation							ISCED 5 (A&B)	Teacher education programmes	Distance education programmes
D.1	Number of teachers	Total							
		Female							
		Public							
D.1.1	of which: Number of teachers trained via ICT-enabled distance education programmes	Total							
		Female							
		Public							
D.1.2	of which: Number of teachers who teach basic computer skills (or computing)	Total							
		Female							
		Public							
D.1.3	of which: Number of teachers trained to teach basic computer skills (or computing)	Total							
		Female							
		Public							
D.1.4	of which: Number of teachers currently teaching subject(s) using ICT facilities	Total							
		Female							
		Public							
D.1.5	of which: Number of teachers trained to teach subject(s) using ICT facilities	Total							
		Female							
		Public							

SECTION E. LEARNERS

ENROLMENT

E.1 Please provide data on enrolment by ISCED level and programme orientation.

ISCED level			Primary and secondary (ISCED 1-3)		Post-secondary non-tertiary (ISCED 4)		All technical and vocational programmes (ISCED 2C, 3C, 4B)	Tertiary (ISCED 5 & 6)		
			All programmes	of which: technical / vocational	All programmes	of which: technical / vocational		All programmes (5A, 5B, & 6)	of which:	
Programme orientation								ISCED 5 (A&B)	Teacher education programmes	Distance education programmes
E.1	Number of learners	Total								
		Female								
		Public								
E.1.1	of which: Number of learners entitled to use computer laboratories at school as pedagogical aid	Total								
		Female								
		Public								
E.1.2	of which: Number of learners entitled to use Internet laboratories at school as pedagogical aid	Total								
		Female								
		Public								
E.1.3	of which: Number of learners enrolled in grades with ICT-assisted instruction	Total								
		Female								
		Public								
E.1.4	of which: Number of learners enrolled in grades at which basic computer skills (or computing) are currently taught	Total								
		Female								
		Public								
E.1.5	of which: Number of learners enrolled in ICT-related fields	Total								
		Female								
		Public								
E.2	Number of learners enrolled in ICT-related fields in the previous academic year	Total								
		Female								
		Public								
E.2.1	Number of graduates from ICT-related fields in the previous academic year	Total								
		Female								
		Public								

PROMOTION BY GRADE

E.2 Please provide data on the enrolment and promotion of learners by grade.

ISCED level		Primary and secondary (ISCED 1-3)														
Grades		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
E 3	Number of learners enrolled during the last academic year	Total														
		Female														
		Public														
E 3.1	of which: Number of learners enrolled only in grades with ICT-assisted instruction during the last academic year	Total														
		Female														
		Public														
E 3.2	of which: Number of learners enrolled in the grades where basic computer skills were taught during the last academic year	Total														
		Female														
		Public														
E 4	Number of learners promoted from the <u>previous</u> grades at the end of last academic year (t-1)	Total														
		Female														
		Public														
E 4.1	of which: Number of learners promoted only from previous grades with ICT-assisted instruction at the end of last academic year (t-1)	Total														
		Female														
		Public														
E 4.2	of which: Number of learners who successfully completed a basic computer skills course in <u>previous</u> grades at the end of last academic year (t-1)	Total														
		Female														
		Public														

APPENDIX II

Definitions

ALL PROGRAMMES	
<p>Questionnaire item:</p> <p>Table headings for Section C, D and E</p>	<p>Definition:</p> <p>All programmes include both general education as well as technical and vocational education programmes. See corresponding definitions.</p>
<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records)</p>	<p>Data source:</p> <p>Statistical unit of the Ministry of Education or, alternatively, national statistical office.</p>
BASIC COMPUTER SKILLS	
<p>Questionnaire item:</p> <p>A.6, A.7, D.1.2, D.1.3, E.1.4, E.3.2, E.4.2</p>	<p>Definition:</p> <p>Basic computer skills is a curriculum module that covers the most common usages of a computer, including a majority or all of the following: understanding the basic notions of computer manipulation; managing computer files, word processing, using spreadsheets and databases; creating presentations; finding information and communicating using computers; and being aware of social and ethical implications of Internet use.</p> <p>From a statistical perspective, nationally-defined content of such modules 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 a basic computer skills course.</p> <p>Basic computer skills may be taught as a separate subject or integrated into other subjects. A common standard applied by a growing number of countries is the International Computer Driving Licence (ICDL) assessment system, which is derived from the European Computer Driving Licence (ECDL).</p>
<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records)</p>	<p>Data source:</p> <p>Statistical unit of the Ministry of Education or, alternatively, national statistical office.</p>
BLOG PAGE	
<p>Questionnaire item:</p> <p>C.10.1</p>	<p>Definition:</p> <p>A blog page, in the current context, is a website that allows collaborative and interactive learning between learners and with their teachers affiliated (or not) to the same educational institution through uploads of texts, documents, images or videos... on specific subject(s) of pedagogical interest.</p> <p>From a statistical perspective, only educational institutions that have a clear policy to host such blog page are to be counted.</p>
<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records)</p>	<p>Data source:</p> <p>Statistical unit of the Ministry of Education or, alternatively, national statistical office.</p>

CAPITAL EXPENDITURE	
Questionnaire item: B.5.1.2	Definition: 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. <i>Source: UIS Instruction Manual for Completing the Questionnaires on Statistics of Education</i>
Method of collection: Extract data from financial statements or budget documents.	Data source: Budget or accounts of the finance department of the Ministry of Education or, alternatively, the national statistical office or Finance Ministry.
CAPITAL EXPENDITURE ON ICT IN EDUCATION	
Questionnaire item: B.5.1.2.1, B.5.2.2, B.5.3.2	Definition: Capital expenditure on ICT in education is expenditure on ICT assets within the context of educational institutions that last longer than one year. It includes expenditure on construction, renovation and major repairs of infrastructure (e.g. computer or audiovisual laboratories), computer networks, main telephone lines, cable installations, satellite dishes and other ICT equipment. Capital expenditure on the acquisition of computers, servers, audiovisual materials, radio sets, television sets and other related ICT equipment that last longer than one year is also included. <i>Source: Adapted from the UIS Instruction Manual for Completing the Questionnaires on Statistics of Education</i>
Method of collection: Extract data from financial statements or budget documents.	Data source: Budget or accounts of the finance department of the Ministry of Education or, alternatively, the national statistical office or Finance Ministry.
COMPUTER	
Questionnaire item: C.2, C.2.1, C.2.1.1, C.2.1.2, C.2.2, C.2.3, C.2.4	Definition: Computer refers to a programmable electronic device that can store, retrieve and process data, as well as share information in a highly-structured manner. It performs high-speed mathematical or logical operations according to a set of instructions. When providing data on the number of computers, personal computers (PCs), laptops, notebooks, terminals connected to mainframes and mini-computers intended for shared use should be included. Source: Adapted from <i>Revisions and Additions to the Core List of ICT Indicators – Partnership on Measuring ICT for Development</i>
Method of collection: Administrative data collection through annual school census (or extract data from school records)	Data source: Statistical unit of the Ministry of Education or, alternatively, national statistical office.

COMPUTER-ASSISTED INSTRUCTION

Questionnaire item:

C.1.5

Definition:

Computer-assisted instruction is an interactive learning method in which a computer is used to present instructional material, monitor learning and help in selecting and accessing 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.

Source: Adapted from *Revisions and Additions to the Core List of ICT Indicators – Partnership on Measuring ICT for Development*

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical units of the Ministry of Education or, alternatively, national statistical office.

COMPUTER LABORATORY

Questionnaire item:

E.1.1

Definition:

Computer laboratory is a room or space equipped with computers (networked or not) devoted to pedagogical use in an educational institution or school library. A computer laboratory differs from an 'Internet café' because its usage is in theory safe from any disruptive, non-pedagogical content and users need authorized access credentials. 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.

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

COMPUTERS FOR ADMINISTRATIVE USE

Questionnaire item:

C.2.2, C.2.3

Definition:

Computers for administrative use refer to computers used by non-teaching staff to assist with school management. Such usage may include record-keeping or data processing and analysis of registration and daily attendance in classes, teaching and non-teaching staff, physical school facilities, budget and expenditure data, and assessment results. It also includes planning of programmes and deployment of human, material and financial resources. It may involve secretarial usage through word processing, as well as communications with external bodies or parents through emails.

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

COMPUTING	
<p>Questionnaire item:</p> <p>D.1.2, D.1.3, E.1.4</p>	<p>Definition:</p> <p>Computing refers to a course programme usually taught at ISCED 4, 5 or 6 levels. Some schools may also teach computing (mainly computer programming) at ISCED 3. Typical computing course content may include: system design, computer programming, data processing, networks, operating systems and software development. Computing does not include computer hardware design, construction and production.</p> <p>Source: Adapted from <i>International Standard Classification of Education (ISCED97)</i></p>
<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records)</p>	<p>Data source:</p> <p>Statistical unit of the Ministry of Education or, alternatively, national statistical office.</p>
CURRENT EXPENDITURE	
<p>Questionnaire item:</p> <p>B.5.1.1</p>	<p>Definition:</p> <p>Current expenditure is expenditure on goods and services consumed within the current year and which may need to be renewed for subsequent year(s).</p> <p>Source: <i>Instruction Manual for Completing the Questionnaires on Statistics of Education</i></p>
<p>Method of collection:</p> <p>Extract data from financial statements or budget documents.</p>	<p>Data source:</p> <p>Budget or accounts of the finance department of the Ministry of Education or, alternatively, the national statistical office or Finance Ministry.</p>
CURRENT EXPENDITURE ON ICT IN EDUCATION	
<p>Questionnaire item:</p> <p>B.5.1.1.1, B.5.2.1, B.5.3.1</p>	<p>Definition:</p> <p>Current expenditure on ICT in education is expenditure on goods and services for operating ICT-assisted instruction which are consumed within the current year and which may need to be renewed for subsequent year(s).</p> <p>Source: Adapted from the <i>UIS Instruction Manual for Completing the Questionnaires on Statistics of Education</i></p>
<p>Method of collection:</p> <p>Extract data from financial statements or budget documents.</p>	<p>Data source:</p> <p>Budget or accounts of the finance department of the Ministry of Education or, alternatively, the national statistical office or Finance Ministry.</p>
CURRICULUM	
<p>Questionnaire item:</p> <p>A.6, A.7, A.8</p>	<p>Definition:</p> <p>Curriculum refers to the design, planning and sequencing of teaching and learning processes. It includes a statement of purpose, contents, activities and learning practices, as well as the modalities for assessing learners' achievements.</p>
<p>Method of collection:</p> <p>Extract information from official documents on primary and secondary school curricula.</p>	<p>Data source:</p> <p>Department agency under the Ministry of Education in charge of policy and/or primary and secondary school curricula.</p>

DISTANCE EDUCATION IN TERTIARY

Questionnaire item:

A.5

Definition:

Distance education in tertiary refers to ICT-enabled distance education programmes offered at ISCED levels 5 and 6. (See also definition for ICT-enabled distance education programme.)

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

EDUCATIONAL AND RESEARCH DIGITAL RESOURCES

Questionnaire item:

C.1.13

Definition:

Educational and research digital resources refer to electronic collections of pedagogical material (e.g. e-books, scientific journals, databases, virtual laboratories and educational software) to which educational institutions have subscribed (free of charge or paid) or collections of the institution's own digitized pedagogical resources which are hosted in their electronic repositories. (See definitions for scientific digital libraries and virtual experiment laboratories.)

Method of collection:

Administrative data collection through annual school census or surveys of educational institutions (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

EDUCATIONAL INSTITUTIONS

Questionnaire item:

C.1, C.1.1, C.1.2, C.1.3, C.1.4, C.1.5, C.1.6, C.1.7, C.1.8, C.1.8.1, C.1.9, C.1.9.1, C.1.9.2, C.1.9.3, C.1.10, C.1.10.1, C.1.11, C.1.12, C.1.13, C.1.13.1, C.1.13.2, C.1.14

Definition:

Educational institutions or schools are established institutions, which have the provision of education as their sole or main purpose. Such institutions are normally accredited or sanctioned by a 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 for profit and non-profit.

Source: Adapted from the *UIS Instruction Manual for Completing the Questionnaires on Statistics of Education*

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

ELECTRICITY	
<p>Questionnaire item:</p> <p>C.1.1</p>	<p>Definition:</p> <p>Electricity refers to permanent sources of power (e.g. grid/mains connection, wind, water, solar and permanently fuel-powered generator, etc.) that enable the adequate and sustainable use of ICT infrastructure for educational purposes.</p> <p>Source: Adapted from <i>Revisions and Additions to the Core List of ICT Indicators – Partnership on Measuring ICT for Development</i></p>
<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records)</p>	<p>Data source:</p> <p>Statistical unit of the Ministry of Education or, alternatively, national statistical office.</p>
EMAIL ACCOUNT	
<p>Questionnaire item:</p> <p>C.1.11, C.1.12</p>	<p>Definition:</p> <p>Email account refers to an individualized user name for each learner or teacher with a domain (or host name).</p> <p>From a statistical perspective, only educational institutions that have a policy to provide individualized email accounts for all learners (or all teachers) should be counted.</p>
<p>Method of collection:</p> <p>Administrative data collection through annual school census or surveys of educational institutions at ISCED levels 4, 5 and 6 (or extract data from the records of these educational institutions)</p>	<p>Data source:</p> <p>Statistical unit of the Ministry of Education or, alternatively, national statistical office.</p>
ENROLLED	
<p>Questionnaire item:</p> <p>E.1, E.1.1, E.1.2, E.1.3, E.1.4, E.1.5, E.2, E.3, E.3.1, E.3.2</p>	<p>Definition:</p> <p>Enrolled refers to a learner registered in a grade or programme of study at an educational institution who met enrolment prerequisites at the registration date.</p>
<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records)</p>	<p>Data source:</p> <p>Statistical unit of the Ministry of Education or, alternatively, national statistical office.</p>
ENTITLED TO USE	
<p>Questionnaire item:</p> <p>E.1.1, E.1.2</p>	<p>Definition:</p> <p>Entitled to use refers to learners who are enrolled in a grade in which the official school curriculum prescribes the use of computer or Internet laboratories for ICT-assisted instruction.</p> <p>From a statistical perspective, count total enrolment for grades that have ICT-assisted instruction; the schools concerned must have laboratories with computers (connected to the Internet) in relatively adequate numbers and good working condition according to national requirements.</p>
<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records)</p>	<p>Data source:</p> <p>Statistical unit of the Ministry of Education or, alternatively, national statistical office.</p>

FIXED BROADBAND INTERNET

Questionnaire item:

C.1.9.2, C.1.9.3

Definition:

Fixed broadband Internet refers to high-speed connectivity for public use of at least 256 Kbit/s or more in one or both directions (downloading and uploading). It includes cable modem Internet connections, DSL Internet connections of at least 256 Kbit/s or higher, fibre and other fixed broadband technology connections (such as satellite broadband Internet, Ethernet LANs, fixed-wireless access, Wireless Local Area Network, WiMAX, etc.).

Private Internet connectivity within educational institutions via mobile phone networks is excluded.

Source: Adapted from *Revisions and Additions to the Core List of ICT Indicators – Partnership on Measuring ICT for Development*

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

FIXED NARROWBAND INTERNET

Questionnaire item:

C.1.9.1, C.1.9.3

Definition:

Fixed narrowband Internet refers to connectivity for public use via 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 a download speed of less than 256 Kbit/s.

Source: Adapted from *Revisions and Additions to the Core List of ICT Indicators – Partnership on Measuring ICT for Development*

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

FOUNDATION

Questionnaire item:

A.2

Definition:

Foundation refers to an independent entity that is set up by an individual or group of individuals for a philanthropic purpose.

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

GENERAL EDUCATION

Questionnaire item:

Sections C, D and F

Definition:

General education is designed mainly to provide learners with a deeper understanding of a subject or group of subjects, especially – but not necessarily – with a view to preparing learners for further education at the same or higher level. Such programmes are typically school-based and may or may not contain vocational elements. Successful completion of such programmes may lead to an academic qualification. However, successful completers typically cannot enter a particular occupation, trade or class of occupations or trades without further training. Programmes with a general orientation and not focused on a particular specialization should be classified in this category.

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

GRADUATES

Questionnaire item:

E.2.1

Definition:

Graduates are learners who have successfully completed the final year of a level or sub-level of education. In some countries, learners graduate after passing an examination or a series of examinations. In other countries, they graduate after accumulating a requisite number of course hours. Or they may graduate after meeting both types of completion requisites.

Source: Adapted from the UIS online glossary

Method of collection:

Administrative data collection through annual school census or survey of tertiary educational institutions at ISCED levels 4, 5 and 6 (or extract data from school records).

Data source:

Statistical units of ministries/departments/agency responsible for education at ISCED levels 4, 5 and 6 or, alternatively, the national statistical office.

ICT SUPPORT SERVICES

Questionnaire item:

C.1.14

Definition:

ICT support services refer to a range of services implemented by educational institutions in order to ensure permanence and performance of facilities for operating ICT-assisted instruction without discontinuity. The implementation of such services may imply operational or administrative measures to support the sustainability of ICT-assisted operations by assigning a designated unit or staff member to the task or granting renewable quarterly, bi-quarterly or yearly contract(s) to private service provider(s). Key objectives behind the use of ICT support services by schools may include:

- ascertaining that every pedagogic and administrative unit, including special needs and library units, identifies its requirements for ICT provision;
- coordinating the effective use of ICT across the whole curriculum and encouraging aspects of cross-curricular planning;
- helping pedagogic and administrative units to consider how ICT can support the teaching and learning of subjects other than computing and what those subjects can contribute to the teaching and learning of ICT skills;
- monitoring on behalf of the senior leadership team how equipment and software are accommodated, acquired, maintained and replaced, and how they are stored, accessed and used by learners 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 ICT in their subjects, in line with school policy and practices; and
- managing the school's ICT technician and network manager, etc.

From a statistical perspective, irrespective of the modalities for acquiring such services either through one or multiple means, the sole existence of such regular or renewable contracted services in an educational institution implies the presence of ICT support services.

Source: Adapted from the Department for Children, Schools and Families

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

ICT-ASSISTED INSTRUCTION

Questionnaire item:

A.6, C.1.7, C.1.8.1, E.1.3, E.3.1, E.4.1

Definition:

ICT-assisted instruction refers to teaching methods or models of instruction delivery that employ ICT in supporting, enhancing and enabling course content delivery. It includes any, all or combinations of the following: radio-, television-, computer- and Internet-assisted instruction.

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

ICT-ENABLED DISTANCE EDUCATION PROGRAMMES

<p>Questionnaire item:</p> <p>D.1.1</p>	<p>Definition:</p> <p>ICT-enabled distance education programmes refer to programmes or instructional systems that use ICT (Internet, radio sets, television sets, personal computers, audiovisual material or print material to a minimal degree) to deliver all or a significant portion of teaching to learners removed in space and time. Distance education can take a variety of forms, which include:</p> <ul style="list-style-type: none"> • Internet-based distance learning either synchronously or asynchronously; • Telecourse or broadcast-based education, in which content is delivered via radio or television; • CD-ROM or DVD-based self-learning in which the learners interacts with computer content stored on a CD-ROM or DVD; • Mobile devices-based learning where the learner accesses course content stored on a mobile device or through a wireless server; and • Integrated distance learning, combining live versus recorded delivery modes, individualized interaction versus group instruction through various channels, and/or print materials to a minimal degree, etc. <p>...but exclude:</p> <ul style="list-style-type: none"> • Correspondence-based distance learning conducted exclusively through postal-mail.
<p>Method of collection:</p> <p>Administrative data collection through annual school census or survey of tertiary educational institutions (or extract data from records of tertiary educational institutions).</p>	<p>Data source:</p> <p>Statistical units of ministries/departments/agency responsible for education at ISCED levels 4, 5 and 6 or, alternatively, the national statistical office.</p>

ICT-RELATED FIELDS

<p>Questionnaire item:</p> <p>E.1.5, E.2, E.2.1</p>	<p>Definition:</p> <p>ICT-related fields include any of the following four fields of education and training:</p> <ul style="list-style-type: none"> • 'Audiovisual techniques and media production' is the study of techniques and the acquisition of skills to produce books, newspapers, radio/television programmes, films/videos, recorded music and graphic reproduction with ICT. It includes programmes in methods of colour reproduction, photography and computer graphics, as well as the layout for pictures, words and decorations in the production of books, magazines, posters, advertisements, etc. • 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. <p>Source: For a detailed breakdown of ICT-related fields, please refer to Appendix III</p>
<p>Method of collection:</p> <p>Administrative data collection through annual census or surveys of educational institutions at ISCED levels 4, 5 and 6 (or extract data from records of educational institutions).</p>	<p>Data source:</p> <p>Statistical units of ministries of education or, alternatively, national statistical offices.</p>

INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT)

Questionnaire item:

Standard terminology across the questionnaire

Definition:

For the purpose of statistical reporting and in the context of this guide, information and communication technologies (ICT) is defined as a diverse set of technological tools and resources used to transmit, store, create, share or exchange information. These technological tools and resources include computers, the Internet (websites, blogs and emails), live broadcasting technologies (radio, television and webcasting), recorded broadcasting technologies (podcasting, audio and video players, and storage devices) and telephony (fixed or mobile, satellite, visio/video-conferencing, etc.).

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

INGOS OR NGOS

Questionnaire item:

A.2

Definition:

INGOs or NGOs are international non-governmental organizations (INGOs) and non-governmental organizations (NGOs) which refer to non-profit institutions (including religious organizations) which may develop, finance or implement activities in the domain of ICT in education as either their primary or secondary mission.

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

INTERNET

Questionnaire item:

C.1.9, C.1.9.1, C.1.9.2, C.1.9.3

Definition:

Internet refers to worldwide interconnected networks that enable users to share information in an interactive format – referred to as hypertext – through multiple wired or wireless receivers (personal computers, laptops, PDAs, Smartphones, etc.). (See also definitions for fixed narrowband Internet and fixed broadband Internet.)

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

INTERNET-ASSISTED INSTRUCTION

Questionnaire item:

C.1.6

Definition:

Internet-assisted instruction refers to an interactive learning method using the Internet to deliver instructional materials on a computer or through other devices, in accordance with learners' pedagogical needs. This mode of instruction helps to develop autonomy in research activities and information literacy skills.

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

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

INTERNET LABORATORY

Questionnaire item:

E.1.2

Definition:

Internet laboratory is a room or space in an educational institution or school library with computers connected to the Internet and devoted to pedagogical use. 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 Internet for educational purposes.

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

ISCED LEVELS

Questionnaire item:

Table heading

Definition:

ISCED levels are defined in the 1997 version of the *International Standard Classification of Education (ISCED97)* maintained by UNESCO. Levels of education are classified 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)

Source: *International Standard Classification of Education (ISCED97)*. For a detailed breakdown of ISCED levels, please refer to Appendix III.

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

LEARNERS	
Questionnaire item: E.1, E.1.1, E.1.2, E.1.3, E.1.4, E.1.5, E.2, E.3, E.3.1, E.3.2, E.4, E.4.1, E.4.2	Definition: Learners refer to students enrolled in programmes at educational institutions. Source: Adapted from the <i>UIS Instruction Manual for Completing the Questionnaires on Statistics of Education</i>
Method of collection: Administrative data collection through annual school census (based on school registers)	Data source: Statistical unit of the Ministry of Education or, alternatively, national statistical office.
LEARNERS PROMOTED	
Questionnaire item: E.4, E.4.1, E.4.2	Definition: Learners promoted refer to learners who have successfully completed a grade in academic year $t-1$ and have passed to the next grade in the following academic year t . In education systems where dropouts are not permitted or negligible, data on promotees can be estimated by subtracting the number of repeaters from the total enrolment for academic year t .
Method of collection: Administrative data collection through annual school census (or extract data from school records)	Data source: Statistical unit of the Ministry of Education or, alternatively, national statistical office.
PARENT-TEACHER ASSOCIATION (PTA)	
Questionnaire item: A.2	Definition: Parent-teacher association (PTA) is a non-profit entity that consists of learners' parents (or their legal guardians), teachers and other administrative school staff. The aim of a PTA is usually to promote participation of parents (or guardians) in school-level decisionmaking and sponsor or facilitate fundraising initiatives for supplemental educational materials.
Method of collection: Administrative data collection through annual school census (or extract data from school records)	Data source: Statistical unit of the Ministry of Education or, alternatively, national statistical office.
PEDAGOGICAL USE	
Questionnaire item: C.2.1, C.2.1.1, C.2.3	Definition: Pedagogical use refers to the use of computers to support course delivery or independent teaching and learning needs. This may include activities using computers or the Internet to meet information needs for research purposes; develop presentations; perform hands-on exercises and experiments; share information; and participate in online discussion forums for educational purposes
Method of collection: Administrative data collection through annual school census (or extract data from school records)	Data source: Statistical unit of the Ministry of Education or, alternatively, national statistical office.

PERSONS WITH SPECIAL NEEDS

Questionnaire item:

A.4

Definition:

Persons with special needs are a broad group of persons for whom schools need to adapt their curriculum, teaching method and organization, in addition to providing additional human or material resources to stimulate efficient and effective learning.

Source: Adapted from *International Standard Classification of Education (ISCED97)*

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

PLAN

Questionnaire item:

A.1

Definition:

Plan refers to a government-issued document on how its goals in ICT in education are to be achieved within a specified timeframe. It details each activity to be undertaken, the method employed for implementation, the timeframe, the resources required and the actors responsible for implementing each activity.

Method of collection:

Extract information from official national policy and plan documents.

Data source:

Department within the Ministry of Education in charge of policy and plans.

POLICY

Questionnaire item:

A.1

Definition:

Policy refers to a government-issued document which sets out the principles, guidelines and strategy for ICT in education.

Method of collection:

Extract information from official national policy and plan documents.

Data source:

Department within the Ministry of Education in charge of policy and plans.

POOR GROUPS

Questionnaire item:

A.4

Definition:

Poor groups refer to persons living below the national poverty threshold in both urban and rural areas.

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

PRIVATE EDUCATIONAL INSTITUTION	
<p>Questionnaire item:</p> <p>Sections C, D and E</p>	<p>Definition:</p> <p>Private educational institution is usually controlled and managed by a non-governmental organization (church, trade union or business enterprise), whether or not it receives financial support from public authorities.</p> <p>Source: Adapted from the <i>UIS Instruction Manual for Completing the Questionnaires on Statistics of Education</i></p>
<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records)</p>	<p>Data source:</p> <p>Statistical unit of the Ministry of Education or, alternatively, national statistical office.</p>
PRIVATE INSTITUTION	
<p>Questionnaire item:</p> <p>A.2</p>	<p>Definition:</p> <p>Private institution refers to an independent entity owned by a non-State entity, such as a firm, business enterprise or individual. Although the principal activity is non-educational, it may develop, finance or implement activities in the domain of ICT in education.</p>
<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records)</p>	<p>Data source:</p> <p>Statistical unit of the Ministry of Education or, alternatively, national statistical office.</p>
PUBLIC EDUCATIONAL INSTITUTION	
<p>Questionnaire item:</p> <p>Sections C, D and E</p>	<p>Definition:</p> <p>Public educational institution is usually controlled and managed by a governmental education authority or agency (national/federal, state/provincial or local), irrespective of the origin of its financial resources.</p> <p>Source: adapted from the <i>UIS Instruction Manual for Completing the Questionnaires on Statistics of Education</i></p>
<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records)</p>	<p>Data source:</p> <p>Statistical unit of the Ministry of Education or, alternatively, national statistical office.</p>
RADIO	
<p>Questionnaire item:</p> <p>A.8, C.1.3</p>	<p>Definition:</p> <p>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).</p> <p>Source: Adapted from <i>Revisions and Additions to the Core List of ICT Indicators – Partnership on Measuring ICT for Development</i></p>
<p>Method of collection:</p> <p>Administrative data collection through annual school census (or extract data from school records)</p>	<p>Data source:</p> <p>Statistical unit of the Ministry of Education or, alternatively, national statistical office.</p>

RADIO-ASSISTED INSTRUCTION

Questionnaire item:

C.1.3

Definition:

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

Radio broadcast education entails an audio lecture or lesson, with printed material 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. Broadcast programmes follow the traditional model of education and can cover every subject in many different languages, depending on the target audience.

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 programme contributors, 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.

Source: Adapted from *Revisions and Additions to the Core List of ICT Indicators – Partnership on Measuring ICT for Development*

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

REGULATORY MECHANISM

Questionnaire item:

A.1

Definition:

Regulatory mechanism refers to a separate body, organization, committee or bureau that has been given responsibility by the government for promoting, coordinating and ensuring correct implementation of ICT in education.

Method of collection:

Extract information from official national policy and plan documents.

Data source:

Department within the Ministry of Education in charge of policy and plans.

RURAL AREA

Questionnaire item:

A.4, C.1.8, C.1.8.1

Definition:

Rural area is based on the definition applied in national statistical practices and exercises. For example, a rural area can be considered as a geographical region outside the urban agglomeration.

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

SCHOOL MANAGEMENT BOARD	
Questionnaire item: A.2	Definition: School management board usually has responsibility for monitoring and managing the overall strategic direction, finances, performance and policies of a school, and provides advice and guidance to the principal of the school. Its membership may include representative(s) of the parent-teacher association.
Method of collection: Administrative data collection through annual school census (or extract data from school records)	Data source: Statistical unit of the Ministry of Education or, alternatively, national statistical office.
SCIENTIFIC DIGITAL LIBRARIES	
Questionnaire item: C.1.13.1	Definition: Scientific digital libraries refer to: <ul style="list-style-type: none"> • 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 information retrieval or data manipulation. • Electronic books (e-Books): Digitized documents, licensed or not, where searchable text is prevalent and can be seen in analogy to a print book (monograph). • Electronic serials: These are serials published in electronic form only or in both electronic and another format. They comprise 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. <p>For the purpose of statistical reporting, please count the number of educational institutions with repositories of their own scientific electronic collections; regular subscriptions (paid or free of charge); or purchased licenses to scientific electronic journals, databases and other digital documents.</p> <p>Source: Adapted from <i>ISO 2789: Information and Documentation – International Library Statistics, 4th ed</i></p>
Method of collection: Administrative data collection through annual school census or surveys of educational institutions (or extract data from school records)	Data source: Statistical unit of the Ministry of Education or, alternatively, national statistical office.
STUDENT-OWNED COMPUTER	
Questionnaire item: C.2.1.2	Definition: Student-owned computer refers to a computer that belongs to a learner and is operated for educational use. This includes laptops or any personal computer (excluding personal digital assistants and Smartphones). From a statistical perspective, count privately owned computers in educational institutions that have a policy requiring all learners to possess their own computer as part of the pedagogical kit. The total number of learners enrolled in such educational institutions will correspond to the total number of student-owned computers.
Method of collection: Administrative data collection through annual school census (or extract data from school records)	Data source: Statistical unit of the Ministry of Education or, alternatively, national statistical office.

SUCCESSFULLY COMPLETED BASIC COMPUTER SKILLS COURSE

Questionnaire item:

E.4.1

Definition:

Successfully completed basic computer skills course refers to learners who have acquired the expected basic computer skills, as nationally defined for each level of education. This can be accomplished either through passing an examination or a series of examinations; accumulating a specified number of hours of study credits required for the course; or receiving a formal assessment of the skills/knowledge acquired.

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

TAX WAIVER ON ICT EQUIPMENT

Questionnaire item:

A.3

Definition:

Tax waiver on ICT equipment refers to an incentive whereby educational institutions, teachers and learners may buy tax-free or claim deductions or credits on tax payments when purchasing ICT equipment for educational needs.

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

TEACHER EDUCATION

Questionnaire item:

A.5

Definition:

Teacher education refers to formal teacher training (pre-service or in-service) designed to equip teachers with the knowledge, attitude, behaviour and skills required for teaching at the relevant level.

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

TEACHERS

Questionnaire item:

D.1, D.1.1, D.1.2, D.1.3, D.1.4, D.1.5

Definition:

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

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

TEACHERS TRAINED TO TEACH BASIC COMPUTER SKILLS (OR COMPUTING)

Questionnaire item:

D.1.3

Definition:

Teachers trained to teach basic computer skills (or computing) refer to teachers considered qualified according to national standards or norms to teach basic computer skills (or computing) courses.

At higher ISCED levels, in particular, teachers trained to teach computing should have a nationally required academic credential in an ICT-related field of study, such as computer science.

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

TEACHERS TRAINED TO TEACH SUBJECTS USING ICT FACILITIES

Questionnaire item:

D.1.5

Definition:

Teachers trained to teach subjects using ICT facilities are teachers that have received at least a nationally defined minimum of formal training to teach one or various subjects at the relevant level(s) using ICT to support their teaching.

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

TECHNICAL EDUCATION or VOCATIONAL TRAINING

Questionnaire item:

A.5, table headings for Sections C, D and E

Definition:

Technical education or vocational training is designed mainly to provide learners with the practical skills, know-how and understanding necessary for direct entry into a particular occupation or trade (or class of occupations or trades). Successful completion of such programmes normally leads to a labour market-relevant vocational qualification recognised by the national competent authorities (e.g. Ministry of Education, employers' associations, etc.).

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

TELEPHONE COMMUNICATION FACILITY

Questionnaire item:

C.1.2

Definition:

Telephone communication facility refers to fixed telephone lines, cable connections (i.e. cable telephony) or other sustainable communication technology that connects an educational institution's terminal equipment (e.g. telephone set, facsimile machine) to the public switched telephone network (PSTN) and has a dedicated port on a telephone exchange. Access is defined by a subscription to services that allow the physical presence and use 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.

Source: Adapted from *Revisions and Additions to the Core List of ICT Indicators – Partnership on Measuring ICT for Development*

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

TELEVISION

Questionnaire item:

A.8, C.1.4

Definition:

Television 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).

Source: Adapted from *Revisions and Additions to the Core List of ICT Indicators – Partnership on Measuring ICT for Development*

Method of collection:

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

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

TELEVISION-ASSISTED INSTRUCTION

Questionnaire item:

C.1.4

Definition:

Television-assisted instruction is similar to radio broadcast education, with the additional benefit of video. It helps to bring abstract concepts to life through clips, animations, 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 broadcast education.

Source: Adapted from *Revisions and Additions to the Core List of ICT Indicators – Partnership on Measuring ICT for Development*

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

TOTAL EXPENDITURE ON ICT IN EDUCATION FROM INTERNATIONAL (FOREIGN) SOURCES

Questionnaire item:

B.5.3

Definition:

Total expenditure on ICT in education from international (foreign) sources consists of funds received by a country to support ICT in education policy implementation from intergovernmental, multilateral and bilateral agencies, as well as from foreign philanthropic organizations and INGOs.

Source: Adapted from the *UIS Instruction Manual for Completing the Questionnaires on Statistics of Education*

Method of collection:

Extract data from financial statements or budget documents.

Data source:

Budget or accounts of the finance department of the Ministry of Education or, alternatively, the national statistical office or Finance Ministry.

TOTAL GOVERNMENT EXPENDITURE ON EDUCATION

Questionnaire item:

B.5.1

Definition:

Total government expenditure on education refers to all expenditure for education by a central, regional or local government (public) institution.

Source: Adapted from the *UIS Instruction Manual for Completing the Questionnaires on Statistics of Education*

Method of collection:

Extract data from financial statements or budget documents.

Data source:

Budget or accounts of the finance department of the Ministry of Education or, alternatively, the national statistical office or Finance Ministry.

TOTAL PRIVATE EXPENDITURE ON EDUCATION

Questionnaire item:

B.5.2

Definition:

Total private expenditure on education is the sum of direct payments from learners/households and other private entities to educational institutions, in addition to expenditures such as: i) direct purchase of personal items used in education; and ii) subsidized household expenditure for the 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 total private expenditure, because such financial aid is internal to the private sector and should be netted out in calculating total private expenditure on education.

Source: Adapted from the *UIS Instruction Manual for Completing the Questionnaires on Statistics of Education*

Method of collection:

Extract data from financial statements or budget documents.

Data source:

Budget or accounts of the finance department of the Ministry of Education or, alternatively, the national statistical office or Finance Ministry.

TRAINED TEACHERS

Questionnaire item:

D.1.1, D.1.3, D.1.5

Definition:

Trained teachers have received at least the minimum formal teacher training (pre-service or in-service) required for teaching at the relevant level.

Source: Adapted from *Instruction Manual for Completing the Questionnaires on Statistics of Education*

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

VIRTUAL EXPERIMENT LABORATORIES

Questionnaire item:

C.1.13.2

Definition:

Virtual experiment laboratories are multimedia applications, which allow video and digital simulations of laboratory activities in a real manner but without the risks and costs associated with laboratory experiments. Simulations of science laboratory experiments can 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 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.

For the purpose of this survey, count the number of educational institutions with repositories of home-grown experiment simulation applications; regular subscriptions (paid or free of charge); or purchased licenses to electronic virtual experiment laboratories.

Source: Adapted from *ICT for Education: A Reference Handbook - Analytical Review*

Method of collection:

Administrative data collection through annual school census or surveys of educational institutions (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

WEBSITE

Questionnaire item:

C.1.10, C.1.10.1

Definition:

Website refers to a collection of interlinked web pages with a related topic, usually under a single domain name. In the context of educational institutions, a website includes a home page with links to pertinent pedagogical information and other related activities.

Method of collection:

Administrative data collection through annual school census (or extract data from school records)

Data source:

Statistical unit of the Ministry of Education or, alternatively, national statistical office.

APPENDIX III

Classifications of ICT-related fields from *Fields of Education and Training – Manual* (Eurostat, 1999)

Broad fields	Narrow fields	Detailed fields	Field description	Inclusions	Exclusions
2 Humanities and Arts	21 Arts	213 Audio-visual techniques and media production	<p><i>Audio-visual techniques and media production</i> 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:</p> <ul style="list-style-type: none"> • 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 <i>desktop publishing and lay-out</i> are included in this field.	<p>Separate programmes in using <i>specific software applications</i> for desktop publishing are excluded from this field and included in field 482 'Computer use'.</p> <p>Study of <i>Journalism</i> (wording and content of messages) is excluded from this field and included in field 321 'Journalism and reporting'.</p>

4 Science, Mathematics and Computing	48 Computing	481 Computer science	<p><i>Computer science</i> 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:</p> <ul style="list-style-type: none"> • Computer programming • Computer science • Computer system analysis • Computer system design • Informatics • Network administration • Operating systems • Programming languages (Visual Basic, C++ etc.) 		<p><i>Computer engineering (hardware)</i> is excluded from this field and included in field 523 'Electronics and automation'.</p> <p>Programmes in <i>using computer applications</i> are excluded from this field and included in field 482 'Computer use'.</p>
		482 Computer use	<p><i>Computer use</i> 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:</p> <ul style="list-style-type: none"> • 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	<p><i>Electronics and automation</i> (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:</p> <ul style="list-style-type: none"> • 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 		<p><i>Computer science</i> (design of computer systems and software applications) is excluded from this field and included in 481 'Computer science'.</p>

APPENDIX IV

ISCED classification of levels of study

Description of ISCED97 levels, classification criteria and sub-categories							
0	PRE-PRIMARY LEVEL OF EDUCATION	Main criteria	Auxiliary criteria		Sub-categories		
	Initial stage of organized instruction, designed primarily to introduce very young children to a school-type environment.	Should be centre- or school-based, 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.				
2	LOWER SECONDARY LEVEL OF EDUCATION	Main criteria	Auxiliary criteria		Destination for which the programmes have been designed to prepare students	Programme orientation	
	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 organized 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 education programmes, then programmes should be split at the point where national programmes begin to reflect this organizational change.	If there is no clear break-point for this organizational 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 and upper secondary education, and where lower secondary education lasts for more than three years, only the first three 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.		
C				Programmes primarily designed for direct access to the labour market at the end of this level (sometimes referred to as 'terminal' 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.	

3	UPPER SECONDARY LEVEL OF EDUCATION	Main criteria	Modular programmes	Destination for which the programmes have been designed to prepare students		Programme orientation
	<p>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.</p>	<p>National boundaries between lower and upper secondary education should be the dominant factor for splitting levels 2 and 3.</p> <p>Admission into programmes at this level usually requires the completion of ISCED 2, or a combination of basic education and life experience that demonstrates the ability to handle ISCED 3 subject matter.</p>	<p>An educational qualification is earned in a modular programme by combining blocks of courses, or modules, into a programme meeting specific curricular requirements.</p> <p>A single module, however, may not have a specific educational or labour market destination or a particular programme orientation.</p>	<p>A Programmes designed to provide direct access to ISCED 5A.</p> <p>B Programmes designed to provide direct access to ISCED 5B.</p> <p>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.</p>	<p>General</p> <p>Vocational</p>	<p>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.</p> <p>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.</p>
4	POST-SECONDARY NON-TERTIARY	Main criteria	Types of programmes which can fit into level 4	Destination for which the programmes have been designed to prepare students		Programme orientation
	<p>These programmes straddle the boundary between upper secondary and post-secondary 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.</p> <p>They are often not significantly more advanced than programmes at ISCED 3, but they serve to broaden the knowledge of participants who have already completed a programme at level 3. The students are typically older than those in ISCED 3 programmes. ISCED 4 programmes typically have a duration of 6 months to 2 years.</p>	<p>Students entering ISCED 4 programmes will typically have completed ISCED 3.</p>	<p>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.</p> <p>These programmes are often designed for students who have completed level 3, although a formal ISCED level 3 qualification may not be required for entry.</p> <p>The second type of programmes are nationally considered as upper secondary programmes, even though entrants to these programmes will have typically already completed another upper secondary programme (i.e. second-cycle programmes).</p>	<p>A Programmes designed to provide direct access to ISCED 5A or 5B.</p> <p>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.</p>	<p>General</p> <p>Vocational</p>	<p>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.</p> <p>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.</p>

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 to these programmes normally requires the successful completion of ISCED level 3A or 3B or a similar qualification at ISCED level 4A.			
5A	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.	<ol style="list-style-type: none"> 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 five years; five years or more.	A Categories: First; Second or further.
5B	ISCED 5B programmes are generally more practical/technical/occupationally specific than ISCED 5A programmes.	<ol style="list-style-type: none"> 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)				
	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.	<ol style="list-style-type: none"> 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. 			

Information and Communication Technologies (ICT) have the potential to significantly expand learning opportunities across diverse populations. ICT enables policymakers and educators to improve the quality of teaching and learning processes, as well as learning achievements. Through the innovative use of these technologies, education institutions can help to develop and expand the production of new skills required by information societies.

In the global drive to integrate ICT in education, there is a clear need to monitor the progress of countries, based on accurate and consistent indicators. In addressing this challenge, the UNESCO Institute for Statistics (UIS) has developed this guide based on in-depth consultations with governments and experts worldwide. In particular, the guide is a result of the UIS commitment to the *Partnership on Measuring ICT for Development*, an international consortium of statistical units in a wide range of multilateral agencies.

Given the rapidly evolving nature of ICT, this manual breaks new ground by establishing a standardized framework and specifications for indicator measurement. The definitions and methodologies provided will ensure the consistent use and interpretation of statistics on ICT in education in an international context. In addition, an expanded list of indicators is presented, further building on the UIS core list, in order to address current information needs. The data required to calculate these indicators will be collected through standardized international surveys in order to enable policymakers to review progress over time and compare their results with those of other countries.



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