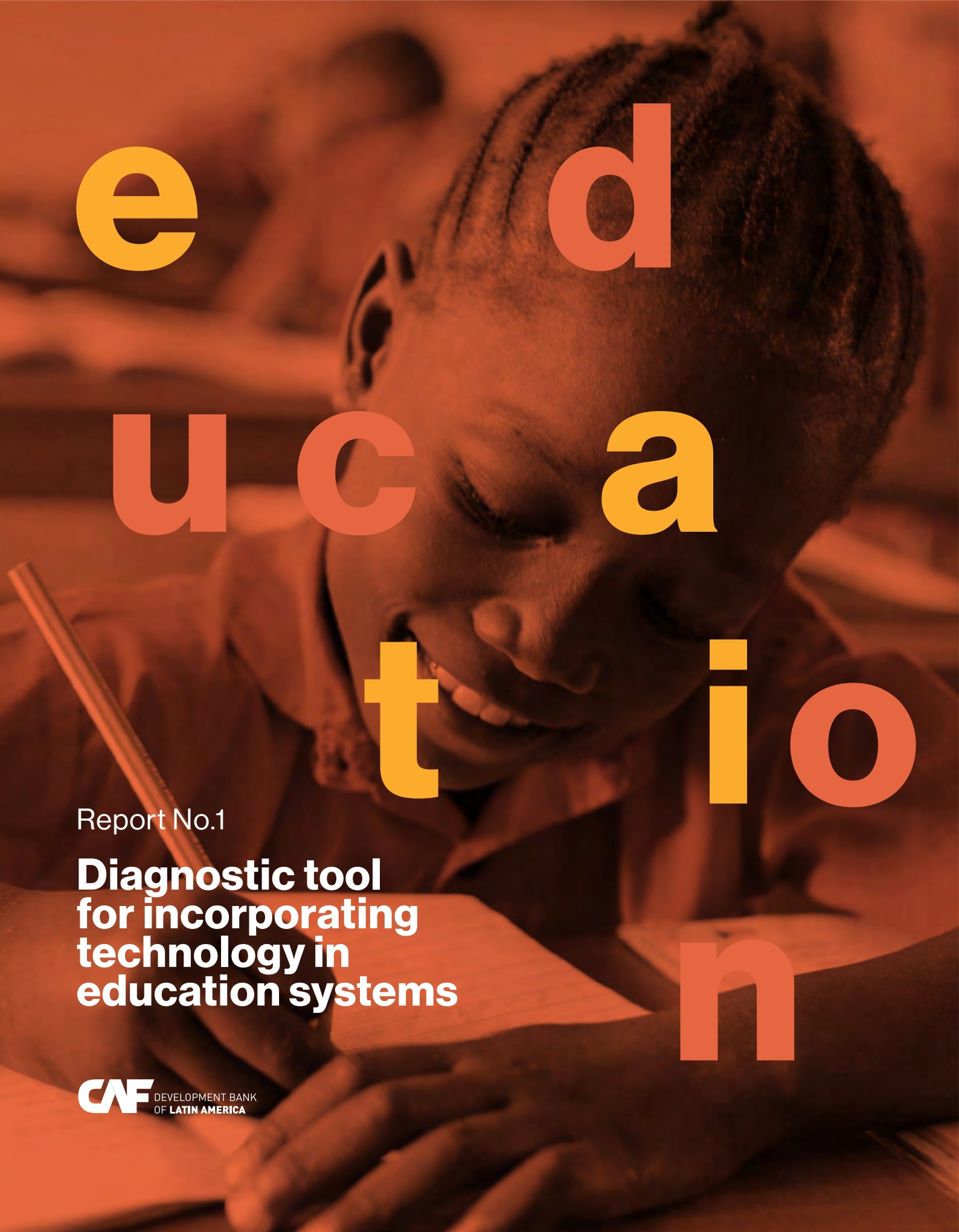

Report No.1

Diagnostic tool for incorporating technology in education systems

CAF DEVELOPMENT BANK OF LATIN AMERICA

Social and Human Development Working Paper | Education

Title: Diagnostic tool for incorporating technology in education systems

Editor: CAF

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The consulting team benefited from the invaluable experience of Raúl Katz, María Teresa Lugo, Marisa Álvarez, and Marisa Álvarez.

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Content

Introduction

In the context of the rapid and profound transformation that technology is bringing about in the different areas of life and work, the COVID-19 pandemic underscored the need for Latin American and Caribbean countries to accelerate the incorporation of technology into their educational systems. At the same time, there are significant social, economic, and, of course, educational gaps in the region, all of which have been aggravated by the impact of the pandemic.

In this regional context, CAF proposed the study "Development of a roadmap for the adoption of technology in education" with the following objectives:

— Development of a diagnostic tool to identify a country's level of progress in each of the dimensions that make up the comprehensive approach to the adoption of technology in the education system;

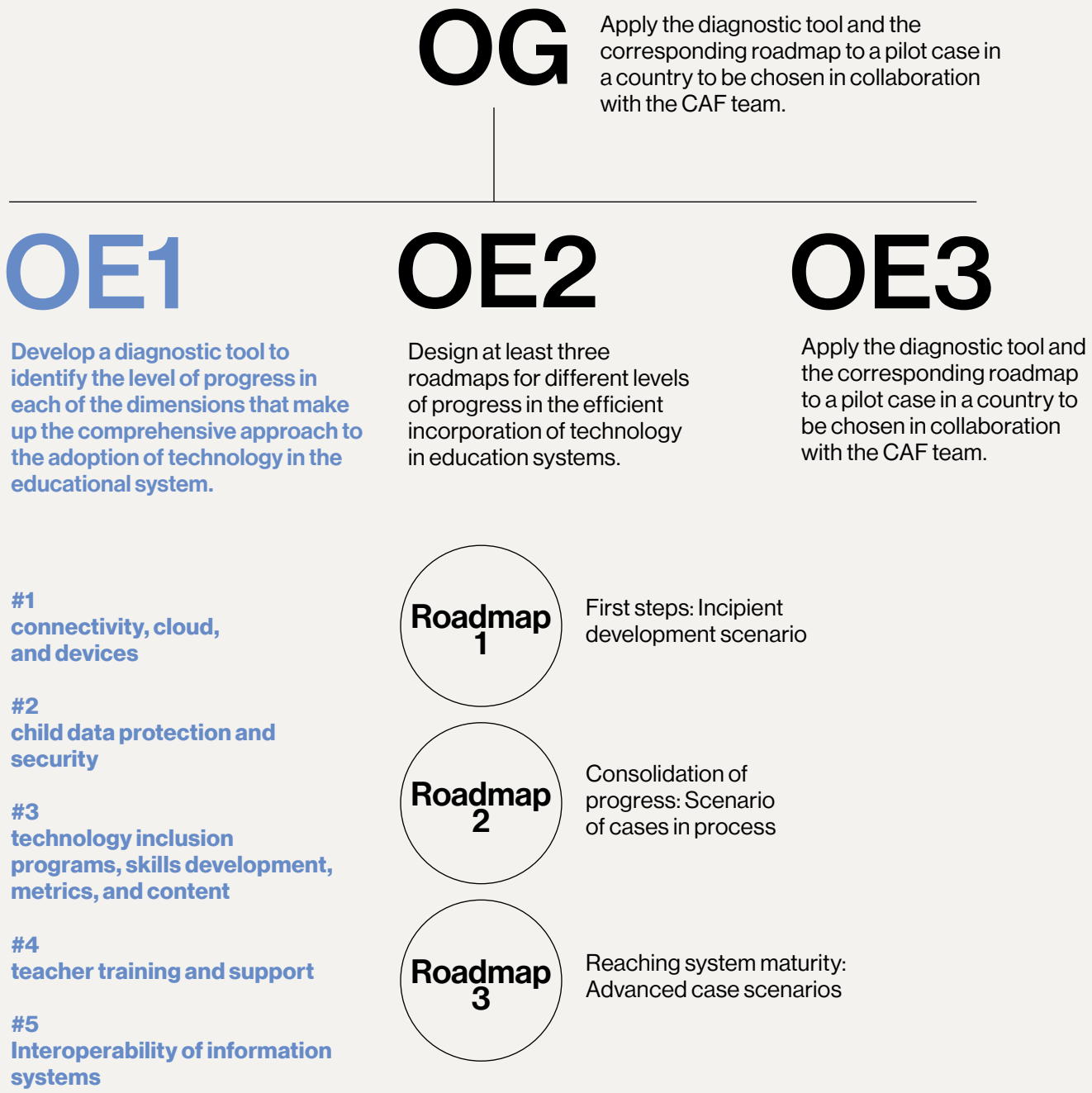
— Design of three roadmaps for different progress levels in the efficient incorporation of technology in educational systems to serve as input for the drafting and/or revision of a program/policy for the adoption of technology in learning processes;

The instruments to be developed are expected to be useful for the countries of the region to undertake or strengthen the incorporation of technology in all areas of their education systems, from the perspective that these processes require a comprehensive approach to primary and secondary education. The comprehensive approach includes the design and implementation of interventions in five dimensions:

(i) National programs or public policies for the inclusion of technologies in education systems with an emphasis on pedagogical models; (ii) connectivity, cloud, and devices; (iii) professional development for teachers and administrators; (iv) child data protection and security; and (v) interoperability of information systems.

The following document aims to present a diagnostic tool to assess the state of technology adoption in an educational system that contains a manual for its implementation (see Figure 1-1). The following sections present the methodological aspects to carry out the tasks and achieve the proposed objective. They also include the sources consulted in drafting the instrument. The annex contains the diagnostic tool and the Implementation Manual.

Figure 1-1
Project Objectives



Methodology used for the development of the diagnostic tool

The development of the diagnostic tool involved a set of methodological definitions. The process of identifying and gathering information included an internet search with specific criteria for their inclusion and consultation with key stakeholders.

The former included the identification and gathering of information from websites and associated technical documentation, accessed via the following channels:

— Public search engine (Google);

— Sites of national and regional organizations;

— Sites of international lending agencies;

— Sites of NGOs or CSOs;

— Sites of companies or corporate foundations;

— Sites of academic institutions;

— Scientific and/or academic information sites (Google Scholar, Web of Science, Scielo.org, Redalyc); and

— Other sites suggested by the experts consulted.

The development of the diagnostic instrument involved a set of methodological definitions. In the process of *identifying and gathering information*, an Internet search was combined with specific inclusion criteria and consultation with key stakeholders.

In the survey, the following aspects were taken into account:

— Documents and websites focused on or linked to the specific field of each of the five dimensions (national programs or public policies for the inclusion of technologies in education systems with an emphasis on pedagogical models; connectivity, cloud, and devices; professional development for teachers and managers; child data protection and security; and interoperability of information systems);

— Documents and websites that comprehensively review actions, programs, or digital education policies promoted by the governments in the region, before or during the pandemic, within the framework of pedagogical continuity strategies.

— Documents and websites that track the status of the incorporation of technology in the educational systems of the region, and of other countries in the world that have achieved significant progress in each of the five dimensions.

— Documents that provide background information for the development of diagnostic and evaluation instruments or tools, taking into account specific survey focuses and areas of vacancy.

Nineteen websites and 200 documents were identified in the information-gathering process. The documents collected and recommended by the stakeholders interviewed were compiled in a dynamic database created to process and analyze the information for the construction of the sub-dimensions, variables, and indicators that make up the diagnostic tool. Consultation with key stakeholders involved the design of protocols for conducting interviews and/or digital surveys to gather information on the five central dimensions of the study. A map of relevant stakeholders was drawn up for the selection of the key stakeholders.

Systematization of the information gathered

Based on the in-depth analysis of the information gathered, the sub-dimensions, variables, and indicators that allow the evaluation of each dimension were defined according to the following criteria:

— They contribute to an exhaustive and integral account of each dimension of the diagnostic tool;

— They represent relevant categories in terms of needs diagnosed by the education systems during the COVID-19 pandemic and/or essential aspects in the countries' educational agendas for the coming years. Each of the five assessment dimensions is composed of a series of sub-dimensions (see Table 2).

Each of the five evaluation dimensions is composed of a series of sub-dimensions (see Table 2).

Table 2
Dimensions, sub-dimensions, and variables that comprise the diagnostic tool matrix

1. National programs or public policies for the inclusion of technologies in the educational systems with an emphasis on pedagogical models

Planning	Governance and stakeholders Legislation and regulations Vision Design Funding Evaluation
Curriculum	Curriculum standards Curriculum development
Institutional management	ICT projects in schools Delivery modalities Organization of work and roles for teachers and administrators

2.
Connectivity, device access, and content in the cloud

Connectivity	National and regional connectivity outreach/development Institutional and legal framework for network development Quality of broadband service (capacity, speed, latency) Broadband and Internet service access Ongoing and planned service outreach projects Alternative models for different geographic and territorial contexts Access costs and opportunity costs Actors in charge of access and connectivity
Access to devices in educational institutions	Accessibility Quantity, quality, and distribution of equipment and educational institutions Adequacy of prioritized educational devices and software Ed-tech technological solutions available on devices Maintenance, upgrading, and renewal of infrastructure and equipment Treatment of technological waste
Students' access to devices in the school and the home	Penetration of PCs and tablets in the home Penetration of smartphones and cell phones in the home Penetration of ICT services in the home Internet usage

3.
Professional development for teachers and administrators

Initial teacher training	Institutionality Curriculum standards Program characteristics Monitoring and evaluation
Continuous teacher training	Institutionality Curriculum standards Program characteristics Monitoring and evaluation

4.
Protection of children's data and security

National legislation on the protection of personal data in the digital world	International, inter-institutional, and inter-sectoral articulation Data protection and security policy Policy and regulatory frameworks Regulatory enforcement Support mechanisms
National legislation for the protection of minors in the digital world	Policy and regulatory frameworks Regulatory enforcement Support mechanisms
Protection of minors in education	Regulations in the educational system Prevention Management and assistance
Access to public data and information	Cybersecurity and Data Integrity Public protection of data of children and adolescents Protection of educational data of children and adolescents
Programs or initiatives for the responsible use of personal data and digital citizenship	Citizen awareness of data protection issues Teacher training

5.
Interoperability of information systems

Strategic information perspective
Authentication of sources and personal data
Educational management and information systems (EMIS)
Interoperability

Next, descriptors were constructed for each variable according to three progress levels in regard to the incorporation of technology in the educational system at the time of the assessment:

— First steps: Incipient development scenario

— Consolidation of progress: Scenario of in-process cases

— Reaching system maturity: Advanced cases in the incorporation of technology

To facilitate countries' use of the diagnostic tool, an implementation manual is presented below. It contains:

— Instructions for using the diagnostic tool.

— Definitions of the diagnostic tool's dimensions and guiding questions to facilitate the application of the diagnostic tool.

— Diagnostic tool with weighting mechanisms.

— Information-gathering techniques and sources broken down by dimension.

— Glossary of terms used in the diagnostic tool.

Diagnostic tool and implementation manual

Using the diagnostic tool

The matrix—presented in the form of a double-entry table—identifies a wide range of issues to consider in the process of incorporating technologies into educational systems. These issues are grouped into five dimensions:

1. **National public programs or policies for the inclusion of technologies in educational systems focused on pedagogical models;**
2. **Connectivity, cloud, and devices;**
3. **Professional development for teachers and administrators;**
4. **Child data protection and security; and**
5. **Interoperability of information systems**

Within these dimensions, also called "gateways," different aspects or categories have been identified that may be relevant to observe and work in educational systems.

The diagnostic tool is based on a conceptual framework for measuring the level of progress in the incorporation of technology in educational systems based on multiple quantitative and qualitative indicators. As such, the level of development and maturity in a given process is calculated according to consistently estimated levels. In this case, a continuous gradation is used based on three levels:

Level 1: First Steps—Incipient development scenario

Level 2: Consolidation of Progress—Scenario of in-process cases

Level 3: Reaching system maturity—Advanced cases in the efficient incorporation of technology

This tool makes it possible to assess the level of development of a process, task, or public policy. In addition, it allows users to build a roadmap for improvement with the corresponding adaptations to territorial particularities, focused on a forward-looking vision and based on monitoring progress against formalized goals and metrics.

Likewise, this type of model is useful in that it provides a comparative perspective between entities—in this case, countries—in relation to a process—in this case the use of digital technology in education—based on best practices or advanced stages of development. Its value lies in the generation of an analytical framework and common language, shared by organizations (governments and multilateral organizations) for the socialization of diagnostics.

The level of progress in the incorporation of technology in education is derived from the combined result of numerous metrics and assessments in the different dimensions and sub-dimensions. Moreover, the country under evaluation can be positioned at a specific development level in the corresponding area. As indicated above, the index positions the country in each sub-dimension on a scale ranging from a limited development situation to an advanced level, reflecting the best practices surveyed. The sub-dimensions can be based on quantitative indicators (e.g., internet adoption) or qualitative indicators (e.g., use of digital technologies in class preparation). An Excel spreadsheet facilitates the entry of levels by sub-dimension and calculates the resulting level (see example).

		First steps: Incipient development scenario	Consolidation of progress: Scenario of in-process cases	Reaching system maturity: Advanced cases in the incorporation of technology	
Connectivity (I)	National and regional scope/development of connectivity	Fixed broadband coverage (percentage of population): < 80% 4G coverage (percentage of population): < 80% Rural broadband coverage: < 20%	Fixed broadband coverage (percentage of population): 80% - 90% 4G coverage (percentage of population): 80% - 90% Rural broadband coverage: 20% - 60%	Fixed broadband coverage (percentage of population): > 90% 4G coverage (percentage of population): > 90% Rural broadband coverage: > 60%	1
	Institutional and legal framework for network development	National Telecommunications Plan: No update in the last four years Responsibility for public policy for telecommunications development: Secretariat of State under the Ministry of Transport and Communications	National Telecommunications Plan: drafted in the last four years without deployment goals Responsibility for public policy for telecommunications development: Autonomous State Secretariat	National Telecommunications Plan: drafted in the last two years with deployment goals Responsibility for public policy for telecommunications development: Cabinet-level ICT Ministry	2
	Quality of broadband service (capacity, speed, latency)	Average fixed broadband download speed: < 30 Mbps Average mobile broadband download speed: < 18 Mbps International bandwidth per user: < 25 Mbps	Average fixed broadband download speed: 3030 - 70 Mbps70 Mbps Average mobile broadband download speed: 18 - 25 Mbps International bandwidth per user: 25 - 60 Mbps	Average fixed broadband download speed: > 70 Mbps Average mobile broadband download speed: > 25 Mbps International bandwidth per user: > 60 Mbps	1
	Broadband and Internet access	Fixed broadband adoption (by household): < 40% Mobile broadband adoption (by individuals): < 60% Internet adoption (by individuals): < 60%	Fixed broadband adoption (by household): 40% - 70% Mobile broadband adoption (by individuals): 60% - 80% Internet adoption (by individuals): 60% - 80%	Fixed broadband adoption (by household): > 70% Mobile broadband adoption (by individuals): > 80% Internet adoption (by individuals): > 80%	1
					1.25

Professional development for teachers and administrators	Sub-dimension: Initial teacher education	Variable: Institutional Structures	First steps: Incipient development scenario	Consolidation of progress: Scenario of in-process cases	Reaching system maturity: Advanced cases in the incorporation of technology	Questions
			Absence or weakness of agencies in charge of ICT-inclusive teaching policies	Existence of agencies in charge of ICT-inclusive teaching policies	Existence and type of governing body for teacher policies with political decision and normative instrumentation for ICT inclusion with the participation of the authorities in charge of ICT policy	Is there a governing body that coordinates initial teacher training actions at the national level, including planning, accreditation, implementation, and monitoring of the program? Is there a National Plan that takes into account the comprehensiveness of the levels of the mandatory education system and is updated based on the evaluation of results? Are authorities linked to ICT policy involved in these actions?
			Absence or weakness of articulation of actions	Existence of articulation and coordination initiatives between educational policy bodies for ICT in Education in the last four years of actions	Existence of programs implemented in the last two years of educational policies for ICT in Education with the participation of the authorities in charge of ICT policy	
			No national teacher training plan with ICT inclusion (or not updated)	National teacher training plan with ICT inclusion at some level and/or modality of the educational system	National teacher training plan with ICT inclusion that addresses all levels and modalities of the formal and updated system based on the evaluation of the results of the policy	
			Absence, weakness of coordination and/or overlap between institution(s) responsible for the planning of the program, accreditation, and monitoring of the training program	Existence of coordinated actions between institution(s) responsible for the planning of the program, accreditation, and monitoring of the training program	Existence of a governing body for the planning of the program, accreditation, and monitoring of the training program (and/or coordinated actions with periodic updates between the responsible institution(s)	

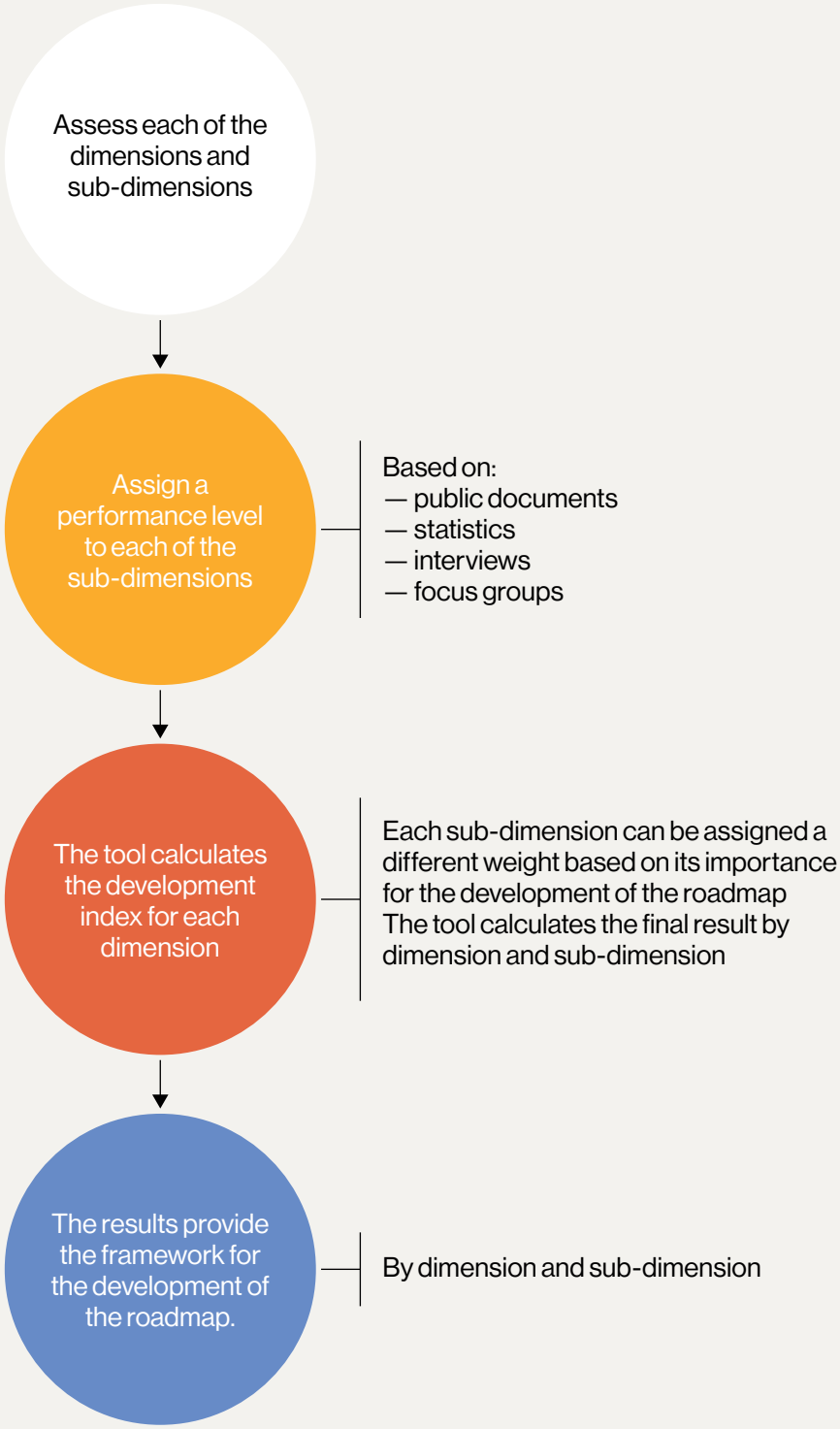
The diagnostic tool is based on a conceptual framework for measuring the level of progress in the incorporation of technology in educational systems based on multiple quantitative and qualitative indicators. As such, the level of development and maturity in a given process is calculated according to consistently estimated levels.

The combination of evaluation levels in each sub-dimension makes it possible to generate a development index for each analysis dimension, as well as an index composed of the five dimensions. Based on these, recommendations are drawn up for the improvement of performance to reach the advanced stage of development.

For each of the dimensions and sub-dimensions, a series of guiding questions are included in a column in an Excel spreadsheet (see example).

The index positions the country in each sub-dimension on a scale ranging from a limited development situation to an advanced level, reflecting the best practices surveyed.

Figure 2-1
Diagnostic tool implementation steps



Dimensions of the diagnostic tool

National public programs or policies for the inclusion of technologies in educational systems focused on pedagogical models

National public programs or policies for the inclusion of technologies in educational systems focused on pedagogical models

This dimension aims to carry out a comprehensive exploration and analysis of national digital policies and programs linked to the inclusion of technologies in countries. It refers to those ICT policies that are carried out by the main authorities. Each dimension is composed of three sub-dimensions: 1) planning, 2) curriculum and 3) institutional management. The first sub-dimension of Planning ICT Policies and Programs in Education comprises six key elements that reflect the complex process of planning, implementing, and evaluating an ICT policy, at the strategic and operational levels:

governance and actors involved in policy planning, legislation, and regulation, behind-the-scenes view of policy, design components, financing strategies, and evaluation mechanisms. The second sub-dimension aims to describe how the curricular dimension is conceived in ICT-inclusive policies and programs and which lines of development are covered.

This component includes the actions carried out under policies designed to promote the production, distribution, and consumption of digital content and resources for education. The third subdimension of institutional management accounts for the models established by the ICT-inclusive policy in terms of ICT projects in educational centers, delivery format (mixed, hybrid, blended), and the roles defined for teaching and management work.

Some of the guiding questions for this dimension are:

— Which organization(s) is/are leading actions under ICT-inclusive policy? Is there an articulation of ICT-inclusive policies with the national science system? What is the vision of the ICT Policy?

— Are there ICT contents integrated into the teaching of the different disciplines or curricular areas in the curriculum standards? What about Computer Science or Information Technology as a specific curricular area? Are there actions for the evaluation of these contents in national tests? Is there a central platform for learning management? Is there a planned policy for the development and acquisition of Ed Tech solutions?

— Are guidelines defined for the development and evaluation of ICT projects in schools? Are modalities or formats established that include virtuality at the different levels and orientations of the system? Are there specific figures for the integration of ICTs with territorial support?

Connectivity, access to devices, and content in the cloud

This dimension evaluates the development of the digital infrastructure that serves as a channel and support for the provision of technology to the education sector. The dimension is composed of three sub-dimensions: 1) connectivity, 2) access to devices in educational institutions, and 3) access to devices by students and families. The connectivity subdimension covers technological (access and adoption), economic (cost of broadband service), and institutional (approaches for the development of public policies in the technological area) aspects. The subdimension of access in educational institutions focuses on the deployment of infrastructure in schools, institutes, and libraries (covering broadband, devices, and software). The subdimension of access to students and families refers to access at home for students and their families to perform homework and interact with teachers and peers.

Most of the variables in this dimension are quantitative in nature. That said, those related to institutional and public policy aspects require a qualitative assessment.

Some of the guiding questions for this dimension are:

— What is the degree of national and regional development of connectivity? Are there institutional and legal frameworks for network development? What is the quality of broadband service? What is the level of adoption of fixed and mobile

broadband services by households and individuals? Are there alternative models for different geographical and territorial contexts? Are there service extension projects underway and/or planned? What are the costs of access and opportunity? Which organization(s) is/are leading the actions aimed at guaranteeing access and connectivity for the population?

— What is the degree of Internet access in schools? What about digital devices? Are there devices to meet the needs of students with disabilities? To what degree is Ed Tech used for teaching and learning? Do Ed Tech solutions address priority content? Are there formalized mechanisms and budgets for the maintenance of technology infrastructure? What about plans for processing technology waste?

— In the home, what is the degree of students' access to the Internet and digital devices?

Professional development for teachers and administrators

This dimension refers to the strengthening of the professionalization of teachers in their different roles (teachers in charge of teaching and personnel of administration teams) in relation to their training processes, which include the initial training stage—prior to the teaching job—, and the continuous training stage throughout their career.

In this study, two specific subdimensions of teacher and administrative professional development are considered, which constitute an integrated training system: 1) initial teacher training, and 2) continuing teacher training.

While the first subdimension corresponds to the subsystem responsible for the training of professionals who will work as teachers in the compulsory education system, the second subdimension focuses on the subsystem responsible for the training of professionals who will work as teachers in the compulsory education system. These two subdimensions comprise four key axes: institutionalism, referring to the governance mechanisms of teacher training, with a focus on the conduction and coordination of actions and with attention to the specificity of the training subsystems; curriculum standards, a component referring to the mechanisms, characteristics, and scope of the requirements of curricular contents for the teacher training subsystems; the program characteristics, with a focus on its composition according to the target training subsystem; and the mechanisms for surveying, systematizing and using information on teacher training for the review of the policies implemented, monitoring and evaluation.

Some of the guiding questions for this dimension are:

— Is there a governing body that coordinates teacher training actions at the national level, including planning, accreditation, implementation, and monitoring of the program? Is there a National Plan or training guidelines that take into account the comprehensiveness of the levels of the compulsory education system and is updated based on the evaluation of results? Are authorities linked to ICT policy involved in these actions?

— - Is the teacher training program framed within the curricular priorities established by the National Plan or the training guidelines and is it articulated with the curricular guidelines of the compulsory education system? Does it address the curricular inclusion of ICT both as a specific disciplinary field and as transversal content? And in the professionalizing practices?

— - Does the program include delivery formats that use virtuality in the different orientations? Does it identify the existence of careers linked to ICT as a specific disciplinary field? Does it include the access, distribution, and circulation of digital educational resources for training, managed at the national level? Have experiences of situated training been developed, in a continuous and evaluated manner? Are there proposals aimed at management and leadership teams for ICT management in educational institutions, with specificity in the different levels and orientations?

— - Are there updated mechanisms for program monitoring, evaluation, and accreditation? Are there periodic surveys on the use of available digital educational resources and the flow and impact of teachers' networks? Are there information management systems for the monitoring of continuous teacher training trajectories and their articulation with the professional teaching career?

Child data protection and security

The safety of children and young people in the digital world, the protection of their personal data, and the access to and security of public information constitute a central policy issue, given the unceasing increase in the incorporation of minors into the digital world, especially since the COVID-19 pandemic.

The development of the Internet provides unprecedented opportunities for children and youth to communicate, learn, access multiple resources and information, and express their opinions, with a high impact on their lives and the life of their communities. But the Internet also presents risks ranging from privacy issues to access to violent or inappropriate content, scams, abuse, and sexual exploitation online, to which children are more vulnerable. In particular, personal data is information of any kind that can be used to identify, contact, or locate a person for various purposes.

Governments have an obligation to protect children and youth, which places responsibilities on officials, institutions, and educators for their protection in the digital world. They must be aware of how privacy, confidentiality, and security practices affect learners and pose a threat to their safety and wellbeing.

The approach to child protection in the digital world is a complex issue that must be approached from different perspectives. Therefore, the study considered five dimensions in relation to the level of data protection and security: 1) national legislation for the protection of personal data in the digital world, 2) national legislation for the protection of minors in the digital world, 3) protection of minors in the educational environment, 4) access to public data and information, 5) programs or initiatives for the responsible use of personal data and digital citizenship.

The subdimension of personal data protection legislation in the digital world analyzes the regulatory framework for data protection in the digital world for the entire population, considering the regulatory support and management aspects related to crime prevention, containment of rights violations, and promotion of digital rights, including support and assistance devices. It then delves into the legislation related to the protection of minors, considering the regulatory frameworks, the characteristics of the application of the regulations, and support mechanisms. The dimension of child protection in the educational environment focuses on the school system's own rules and regulations related to data protection, prevention activities, as well as management and assistance in the event of rights violations.

The subdimension of access to data and public information investigates the level of protection and security of information, in particular of children and youth. It considers the strength of data security, authentication, access, and use, as well as the existence of audits. Programs or initiatives for the responsible use of personal data and digital citizenship—the last subdimension considered—evaluates the maturity with respect to awareness of the problem and communication, awareness, and training projects.

Some key questions for this dimension are:

— What is the policy for the protection of minors in the digital world? What is the scope of the country's regulations and regulatory framework in relation to personal data and cybersecurity? Are there authorities to enforce these regulations? Is there specific legislation that recognizes digital human rights? Are crimes against children and youth in the digital world adequately criminalized?

— How are the issues of digital citizenship, cybersecurity, and cybercrime addressed at school? When faced with an event, are the steps for filing a complaint and how different bodies will intervene clear to the complainant? Are there protocols for action? Are there sanctions? Is there case law? Is there a body of experts to advise institutions? How are they trained? What are their characteristics and competencies?

— Are there programs or projects for technical assistance or assistance to children and youth in situations of digital violence? Are there monitoring and evaluation mechanisms? Which ones? Are the results of the evaluations known to all and are they used to redefine actions?

Interoperability of information systems

This dimension accounts for the use or the possibility of digital transformation of educational systems, the identification of the potential of technologies and areas for improvement to consolidate systemic digital policies that contribute to better educational management. The dimension is composed of four sub-dimensions: 1) strategic perspective of information, 2) authentication of sources and personal data, 3) information systems and educational management, and 4) interoperability.

The strategic perspective subdimension considers the institutional framework and governance of information systems in the educational system, the existence and maturity of the production and use of information for decision making, and the existence of early warning systems for risks related to educational management and their students based on data analysis.

The source authentication subdimension focuses on the existence of robust single-source authentication systems, digital identity, and age certification systems, a module used especially for data protection issues of minors. The next subdimension includes the analysis of the development of educational information and management systems. This subdimension reviews the development and orientation of operational management systems and the capacity of their digital transformation. The systems considered as axes of the management of educational centers and educational management, in general, are i) the comprehensive student management system, ii) the educational center management system, iii) personnel management systems, iv) financial resources management systems and, v) infrastructure and equipment management systems.

The last subdimension analyzes the systems' interoperability capabilities, considering the integration of data at interinstitutional and inter-jurisdictional levels, as well as the possibilities offered by the systems in terms of services to make them compatible and interoperable.

Some key questions for this dimension are:

— - What is the state of progress of the digital transformation of education in the country? What is the degree of use of technologies for educational management processes? What is the degree of development of authentic source systems and system integration and interoperability? What are the criteria for system development? What is the budget allocation for financing a development plan?

Sources and information-gathering techniques

Dimension	Information-gathering techniques	Source
National public programs or policies for the inclusion of technologies in educational systems focused on pedagogical models	Interviews with key informants: policy decision-makers, academics, key stakeholders from international organizations and civil society organizations, representatives of the educational community and the corporate sector. Analysis of policy documents. Analysis of institutional websites.	ECLAC UNESCO UNICEF IADB IDB Lab CAF Information System on Educational Trends in Latin America (SITEAL), International Institute for Education Planning (IIEP) UNESCO Buenos Aires, Office for Latin America. Organization of Ibero-American States for Education, Science and Culture (OEI)
Connectivity, access to devices, and content in the cloud	Interviews with telecommunications regulators, the ministry of education, the infrastructure division of development banks (IDB, CAF), and multilateral entities (ITU, UNESCO) Documentary analysis of the national telecommunications regulatory agency, the ministry or secretariat of communications, and the Universal Service Fund	ITU World Telecommunication/ICT Indicators (WTI) Database 2021 CAF Digital Ecosystem Observatory UNESCO Institute for Statistics OECD Broadband Portal UNCTAD Statistics GSMA Intelligence
Professional development for teachers and administrators	Interviews with key informants: policy decision-makers, academics, key stakeholders from international organizations, and representatives of the educational community. Analysis of policy documents. Analysis of institutional websites.	ECLAC UNESCO UNICEF IADB IDB Lab CAF Information System on Educational Trends in Latin America (SITEAL), International Institute for Education Planning (IIEP) UNESCO Buenos Aires, Office for Latin America. Organization of Ibero-American States for Education, Science and Culture (OEI)
Child data protection and security	Analysis of regulations and jurisprudence Analysis of policy documents Analysis of websites Interviews with key informants: policy decision-makers, academics, key stakeholders from international organizations and civil society organizations, representatives of the educational community and the corporate sector. Budget analysis	UNICEF ITU IDB/OAS Cybersecurity Report Ibero-American Data Protection Network
Interoperability of information systems	Key informant interviews Analysis of institutional websites. Budget analysis	IDB Lab IIPE Inter-American Dialogue

Instructions for using the diagnostic tool

The diagnostic tool is based on an Excel spreadsheet with six tabs: an introductory tab followed by one tab for each of the five dimensions. To use it:

1. Open the first tab titled "home."
2. Column B lists each of the five dimensions. Click on any one of them to go to the corresponding tab.
3. In each tab, you will find each of the sub-dimensions and variables.
4. When focusing on each variable, after deciding which level corresponds to the country being assessed, go to column G (Selection).
5. By clicking on the cell corresponding to each variable in column G, a menu appears with the three options ("First steps," "Consolidating progress," and "Reaching system maturity").
6. Click on the level that you think corresponds to the country being assessed.
7. The tool updates the index automatically; you can monitor the impact of your selection in the index in the "Home" tab; all indexes are calculated based on 100 in order to visualize differences in performance.

Glossary of terms

4G coverage: Percentage of the population that can access 4G technology (the fourth generation of wireless technologies for mobile broadband access).

Algorithm: The knowledge necessary to be able to formulate effective and systematic solutions to various types of problems.

Average download speed: Speed at which broadband Internet is accessed; measured in Megabits per second.

Central learning management platform (LMS): A platform accessible from different devices that includes virtual classrooms, a repository of digital educational resources, and a data dashboard that allows asynchronous and synchronous interaction and communication between students, teachers, and families.

Computational thinking: The thinking process and the set of computer-related skills involved in formulating and solving problems. Computational thinking includes skills such as modeling and decomposing a problem, processing data, creating algorithms, and generalizing them.

Computer Science: The academic discipline that deals with knowledge such as algorithms, programming, structures and databases, computer architectures, computer networks, and the theoretical foundations that differentiate different languages and artificial intelligence. On some occasions and in some countries, the term Informatics is used as a synonym for Computer Science.

Continuing education: The subsystem responsible for the training of professionals working as teachers in the compulsory education system. The program characteristics and modalities of delivery are defined within the framework of the priorities defined in the national education and teacher training policy, in coordination with the different components of professional development, including the teaching career.

Curriculum standards: The set of requirements that regulate the selection, organization, and distribution of educational content in the different levels and cycles of the educational system.

Curriculum design/curriculum framework: The structure and key components for the development of the content of a curriculum.

Curriculum development: The set of strategies and actions for the implementation of curriculum regulations in educational centers through pedagogical and/or didactic guidance and/or support.

Curriculum organization: The political and social agreements on education intended to guide the regulation, implementation, and evaluation of curricula.

Cyberbullying: A form of bullying that occurs among peers. It involves insults, humiliation, aggression, mistreatment, and threats through digital media. It can occur in social networks, forums, blogs, messages, photologs, or chats, and various methods are used to carry it out: Publication or sending of photographs as a form of contempt and humiliation to the person. Violent or insulting comments and messages on cell phones or social networks from fake accounts or anonymously. Publications with reference to sexual experiences with an intention of humiliation or mockery.

Cyber harassment: Harassment or bullying through digital technologies. It can occur on social networks, messaging platforms, gaming platforms, and cell phones. It is repeated behavior that seeks to frighten, anger, or humiliate other people.

Cybersecurity: The set of tools, policies, guidelines, risk management methods, actions, training, best practices, safeguards, and technologies that can be used to protect the availability, integrity, and confidentiality of connected infrastructure assets belonging to governments, private organizations, and citizens; these assets include connected computing devices, personnel, infrastructure, applications, services, telecommunications systems, and data in the cyber world (ITU).

Digital divide: The unequal distribution in access, use, or impact of ICTs among social groups, defined based on different criteria such as gender, geographic, social, age, culture or other.

Digital transformation: The change associated with the application of digital technologies in different aspects of society. Within this context, it refers to the profound changes that occur in pedagogical and educational management processes as a result of the inclusion of digital technologies.

EdTech Solutions: Technological developments aimed at improving teaching and learning processes in response to an identified problem.

Educational center: Schools or institutions of all levels and modalities of the compulsory education system.

Educational management and information systems (SIGED): The set of educational management processes that serve to design, record, exploit, generate, and disseminate strategic information online in an integrated manner, framed by a specific legal, institutional, and technological infrastructure (IDB, 2021).

Fixed broadband coverage: Percentage of households that can access fixed broadband service, regardless of whether they purchase it or not.

Fixed broadband: Technology used to access the Internet; within this term, cable modem (provided by cable TV operators), fiber optics (offered by telecommunications operators), and ADSL (technology offered by telecommunications operators) are considered.

Free, informed, revocable, and restrictive interpretation consent: The characteristics of the consent that must be given to authorize the processing of personal data. It must be free because it must be given of an individual's free will. It must be informed because the owner must be informed of the purpose for which the data is being transferred and must be able to identify the transferee. It must be revocable because the owner of the data can change their mind whenever they choose to do so. And it must be of restrictive interpretation because the data can only be used for the purpose for which it was transferred (UNICEF, 2017).

Good practices: A practice is defined as such when it proves to be effective in achieving certain educational objectives, including achieving better and/or new learning, generating pedagogical change (or innovation) and producing organizational change (ECLAC, 2012).

Governance: The capacity to make government actions effective through the construction of agreements and consensus and the co-responsible participation of the different stakeholders.

Governing body: The body, agency, among other possible institutional arrangements, that governs and directs all actions implemented in a given area.

Grooming: Harassment exercised by an adult to establish a relationship and emotional control over a child or adolescent, in order to pave the way for the sexual abuse of the child or adolescent. It involves situations of harassment with explicit or implicit sexual content.

ICT policies in education: Public policies aimed at the incorporation of Information and Communication Technologies in education systems.

Initial training: The subsystem responsible for the training of professionals who will work as teachers in the compulsory education system. The institutions offering training vary according to the political-educational organization of each country, although they tend to be concentrated in higher education institutions (university-level teaching degrees) and/or on-university higher education institutions. Their action includes the disciplinary and pedagogical training of future teachers and the accompaniment of their first performances. The institutions belonging to this training subsystem are also expected to develop research, outreach, and continuing education activities.

International bandwidth per user: Capacity received by each Internet user in a country, from submarine cable and satellite connections; this is measured by Kbps/user and is provided directly by the ITU yearbook.

Interoperability: The ability of information systems and the procedures they support to share data and enable the exchange of information and knowledge between them.

Mobile broadband: Internet access from mobile terminals, whether PCs, smartphones or tablets. Access is provided by cellular operators through prepaid or postpaid plans (not to be confused with Wi-Fi access).

Personal data: Information of any kind that can be used to identify, contact or locate a person. Among them are first and last name, identity document number, nationality, gender, marital status, telephone and/or cell phone number, fingerprints, email address, spatial location, activities, opinions, etc. (UNICEF, 2017).

Pilot experience: A project that is preliminarily implemented on a small scale to evaluate its design prior to full-scale development.

Price of broadband access: A sum measured as a percentage of a country's per capita GDP monthly plan; it is used as a measure of affordability.

Professional teaching career: The professional regulation of teaching work and includes training actions related to the professional field.

Programming: The knowledge necessary to be able to translate algorithmic solutions into the various languages used by computers. Sometimes in programs linked to schools, algorithmic programming is included within programming.

Protection of personal data: The protection of personal data arises from the right to privacy, which is one of the rights recognized and guaranteed in international human rights treaties.

Robotics: refers to a branch that brings together different technological fields and is dedicated to the study, design, and manufacture of rather autonomous entities, capable of operating in uncontrolled environments and performing complex planning to achieve their goal. In the educational field, robotics is the area where robots are used to achieve learning in different disciplines.

Source authentication: The quality requirements of computer applications for integrability, with the definition of the protocols to be followed to certify the integrability referential for the reliable and shared use of data.

Teacher professional development: The strengthening of teachers' professionalization in their different roles (teacher in charge of teaching and staff of management teams) in relation to their training processes, which include the initial training stage—prior to starting teaching—and the continuous training stage, carried out throughout their professional career.

Teaching resources: Educational materials developed and used to support the teaching and learning process.

Unique mobile broadband users: An indicator that measures the number of individuals who have access to mobile broadband (not to be confused with mobile broadband connections as this value includes sensor connections or individuals who have more than one connection).

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