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ISSN 1564-4162

políticas sociales

Policies and practices for the use of information and communications technologies (ICTs) in education in Latin America and the Caribbean

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NACIONES UNIDAS

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inclusion innovation development

Programme financed by the European Union

SERIE

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UNITED NATIONS

ECLAC

Social Development Division
Santiago de Chile, November 2011

This document was prepared under the supervision of Guillermo Sunkel and Daniela Trucco of the Social Development Division of the Economic Commission for Latin American and the Caribbean (ECLAC), in the framework of the project funded by the European Union, Alliance for the Information Society, phase 2 (@LIS2) "Inclusive political dialogue and exchange of experiences," Component: education (CEC/08/003).

The preparation of this document drew heavily upon the linkages between ECLAC and the UNESCO Institute for Statistics (UIS); UNESCO's relations with the region's ministries of education were a key component. In particular, we would like to thank César Guadalupe and Beatriz Valdez-Melgar, of UNESCO/UIS, and Juan Cruz Perusia, of the UNESCO Regional Office in Santiago, for their collaboration. The authors also wish to express their gratitude for contributions and comments from all the representatives of the ministries of education in the countries participating in the study.

The opinions expressed in this document, which has not undergone formal editorial review, are the sole responsibility of the authors and do not necessarily reflect the views of the aforementioned organizations.

United Nations Publication
ISSN: 1564-4162
LC/L.3335-P

Printed in United Nations, Santiago, Chile

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Executive summary

This report presents the results of a study on policies and practices related to the incorporation of information and communications technologies (ICTs) into education systems in the countries of Latin America and the Caribbean. The purpose of the study was to ascertain how well-defined the policy dimensions for ICTs in education are and to determine the extent to which they have been implemented.

The study was designed using three theoretical approaches:

- Traditional concepts used to gauge ICT penetration in society.
- Findings of studies that seek to identify and describe factors impacting ICT use in school systems.
- The concepts linked to stages of ICT uptake by organizations, and, particularly, by schools.

With this conceptual foundation, and taking into consideration the scarcity of reliable statistical data on these topics, the data were gathered by means of a questionnaire designed to cover the major concerns of the study, i.e. the design and implementation of policies for ICTs in education as assessed by a set of indicators. The questionnaire was sent to representatives designated by the ministries of education of 17 countries in the region, as described in the corresponding section of this report.

The findings on policy definition show that, while only about half of the countries have formal, published policies, most of them have units that are responsible for policies related to ICTs in education.

Most of these policies focus on the teaching-learning process and on school management, as well as the development of ICT competencies among students and teachers. The survey also reveals a correlation between each country's specific objectives and the implementing actions it takes. Most

countries consistently include ICT competency goals in their curricula, particularly at the secondary level. But few employ systems for evaluating policy implementation. Furthermore, despite the fact that increased student learning and improved coverage and student retention have been defined as priorities for the region, half of the countries do not consider these as explicit goals.

As for the findings on policy implementation, we observed that, although most countries have made progress in providing computers, only 31% of the educational establishments in this group of countries have five or more computers; 36% have Internet access and 42% receive some form of technical support. It is estimated that only 42% of the establishments receive digital educational resources through the ministry of education.

The findings reveal that only slightly more than one third of teachers and students in the countries of the region have been trained in ICT use (36% and 38%, respectively). In terms of ICT infrastructure usage, the study shows that, on average, the countries report that their computer labs are being utilized at 50% of their capacity.

Analysing the findings on the basis of context variables reveals that in all cases there are significant gaps between private and public educational establishments, secondary and primary establishments, and urban and rural establishments. The reasons why public, primary and rural establishments are at a disadvantage merit further study, and strategies designed to achieve equity are required.

Looking at policy definition and implementation rates, we see that most countries have made greater gains in the former than in the latter, which suggests the need for funding and/or installed capacity to implement the policies.

Last, bearing in mind the exploratory nature of this study, the findings show a clear lack of records on the implementation of such policies, presenting the countries of the region with an opportunity to develop in this area. To this end, the findings of the study can lay sound empirical groundwork for defining a consensually agreed set of comparative indicators for the region as a whole. The findings can also serve as inputs that can inform the design and implementation of policies for ICTs in education.

Introduction

Information and telecommunications technologies (ICTs) are indeed making their way into the education systems of developed and developing countries. The arguments in favour of introducing ICTs in schools are diverse and varied, but there is consensus on the four arguments set out below (Organisation for Economic Co-operation and Development (OECD), 2001):[1]

- ICT competency is a basic skill like reading, writing and mathematics.
- ICTs open opportunities for economic development and are a job requirement.
- ICTs are a school management tool.
- ICTs are a tool for enhancing the teaching-learning process.

The first two arguments have to do with the potential socio-economic benefits of ICT use and uptake. However, these benefits and how to quantify them are still under debate (R. B. Kozma, 2005; OECD, 2003). Nevertheless, there is a general consensus that ICTs impact human development, so much so that one of the Millennium Development Goal targets is to "Make available the benefits of new technologies, especially information and communications" (United Nations, 2005).

[1] For a broader discussion of this section, see: "Part III, ICTs for development: applications and content: Education. The information society in Latin America and the Caribbean: Developing technology and technology for development (pp. 182-195). Santiago: Economic Commission for Latin America and the Caribbean (ECLAC).

Regarding the potential economic benefits, it is reasonable to assume that ICT use equips individuals in developing countries with skills and competencies that enhance their potential to develop successfully in society. However, these arguments must be viewed more cautiously in developing countries because individuals who live there do not necessarily have the basic competencies needed to fully benefit from the potential of ICTs. Therefore, it does not seem reasonable to assume that merely learning how to use ICTs will enable an individual to make a significant contribution to economic development, a consideration borne out by the low scores posted by countries in the region on international educational assessment tests, such as the Civic Education Study (CivEd),[2] Trends in International Mathematics and Science Study (TIMSS)[3] and Programme for International Student Assessment (PISA).[4]

There is a growing number of arguments in favour of using ICTs to improve school management[5] and thus enhance the teaching-learning process (for example: Becta, 2006; Carnoy, 2002; Kugemann, 2002). However, there is not enough evidence available to prove these assertions in education systems at a country level.

The argument that ICTs are a tool that enhances the teaching-learning process is still a matter of debate (for example, see: Balanskat, Blamire and Kefala, 2006; Cuban, 2001). The main lines of argument are explained below.

Using ICTs in the teaching-learning process can enhance student learning achievements. Studies have tried to demonstrate a positive correlation between available ICT infrastructure and better student achievement results (for example, see: Barrera-Osorio and Linden, 2009). However, this correlation has not yet been clearly established (for more on this debate, see: Balanskat *et al.*, 2006).

Information and communications technologies, when considered as part of a comprehensive strategy for supporting schools, can enhance key aspects of school culture, such as curriculum, pedagogy, testing and professional development of teachers. This argument lowers expectations for a causal relationship between ICTs and improved student learning achievement, on the grounds that ICTs merely facilitate key conditions for such improvements (OECD, 2001; Roschelle, *et. al*, 2000).

ICTs provide a new scenario in which teaching and learning can take place. Based on opportunities that ICTs offer, authors who support this argument advocate for radical changes in the way students learn and teachers teach, calling for constructivist teaching practices[6] that are, inter alia, student-centred and involve active commitment, constant interaction and dialogue (Voogt and Pelgrum, 2005; Yelland, 2006). This argument is interesting in that, among other things, it focuses on developing the potentialities of ICTs to produce new scenarios and forms of representation that allow for a broader and stronger pedagogical repertoire (Dede, 2000).

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[2] The International Association for the Evaluation of Educational Achievement (IEA) Civic Education Study, conducted between 1994 and 2002, was administered to fourteen-year-olds from 31 countries (including Chile and Colombia) and measured knowledge, attitudes and civic commitment (see: www.iea.nl/cived.html).

[3] The IEA Trends in International Mathematics and Science Study (TIMSS), conducted in 1995, 1999, 2003 and 2007, was administered to nine- or ten-year-old students and fourteen-year-olds. In 2003, 50 countries participated (including Argentina and Chile). TIMMS seeks to measure how much of the prescribed curricula for mathematics and science is covered by teachers and, based on student outcomes, how much has been learned (see: http://www.iea.nl/timss2003.html).

[4] Using data from the Organisation for Economic Co-operation and Development (OECD) Programme for International Student Assessment (PISA), conducted in 2000, 2003, 2006 and 2009. This test was administered to fifteen-year-old students. In 2009, 65 countries participated (including Argentina, Brazil, Chile, Colombia, Mexico, Panama, Peru, Trinidad and Tobago and Uruguay). This study measures the capacity of students to apply and relate both knowledge and skills in reading, mathematics and science in solving tasks that are relevant to their future lives, instead of memorizing knowledge content. This assessment is not limited to the curriculum and focuses on capacities needed for lifelong learning (see: http://www.oecd.org).

[5] Generally speaking, the concept of school management can include management of economic and human resources (such as teachers and administrators) as well as matters concerning students (enrolment, grades, observation), parents and guardians (background, communication), subjects (scheduling) and teaching (curriculum planning, curriculum compliance monitoring, lesson plans).

[6] According to these practices, the teaching process should focus on promoting and enabling a student to develop strategies and methods that allow him/her to learn better, giving comprehension priority over memorization.

ICTs are a tool for learning and teaching. Though this argument is not often used, it proposes the use of ICTs for enhancing the teaching-learning process while not holding that these technologies are intrinsically capable of changing things.

Last, for the past two years various authors have been suggesting that the proliferation of ICTs merits a new curriculum and new assessment systems. These arguments are based on the assumption that the information society demands new abilities and skills, such as knowledge construction[7] (Scardamalia and Bereiter, 2006), the capacity for change and innovation (Roschelle *et. al*, 2000) and lifelong learning (Voogt and Pelgrum, 2005), which traditional evaluation systems do not measure.

In this scenario perspectives and roles for ITCs in education come and go, sparking an endless debate that makes it impossible to flesh out evidence-based arguments for developing foundational ideas (Dillon, 2004). This is partially due to the fact that ICTs are evolving so quickly that it is very difficult to set and maintain strategic or policy objectives (Rycroft, 2006). Another factor is that in many cases ICTs are obtained through earmarked government funding; therefore, each time changes occur, goals are redefined.

Because of these prospective benefits of ICTs, developed countries have closely followed the new technologies that are available for education. In many cases they have adjusted their policies to take advantage of the potential benefits of a specific technology to improve their education system outcomes. Analysis of ICT policies in education in developed countries[8] reveals a three-stage progression:

1. During the first stage, policies seek mainly to ensure access by providing infrastructure, (basic) digital educational resources and competency training in the use of ICTs. In many cases, this first stage has been accompanied by government policies geared to reducing the digital divide by increasing ICT infrastructure available for use by communities. This stage also includes strategies for training in general ICT use and for creating incentives for the industry to adopt ICTs and/or use them in government services.
2. The second policy stage stresses strategies that ensure conditions for ICT use, with special attention paid to their use in teaching and learning. In many cases, this second stage includes national strategies to provide support aimed at ensuring that the proper conditions for using ICTs exist in each school, as well as incentives for using them in the classroom.
3. In the third stage, which is the current stage in many developed countries, the policy focus extends beyond schools and includes the use of ICTs by students in their communities. It also includes a broader and more specialized set of digital educational resources. In this third stage, despite differing levels of economic, social and ICT development among the countries, there are many similarities, such as the focus on developing faculty ICT competencies for teaching and an emerging trend toward the use of mobile devices and/or home-based ICT infrastructure as tools for extending teaching and learning beyond the classroom.

In the context of this third stage, developed countries show the following specific trends in terms of policies for ICTs in education:

- Faculty and teaching. Initiatives on a national scale for training faculty in ICT use as a tool supporting their work (including planning, teaching and testing) and, in some cases, for initial teacher training. Some countries also include guides for integrating ICTs with pedagogical practices, with an emphasis on teaching styles that encourage personalized learning.[9]
- Students and learning. This includes strategies that seek to help students learn more independently, anytime and anywhere. Some countries have made significant investments in setting up distance education systems for school-age students.

[7] This refers to students developing the capacity to create and share knowledge, participating in a range of communities through networks (an example of this is the development of Wikipedia).

[8] These findings are from a study of informatics in education policies in Finland, France, Ireland, South Korea, Singapore and the United Kingdom, conducted by the World Bank while preparing the report, "ICT Policy in Chilean Primary and Secondary Education: 2010 and Beyond," at the request of the Ministry of Finance of Chile, in 2009.

[9] A highly structured type of learning that responds to individual learning needs.

- Curriculum. In most countries the curriculum is revised to define and promote the enhancement of twenty-first century ICT skills and competencies. These include functional competencies (use of ICTs), higher-order thinking (discrimination, analysis and synthesis of information), collaboration skills (working in collaboration and cooperation networks) and lifelong and lifewide learning.
- Digital educational resources. Practically all of the countries have initiatives for increasing the availability of digital educational resources. Some promote public-private partnerships with software companies and/or encourage local development of digital resources that adhere to specific quality standards. Other countries include targeted initiatives for evaluating resource quality and promoting the adoption of minimum standards.
- Infrastructure. In almost all of the countries the governments finance the provision and replacement of ICT infrastructure (computers, Internet access, etc.).
- ICTs, management and leadership. Many countries have initiatives that promote the integration of ICTs in management areas, including ICTs as part of the school's vision and coordinating actions to ensure technical and pedagogical support. Furthermore, some countries are using learning management systems in schools.
- Research and development. Some countries are considering initiatives to stimulate and support research and development in the field of education informatics, while others include initiatives that focus on innovation.

As can be seen, developed countries are constantly expanding the scope of ICT actions and are concerned not only with ensuring access and enhancing usage, but also with diversifying the environments in which ICTs can be applied.

From a regional perspective, the introduction and use of ICTs in education in Latin America is no different than in the rest of the world. Where the region differs from many developed countries is that there is very little evidence on the characteristics of policies and the extent to which they are being implemented. Considering that there is international consensus about the importance of designing evidence-based policies (see, for example: OECD; 2007), this situation is cause for concern and calls for reliable, periodic indicators that track progress and challenges in education systems.

In this context, this document presents the available information on the characteristics of policies for ICTs in education in the countries of Latin America and the Caribbean, as well as the extent to which those policies have been implemented. It introduces and proposes a set of indicators that can be used as a basis for periodic assessment of these policies.

This document introduces the theoretical framework on which the study design was based and the methodology used for gathering data and analysing the findings. It ends with a discussion of the characteristics of policies for ICTs in education in participating countries and the extent to which those policies have been implemented.

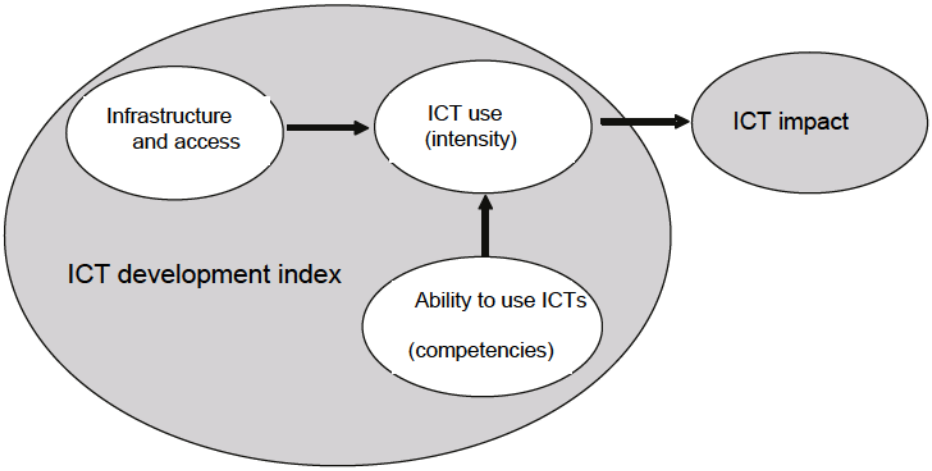
I. Theoretical framework: conceptualizing the digital development of education systems

In this study, digital development of school systems is conceptualized using three theoretical approaches, in that it:

- Considers traditional concepts used to gauge the extent of ICT penetration in society;
- Takes into account studies that attempt to identify and describe factors impacting the use of ICTs in school systems, particularly in the teaching-learning process;
- Utilizes concepts that have to do with the stages that organizations, particularly schools, go through to appropriate ICTs.

Regarding the first theoretical approach, the International Telecommunication Union (ITU) proposes an ICT development index that considers three groups of interrelated indicators: (i) infrastructure and access (ICT readiness); (ii) ICT use (intensity); and (iii) ability to use ICTs (competencies). According to ITU, this last aspect enables the specific impact of ICTs to be determined (ITU, 2009).

FIGURE 1
ITU ICT DEVELOPMENT INDEX INDICATOR SETS



Source: Adapted from ITU (2009, p.14)

ITU also suggests that these sets of indicators, because they are interdependent, may reflect where a country stands in its effort to join the information society, given that infrastructure and access determine the possibilities for ICT use, just as the level of ICT competencies determines their actual use.

Other authors suggest that integration of ICTs in society at large follows a linear path of progression. For example, Selwyn (2004) posits a framework for describing the evolution of the digital divide in six stages (table 1).

TABLE 1
STAGES OF THE DIGITAL DIVIDE

Formal/theoretical access to ICTs and content	ICTs formally provided in households, communities, schools and workplaces that theoretically are available to be used by individuals.
Effective access to ICTs and content	ICTs provided in households, communities, schools and workplaces that individuals feel they can use.
Use of ICTs	Any type of contact with ICTs. May or may not be significant, and may or may not produce medium or long-term consequences.
ICT appropriation	Significant use of ICTs in which the individual exercises a degree of control and choice over technology and content. This type of use would be considered useful, productive, valuable and relevant to the user.
Outcomes – actual and perceived	Immediate and short-term consequences from use of ICTs.
Consequences – actual and perceived	Medium- and long-term consequences from the use of ICTs, in terms of participation in the information society. These consequences can be seen in terms of activities that are: • Productive • Political • Social • Consumption • Savings

Source: Prepared by the authors, based on Selwyn, 2004: 352.

The second theoretical approach considers factors that influence the use of ICTs in the teaching-learning process. These can be analysed from at least three perspectives. The first seeks to explain strategies that enable the successful adoption of ICT innovations in schools, based on the notion that the introduction of ICTs is equivalent to the introduction of other innovations. The second perspective seeks to understand the relationship among a set of school-related variables and the process of innovation and change using ICTs in schools. The third perspective seeks to establish statistically significant correlations among a set of school-related variables and the implementation of specific types of pedagogical practices in schools.

Concerning the first perspective, various authors hold that innovation is one of the core elements in the transformation of schools (Bishop, 1986; Fullan, 2007; Hargreaves and Shirley, 2009; Huberman and Miles, 1984; Smith *et al.*, 1988). Early in the 1980s it was suggested that the computer would act as a "Trojan horse," carrying within it the seeds of change and innovation (Olson, 2000). Then, in the 1990s, ICTs were spoken of as a catalyst that, under the right conditions, accelerates change (McDonald and Ingvarson, 1997). Finally, in this decade, ICTs are seen as a lever to be used intentionally to produce change (Venezky, 2002). This latter conceptualization presumes the need to map a strategy for change in which ICTs can prove useful, insofar as they serve to achieve previously defined goals. According to Fullan (1993), innovation through technology is one of the most difficult ways to innovate in education because there is no clear picture of what a successful innovation or a true impact on students would look like. Even if there were a clear idea as to what is considered a successful innovation using technology, or even if the requirements for implementing such a successful innovation were known, this still does not mean that an organization would know how to get there. Fullan and Smith (1999) call this the "pathways' dillema." With this principle in mind, and considering the factors that influence the development of innovations using technology, various initiatives have taken shape that seek to provide a clear picture to schools. Notable among these initiatives is the Becta[10] Self-Review Framework.[11]

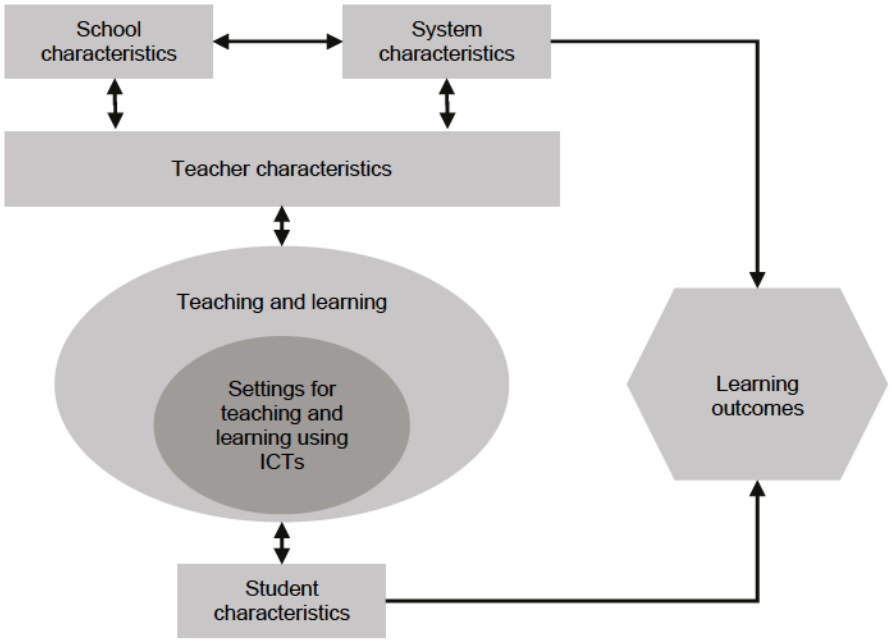
Concerning the second perspective, several studies (R. B. Kozma, 2003; Law, Pelgrum and Plomp, 2008; Wagner *et al.*, 2005) that have sought to identify and/or measure variables (or factors) that influence the use of ICTs in teaching and learning in schools (or in innovative pedagogical practices using ICTs) group these variables into three levels: macro (variables in ICT policies, curricular parameters, etc.), meso (variables related to the school and its immediate context) and micro (variables related to the classroom, the teachers and the students). These concepts were adapted and applied to the international SITES 2006 study, the theoretical framework of which is based on the diagram in Figure 2.

According to several authors (De Corte, 1993; R. Kozma, 1994; Venezky, 2002), the successful application of innovative practices does not depend solely on these variables, but also on the characteristics of the innovation. This includes the practices of teachers and students, the resources utilized, the curriculum being taught (Law *et al.*, 2008), testing, professional development, administration, organizational structure, etc. (Dede, 1998).

Finally, concerning the third perspective, which seeks to establish statistically significant correlations among the factors, the SITES 2006 study concludes, based on a multilevel analysis, that it is possible to identify three key variables in using ICTs to support development of twenty-first century pedagogical practices: (i) how much ICT infrastructure is available (pupils per computer), (ii) availability of technical support and (iii) availability of pedagogical support (Law *et al.*, 2008).

[10] British Educational Communications and Technology Agency, BECTA.
[11] See [online] http://selfreview.becta.org.uk

FIGURE 2
SITES 2006 STUDY: DIAGRAM OF THE THEORETICAL FRAMEWORK



Source: Adapted from Law *et al*. (2008).

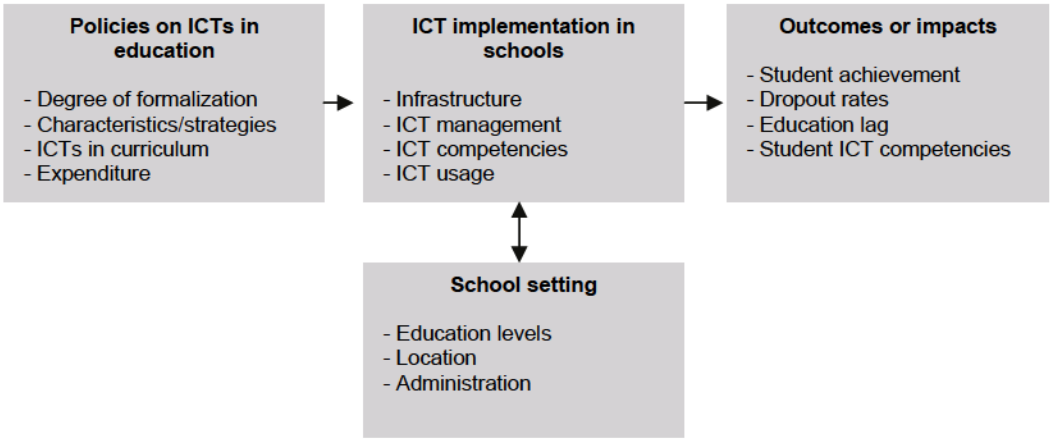
Concerning the stages of ICT uptake in a school context, there is consensus about the evolutionary and sequential quality of ICT adoption in different areas of the school. In one classic study, Huberman and Miles (1984) describe three stages of innovation in schools: (i) initiation, (ii) implementation and (iii) institutionalization. One decade later, Sandholtz, Ringstaff and Dwyer (1997) identified the following five sequential stages through which the use of ICTs in the classroom evolves. The five stages are (i) introduction, (ii) adoption, (iii) adaptation, (iv) appropriation and (v) invention. Last, UNESCO (2003) identifies four levels of sequential evolution: birth, application, integration and transformation.

With these perspectives in mind, Figure 3 shows the general model of indicators used in this study to characterize the policies and practices of the countries for use of ICTs in education.

As can be seen, the model draws on elements of the different theoretical frameworks described in this section and seeks to characterize the development and implementation of policies related to ICTs in education, using indicators to gauge the level of policy development, the status of implementation in educational establishments and the potential outcomes or impacts these could have.

Furthermore, the study seeks to characterize these dimensions, identifying groups of educational establishments, given that policies, their implementation and their potential outcomes inevitably differ according to the setting.

FIGURE 3
MODEL OF INDICATORS USED TO MEASURE DIGITAL DEVELOPMENT IN SCHOOLS



Source: Prepared by the authors.

The expectation is that once the first set of indicators has been gathered it will be possible to identify relationships among the various component areas and thereby to characterize potential stages of evolution of policies for ICTs in education. Some components of this model have been developed through prior studies, such as the School Digital Development Index of Chile's Ministry of Education Centre for Education and Technology, and the characterization of ICT policies in Latin American countries, as described in Hinostroza (2009).

II. Methodology

The study was conducted within the framework of the @LIS2 Project "Alliance for the Information Society 2 — Inclusive political dialogue and exchange of experiences" which is being executed by the Economic Commission for Latin America and the Caribbean (ECLAC), with funding from the European Union. The questions the study sought to answer are set out below.

What are the characteristics of the national policies and/or initiatives for incorporating ICTs in education in the countries of Latin America and the Caribbean? How do they compare with each other?

To what extent have national policies and/or initiatives for the incorporation of ICTs in education in the countries of Latin America and the Caribbean been implemented? How do the various countries compare in their progress on implementation?

The survey, titled ICT Policies and practices in countries of Latin America and the Caribbean, was prepared using the theoretical framework presented in Section 2 and followed the model of indicators shown in Figure 3.

Specifically, the survey sought to gather information about the indicators needed to characterize ICT policies in education (formalization, characteristics, integration of ICTs in the curriculum and expenditure), ICT implementation in schools (infrastructure, management, ICT competencies, ICT usage), school context (education level, location and administration) and the outcome or impact (dropout rates, education lag). Impact indicators for education achievement were not included because most countries do not have comparable data.

The survey was sent in early October 2010 to representatives who were officially appointed by the ministries of education of each country who were given four weeks in which to answer the questions with the most recent official information.[12] Nineteen countries were approached, but only 17 responded: Argentina, the Plurinational State of Bolivia, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, the Dominican Republic and Uruguay.

Once the questionnaires were received by e-mail, the answers were compiled, tabulated and subjected to a preliminary analysis. Subsequently, a workshop[13] was held with representatives from each country.[14] In the workshop the partial results were presented, the indicators were discussed and some missing surveys were completed. This workshop was held in Santiago, Chile on 25 October 2010.

When the workshop was over the new data contributions were tabulated and the various indicators were descriptively analysed. In general, the total number of educational establishments reported by each country served as the basis for calculating percentages of coverage in implementing the various policy dimensions.

Based on this information, the first draft of this document was prepared and sent to representatives of each country for review and comments, after which the final version was written.

In methodological terms, as the section on findings shows, the rate of response on items related to the characterization of policies or initiatives for ICTs in education in the countries was 100%; that is, all of the countries answered the questions. Nevertheless, the response rate for questions having to do with implementation of the initiatives was substantially lower and in some cases only one or two countries responded, as was the case for items related to expenditure. Furthermore, the questions that had to do with the use of ICTs also had very low response rates, mainly because of a lack of official information on the subject. This serves as important evidence of the relative lack of indicators for quantifying progress in policy implementation.

[12] Only one country appointed a representative from its digital literacy program, which is not related to the ministry of education.

[13] This workshop was organized in coordination with the UNESCO Institute of Statistics (UIS), which was also conducting research on progress indicators for ICTs in education in Latin America and the Caribbean.

[14] In many cases the countries were represented by two participants from the ministry of education, one from the area of educational statistics and the other from the area of national policies and/or initiatives for incorporating ICTs in education.

III. Policies for ICTs in education in Latin America

This section presents the findings on the characterization of policies for ICTs in education, including:

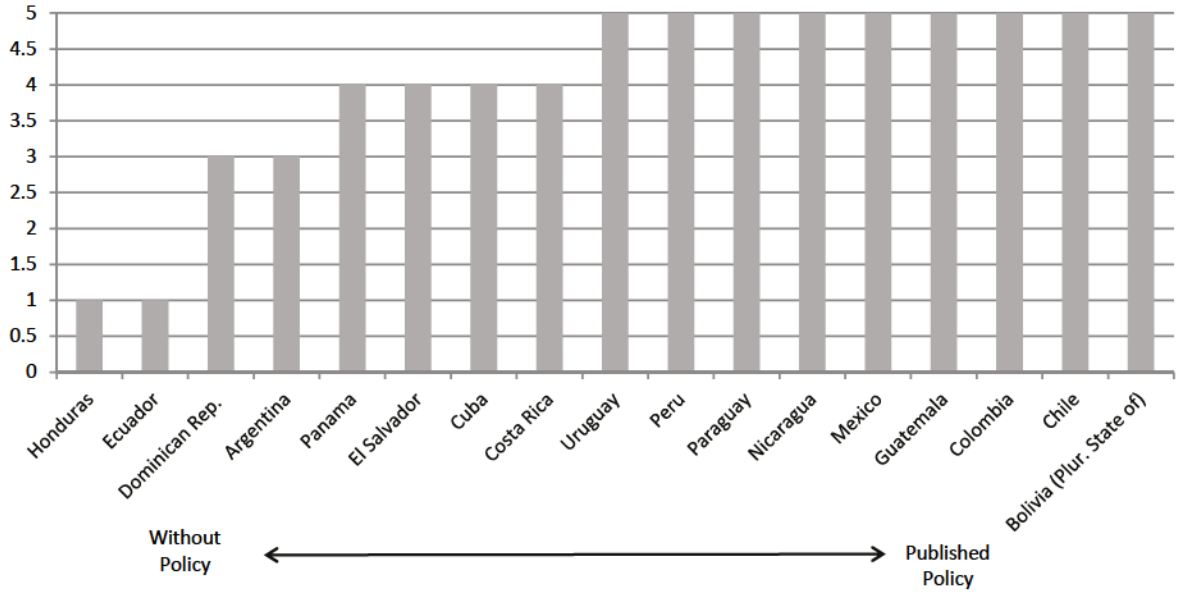
- Extent of policy institutionalization
- Major characteristics (participants, actions, objectives, etc.)
- Integration of ICTs in the curriculum of each country

The results for each component are presented below.

A. Institutionalization of policies for ICTs in education

Though there has been much debate at the international level over the advisability of having formal ICT policies, international organizations such as the World Bank, UNESCO and others increasingly advocate the formalization of these policies (an example of this is the UNESCO tool for formulating ICT policies: http://www.ictinedtoolkit.org). The study found that 53% of the countries surveyed have official published policies for ICTs in education. This percentage rises to 76% if we include those countries that are in the process of designing policies.

FIGURE 4
LATIN AMERICA AND THE CARIBBEAN (17 COUNTRIES):
POLICIES FOR ICTS IN EDUCATION: DEGREE OF FORMALIZATION

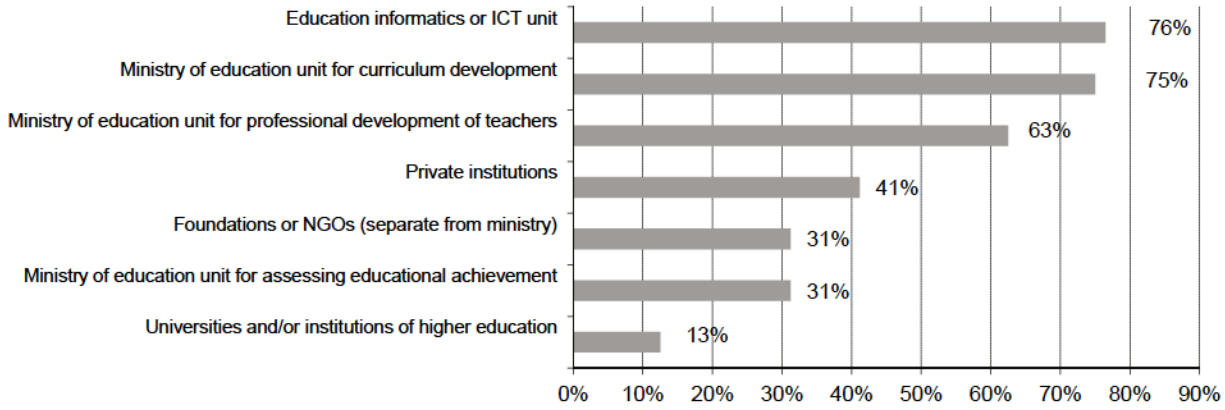


Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

Note: Scoring: 1 = No, but policies and projects are being designed; 2 = No, only a few initiatives exist for ICTs in education; 3 = No, but there are a number of national initiatives for ICTs in education; 4 = Yes, but the defining document is in the design phase; 5 = Yes, it is published.

As concerns the involvement of units of the ministry of education and other institutions in policy implementation, the study shows that 76% of the countries have policy management units. The study further shows that in 75% of the countries the curriculum unit is involved at the policy level; in 63% of the countries the faculty professional development unit is involved, and only in 31% is the achievement assessment unit involved.

FIGURE 5
LATIN AMERICA AND THE CARIBBEAN (17 COUNTRIES): PERCENTAGE OF COUNTRIES THAT HAVE DEDICATED UNITS INVOLVED IN THE IMPLEMENTATION OF POLICIES FOR ICTS IN EDUCATION



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

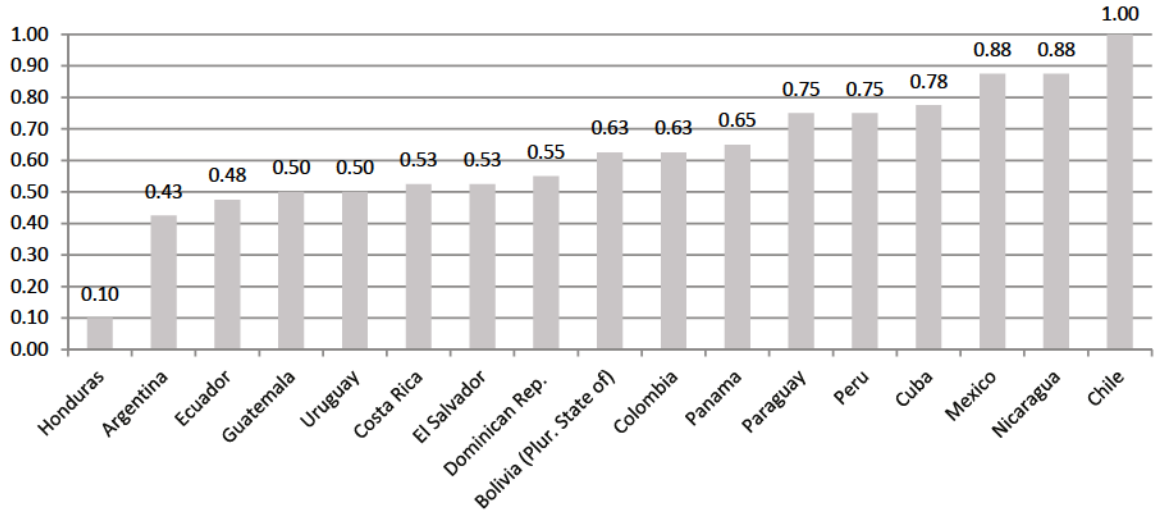
In reviewing the responses of each country (Table A. 1), the findings show that formalization of policies for ICTs in education is linked to the existence of a dedicated unit that manages initiatives in this area.

Seven of the nine countries that have a written, published policy have an education informatics unit, the exceptions being Uruguay[15] and Guatemala. Most of the countries that are in the policy design phase (three out of four) also have such a unit.[16] On the other hand, those countries that have no published policy for ICTs in education do not have an *ad hoc* unit, as can be observed in Ecuador and Honduras. Last, Argentina and the Dominican Republic are exceptions in that, while also having an education informatics unit the actions being taken under a formal policy are not coordinated.

In several countries ICT policies for education are implemented jointly by different units of the ministry of education. This is the case in Chile and Ecuador, which have involved the curriculum, faculty professional development and achievement assessment units.

Below is a chart that displays the rate of institutionalization of policies for ICTs in education in the countries.[17]

FIGURE 6
LATIN AMERICA AND THE CARIBBEAN (17 COUNTRIES): INDEX OF INSTITUTIONALIZATION OF POLICIES FOR ICTS IN EDUCATION



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

As can be seen in Figure 3, Chile, Nicaragua and Mexico show the highest degree of institutionalization of their policies for ICTs in education, with Honduras showing the least development in this regard.

The conceptualization of this index is generally tied to a relatively centralized government structure in which the ministry of education plays the lead role in designing and implementing policies through a set of internal units. However, in the case of some ministries of education, as is the case in Uruguay, policies are implemented by semi-independent units linked to the government.

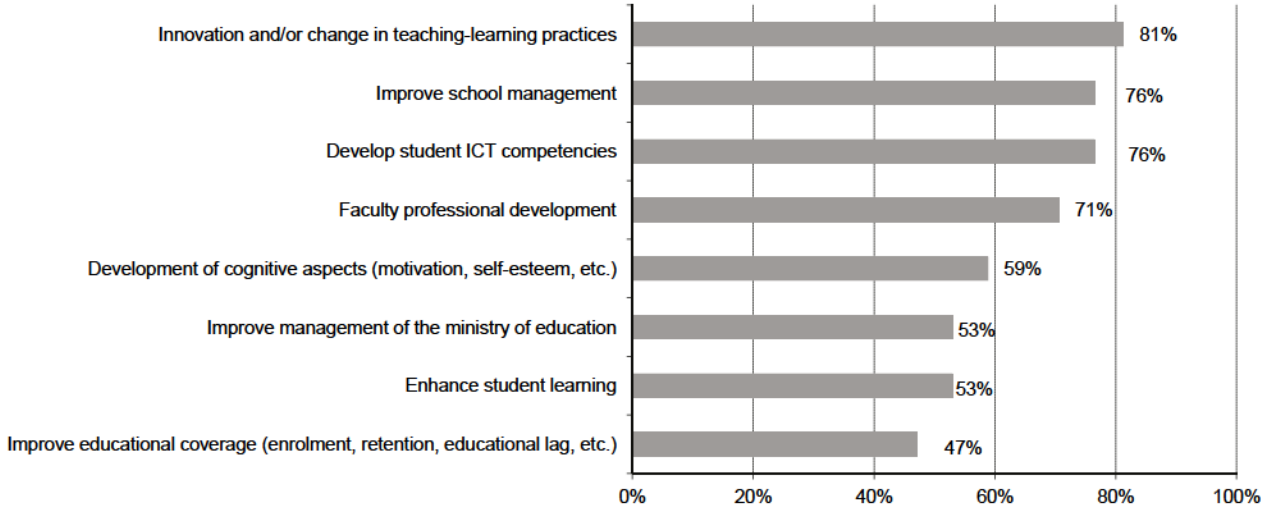
[15] A special government body was created in Uruguay for the purpose of policy implementation.
[16] In Costa Rica, it may be assumed that Fundación Omar Dengo fulfills an equivalent role.
[17] Calculated using scores on the scale for the existence of formal policies (inverted and changed to a 0-to-1 scale) and the sum of the units of the ministry of education that are involved at the policy level (changed to a 0-to-1 scale).

B. Characteristics of policies for ICTs in education

In all of the countries, policy implementation is aimed at the school population included in the International Standard Classification of Education (ISCED)[18] 1 to 3. As the chart below indicates, most of the countries have set the goal of innovating and/or changing practices in teaching-learning (81%), improving school management (76%) and developing ICT competencies of students (76%) and teachers (71%). In most cases these latter objectives are directly tied to reducing the digital divide.

Only about half the countries have expressly declared the goal of "enhancing student learning" (53%) and "improving educational coverage" (enrolment, retention, educational lag, etc.) (47%), despite the direct association these goals have with two of the major problems faced by education systems in the region (ECLAC, 2009). Furthermore, the study shows that over half the countries (53%) have the express goal of "improving management of the Ministry of Education".

FIGURE 7
LATIN AMERICA AND THE CARIBBEAN: (17 COUNTRIES) PERCENTAGE OF COUNTRIES THAT EXPRESSLY INCLUDE THE FOLLOWING OBJECTIVES IN THEIR POLICIES FOR ICTS IN EDUCATION



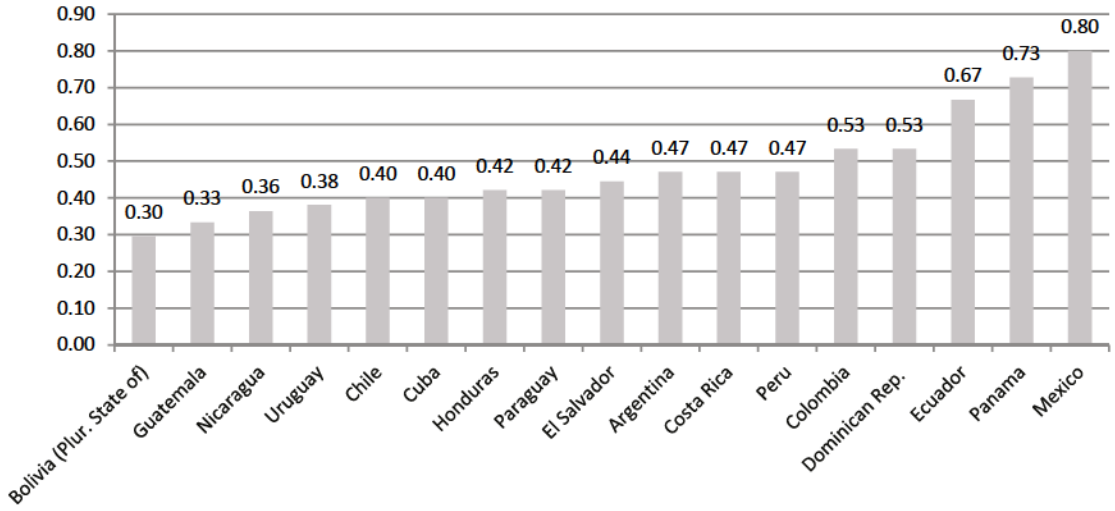
Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

Figure 5 reflects the extent to which the countries have defined objectives.[19] In simple terms, the index reflects the number of objectives defined by each country, interpreted to mean, as is shown in the initial sections, that a higher number of objectives could reflect better use of ICT potential in education. As can be seen, Mexico and Panama have the highest number of objectives to meet through policies for ICTs in education. In comparison, the Plurinational State of Bolivia has the fewest specifically defined objectives (see details in table A.3).

[18] UNESCO classification that identifies six levels of education: ISCED 0, Pre-primary; ISCED 1, Primary education (first stage of basic education); ISCED 2 Lower secondary education (or second stage of basic education); ISCED 3, Upper secondary education; ISCED 4, Post-secondary, non-tertiary education; ISCED 5, first stage of tertiary education; ISCED 6, Second stage of tertiary education (advanced research).

[19] Calculated using scores on the scale for defined ICT policy goals (changed to a 0-to-1 scale)

FIGURE 8
LATIN AMERICA AND THE CARIBBEAN (17 COUNTRIES):
INDEX OF SPECIFICALLY DEFINED OBJECTIVES IN POLICIES FOR ICTS IN EDUCATION

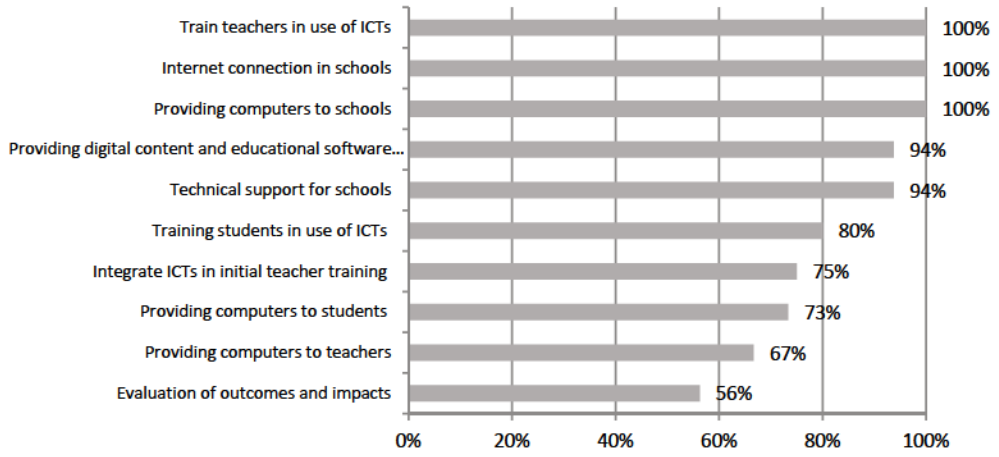


Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

The findings show that practically all of the countries consider all levels as beneficiaries of the policies.

Figure 6 looks at the actions the countries include in their policies for ICTs in education. All of the countries include teacher training, Internet connectivity and providing schools with computers. More than 75% of the countries include providing digital resources, technical support services and student training for use of ICTs. However, little more than half of the countries include actions to assess the impact of their policies for ICTs in education.

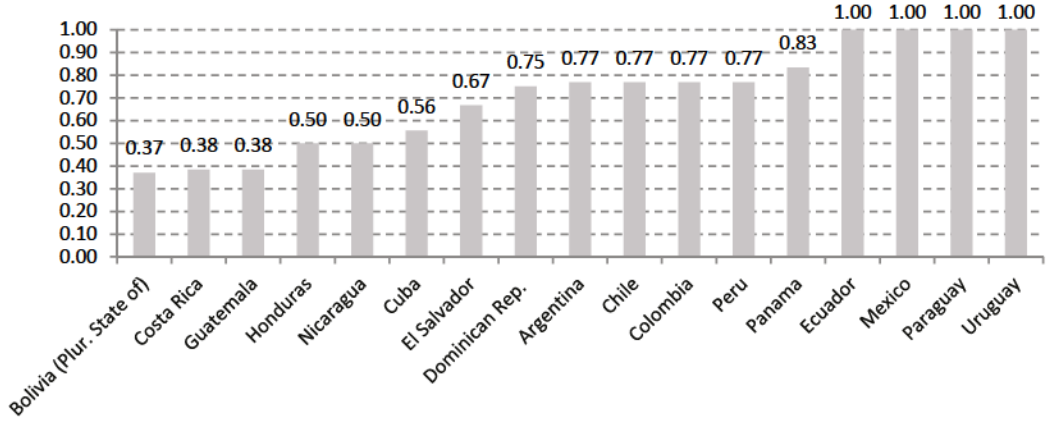
FIGURE 9
LATIN AMERICA AND THE CARIBBEAN (17 COUNTRIES): PERCENTAGE OF COUNTRIES THAT CONSIDER THE FOLLOWING ACTIONS WHEN IMPLEMENTING POLICIES FOR ICTS IN EDUCATION



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

Figure 7, too, presents the index for actions the countries included when implementing policies.[20] The assumption is that a greater number of actions would enhance the use of the range of potentials ICTs can provide. As the findings show, Uruguay, Paraguay, Mexico and Ecuador are the countries that are implementing the greatest number of actions. At the other end of the scale are the Plurinational State of Bolivia, Costa Rica and Guatemala (see table A.2).

FIGURE 10
LATIN AMERICA AND THE CARIBBEAN (17 COUNTRIES): INDEX OF ACTIONS INCLUDED BY THE COUNTRIES WHEN IMPLEMENTING POLICES FOR ICTS IN EDUCATION

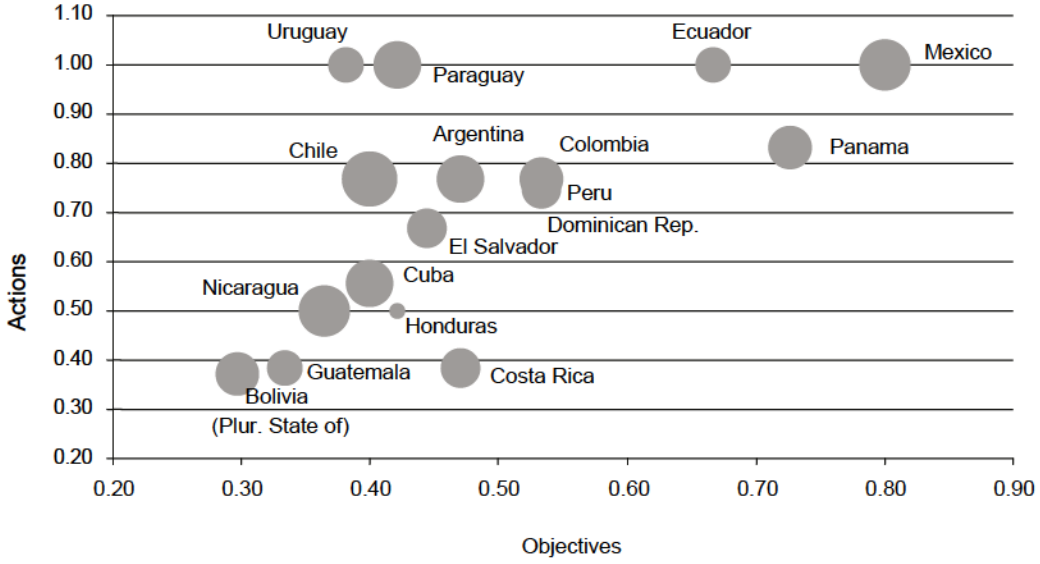


Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

Figure 8 shows the correlations among the findings on institutionalization, objectives and actions. There is a relatively high correlation (axes) between the number of objectives and defined actions. However, there is no observable correlation between policy institutionalization (size of the bubble) and the other indices.

[20] Calculated using scores on the scale for formal policy action (changed to a 0-to-1 scale).

FIGURE 11
LATIN AMERICA AND THE CARIBBEAN (17 COUNTRIES): CORRELATIONS AMONG THE INDICES FOR INSTITUTIONALIZATION, OBJECTIVES AND ACTIONS



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICT in education.

These findings could suggest that, though there may be consistency in the way the countries define objectives and actions, the institutionalization needed to implement policies may depend on other factors, such as the organization of the ministry of education and/or of the government itself.

C. Integration of ICTs in the curriculum

In practice, as opposed to traditional school subjects (language, mathematics, science), there is no consensus about how to integrate ICTs in the curriculum or about what types of competencies should be incorporated. Therefore, the countries have done this in different ways.

Nevertheless, UNESCO (2002) distinguishes the following three strategies for developing student ICT competencies:

1. ICTs as standalone content. The objectives and contents related to ICT use are included in the curriculum separate from other content and are taught through ICT courses such as information systems, computers and programming.
2. ICTs as complementary content. The objectives and content related to ICT use are included in the curriculum as complements to the objectives of other content, such as mathematics and science. An example would be learning to use word processors during language classes.
3. Specialized and advanced ICT content. This refers to a curriculum that seeks to train technicians in ICT-related areas, such as software programming, network administration and computer repair.

Many countries are also adding to their curricula the recommendation that ICTs be used in a variety of learning settings and subject areas. This strategy focuses on:

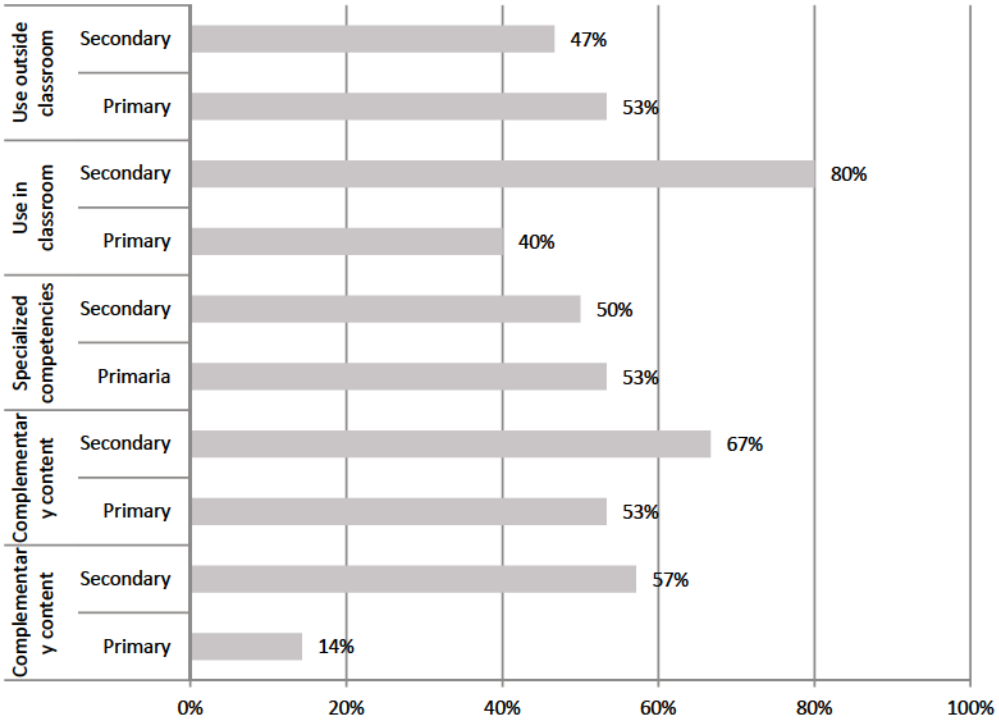
4. Using ICTs to support other content. Objectives for ICT use are subordinated to their use as a tool for supporting the achievement of traditional curriculum objectives, either in the classroom or outside of the classroom. For example, this model might use spreadsheets for teaching the concept of series, or geometry software to teach about angles.

Based on these categories, Figure 9 shows the percentage of countries that include each of the objectives in their curricula for primary and secondary education (see details in table A.4). The findings indicate that slightly more than half (57%) of the countries include the development of ICT competencies, either as standalone or complementary competencies, in the primary school curriculum, and 79% include it in the secondary school curriculum.

In secondary school, 67% of the countries include the development of ICT competencies as complementary content, and 57% treat it as a standalone subject.

Most of the countries (80%) include classroom use of ICTs in their secondary education curriculum recommendations, and half of them include recommendations that ICTs be used outside the classroom at the primary school level (53%).

FIGURE 12
LATIN AMERICA AND THE CARIBBEAN (16 COUNTRIES): PERCENTAGE OF COUNTRIES THAT INCORPORATE DIFFERENT TYPES OF OBJECTIVES IN THE CURRICULUM



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

Note: The Plurinational State of Bolivia does not have data available for determining the different types of objectives in the curriculum.

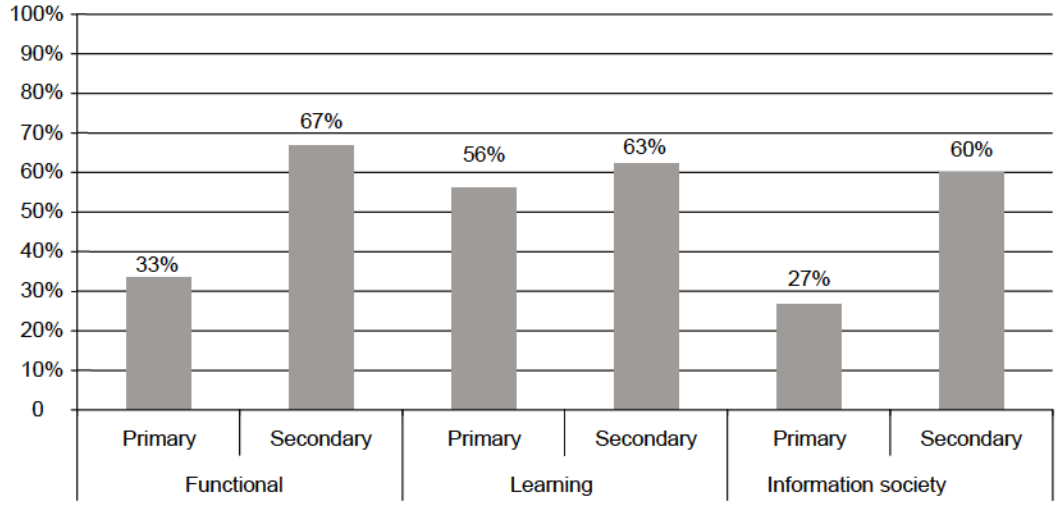
The survey looked at three types of ICT competencies included by the countries:

1. Functional competencies. These are competencies needed to properly use the applications available on a computer, particularly productivity applications such as word processing and spreadsheets.
2. Learning competencies. These are competencies that enhance student learning, often referred to as "thinking skills." These include Internet search strategies, analysing, processing and synthesizing information, preparing presentations and participation in virtual communities.

3. ICT competencies for the information society. These are competences perceived to be essential for success in the twenty-first century society; they include communication skills, logical argument construction, critical thinking and problem-solving.

Figure 10 shows the percentage of countries that incorporate each type of ICT competency in their curricula (see details in table A.5). About 60% of the countries include all three types of competencies in secondary education, and 56% include learning competencies in primary school. However, only about one third of the countries includes functional competencies (33%) and those associated with the information society (27%) at the primary school level.

FIGURE 13
LATIN AMERICA AND THE CARIBBEAN (16 COUNTRIES): PERCENTAGE OF COUNTRIES THAT INCORPORATE SPECIFIC TYPES OF ICT COMPETENCIES IN THEIR CURRICULA



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

Note: The Plurinational State of Bolivia does not have data available for gauging the incorporation of ICT objectives in the curriculum.

As this section demonstrates, a good number of the countries have incorporated ICT objectives into their curricula and have defined ICT competencies. However, this has not been the case in 19% of the countries (Ecuador, Honduras and Paraguay).

D. Summary of policies for ICTs in education

About half of the countries have formal, published policies, and most of these have units responsible for implementing policies or initiatives for ICTs in education. Most strategies seek to have an impact on the teaching-learning process and on school management, and to develop student and teacher ICT competencies. Furthermore, there is a correlation between the objectives defined by each country and the actions each is implementing. Most of the countries consistently include in their curricula objectives related to developing ICT competencies, particularly at the secondary education level. However, it is interesting to note that:

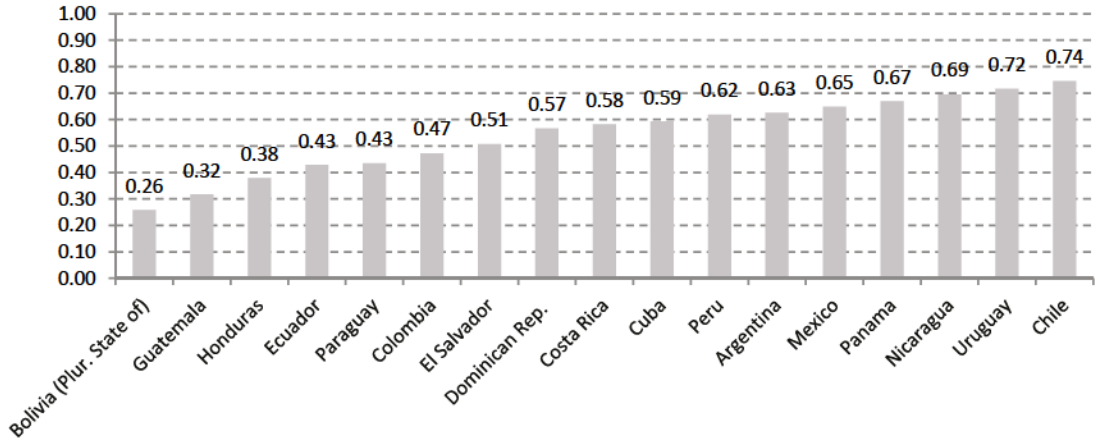
- Relatively few countries incorporate systems for evaluating policy implementation.
- About half of the countries do not include enhanced student learning or improvements in areas such as coverage and student retention as explicit objectives despite the fact that these latter two objectives are priority problems for the region.

- Twenty percent of the countries have not yet incorporated ICT competency development in their curricula.

Generally speaking, and considering the indicators presented in the foregoing sections, Figure 11 presents an index showing the degree of definition of policies for ICTs in education.[21] This index gauges the completeness of the countries' policies for ICTs in education. A high index value means that a country has institutionalized its policies, engaged various actors or units that together seek to achieve a broad range of objectives and conducts a wide variety of actions related to incorporating ICT objectives in the curriculum and to developing ICT competencies.

Specifically, considering the many roles that ICTs play in education, this index shows the extent to which countries have designed their policies so as to take advantage of the diversity of options, both in policy and in their respective curricula.

FIGURE 14
LATIN AMERICA AND THE CARIBBEAN (17 COUNTRIES): INDEX OF DEFINED POLICIES FOR ICTS IN EDUCATION



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

Note: The Plurinational State of Bolivia and Ecuador do not have data available on the dimensions referring to ICT goals in the curriculum or to ICT competencies.

The findings reveal progress by the countries in defining the policy dimensions for ICTs in education (0.58, on average). They also show that the countries that have defined and incorporated the most dimensions are Chile, Uruguay and Nicaragua, and those with the lowest number of definitions are the Plurinational State of Bolivia, Honduras and Guatemala.

This index makes it possible to compare the characteristics of policies for ICTs in education using a common basis of dimensions. The quality of implementation, outcomes and impacts can be compared while considering the social, economic and cultural peculiarities of each country. On this basis, design decisions can be made.

[21] The rate is calculated as the sum of the indices of institutionalization, objectives, actions, ICT objectives and competences as part of the curriculum, divided by five.

IV. Implementation of policies for ICTs in education

The following components taken into consideration:

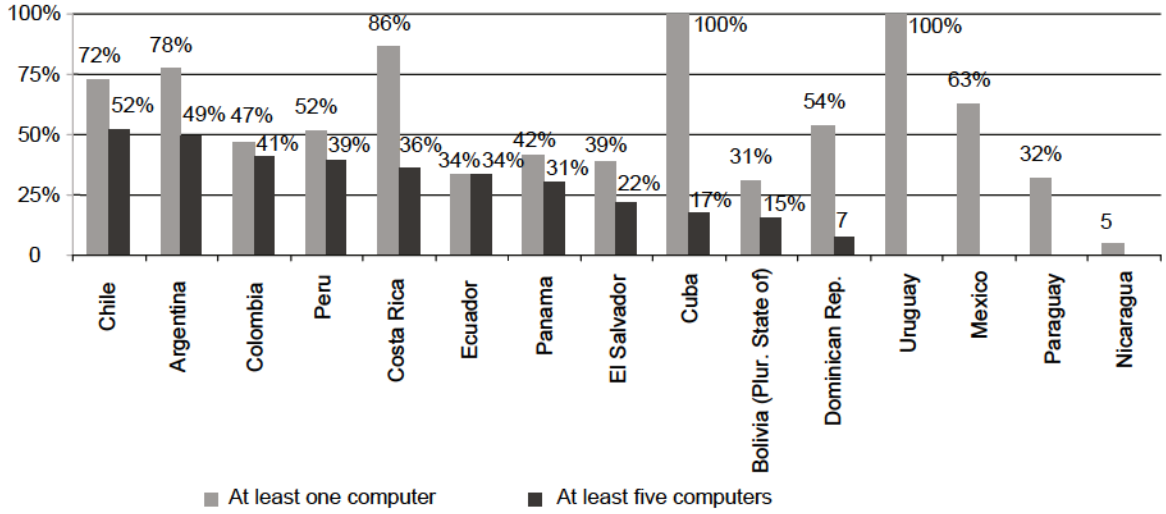
- ICT infrastructure provided; this includes computers, Internet and digital educational resources
- Availability of technical support
- Training
- Usage

A. ICT infrastructure

The findings show that, on average, 57% of educational establishments have at least one computer while only 31% have five or more. However, as Figure 12 shows, there is relatively high variance among the countries.

Both Cuba and Uruguay have at least one computer per educational establishment. In Chile and Argentina about half of all establishments have five or more computers, while only a small minority of establishments in the Dominican Republic, Plurinational State of Bolivia and Cuba do (7%, 15% and 17%, respectively).

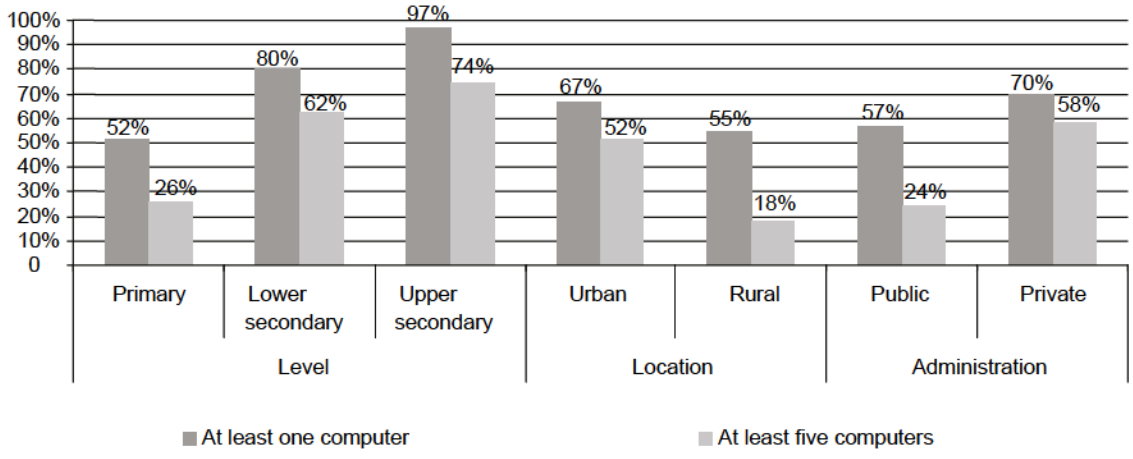
FIGURE 15
LATIN AMERICA AND THE CARIBBEAN (15 COUNTRIES): PERCENTAGE OF EDUCATIONAL ESTABLISHMENTS WITH COMPUTERS



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.
Note: Guatemala and Honduras do not have information available for calculating the percentage.

Grouping educational establishments according to context variables, the figure shows the average percentage of establishments in each country that have computers (see details in tables A.6 and A.7). In most of the countries ICT infrastructure is found mostly in secondary schools. In fact, 97% of upper secondary schools have at least one computer. Urban schools have more infrastructure than rural ones and private schools more than public ones. These differences are even more pronounced for schools that have five or more computers.

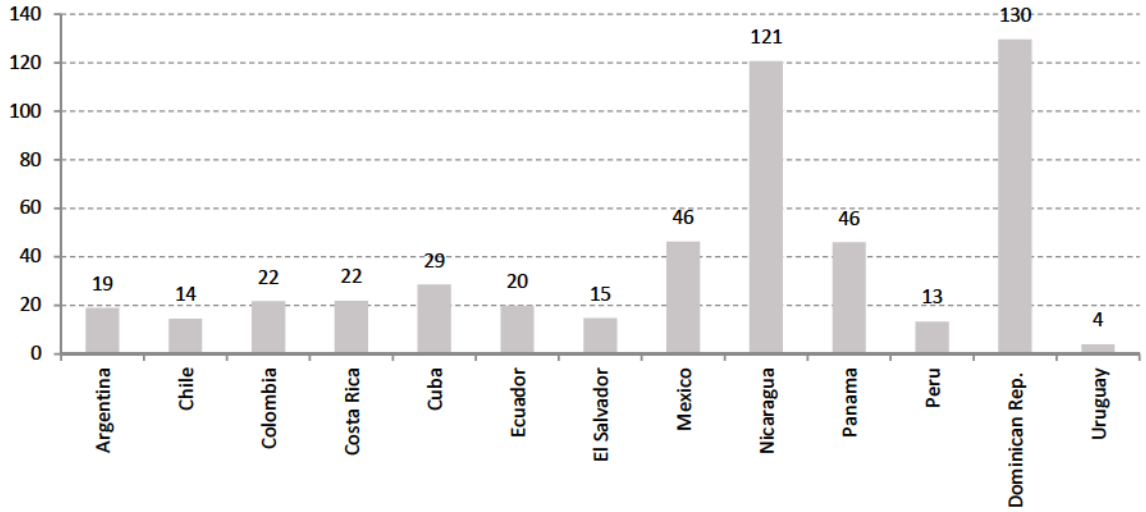
FIGURE 16
LATIN AMERICA AND THE CARIBBEAN (14 COUNTRIES): PERCENTAGE OF EDUCATIONAL ESTABLISHMENTS WITH COMPUTERS, BY LEVEL, LOCATION, AND ADMINISTRATION



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.
Note: Colombia, Guatemala and Honduras do not have information available for calculating the percentage.

Figure 14, on the other hand, reflects student access to ICTs by showing the student-to-computer ratio for each country. There are significant differences among the countries. For example, Uruguay has a ratio of only four students per computer, which is comparable to the ratio of 5.2 students per computer in OECD countries in 2006 (OECD, 2010). However, the Dominican Republic and Nicaragua have 130 and 121 students per computer, respectively.

FIGURE 17
LATIN AMERICA AND THE CARIBBEAN (13 COUNTRIES): STUDENT-TO-COMPUTER RATIO[22]



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

Note: The Plurinational State of Bolivia, Guatemala, Honduras and Paraguay do not have information available for calculating the ratio.

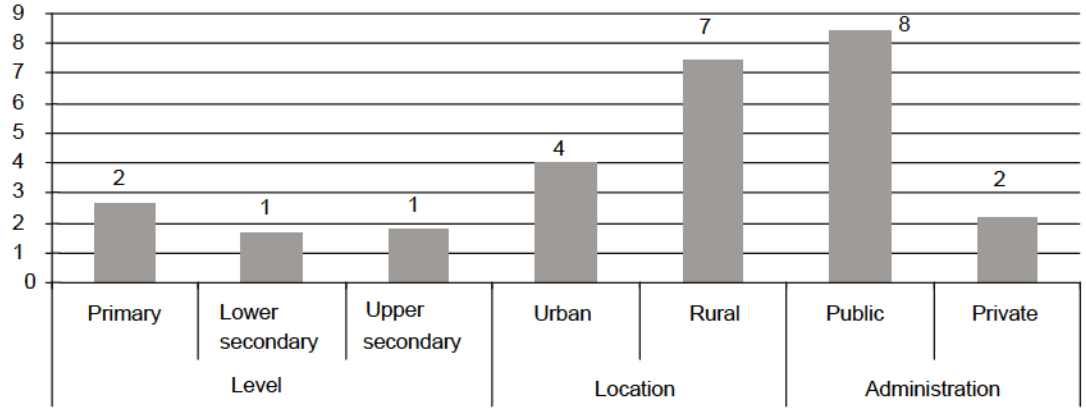
Figure 15, which looks at the distribution of the student-per-computer ratio according to context variables (see details in table A.8), shows that private educational institutions have much lower ratios than public ones (22 and 84, respectively). The same is true when comparing urban and rural establishments (40 and 74, respectively), and when comparing secondary[23] with primary ones (17 and 27, respectively).

These results confirm the ICT access gaps that exist in the region, with urban, private and secondary educational establishments showing greater access.

[22] Calculated as the sum of available computers in all educational establishments divided by the total number of students in all establishments.

[23] Based on the average between lower and upper secondary schools.

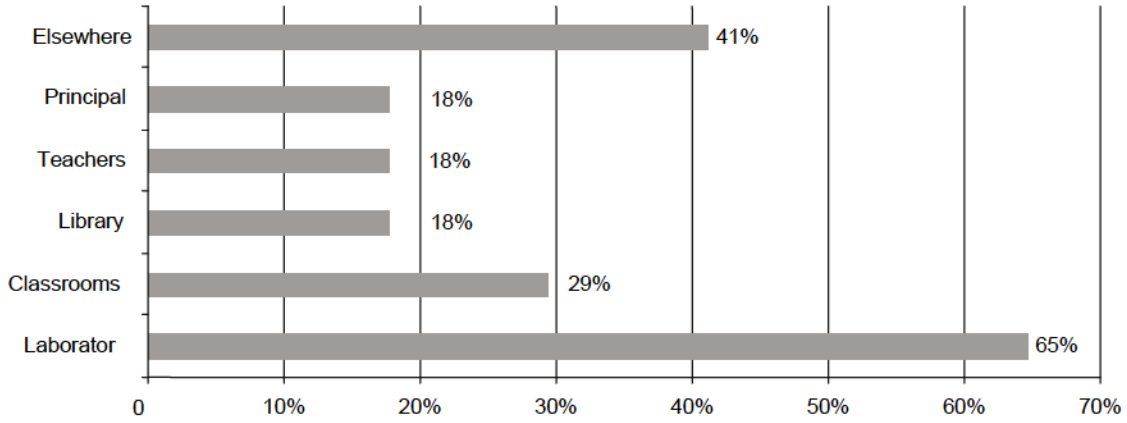
FIGURE 18
LATIN AMERICA AND THE CARIBBEAN (13 COUNTRIES): STUDENT-TO-COMPUTER RATIO ACCORDING TO LEVEL, LOCATION AND ADMINISTRATION



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.
Note: The Plurinational State of Bolivia, Guatemala, Honduras and Paraguay do not have information available for calculating the ratio.

Figure 16 looks at where computers are located, with 65% of the countries reporting that computers are located in a laboratory and 29% reporting that they are located in classrooms. However, only 18% of the countries report that computers are availale in the teachers' lounge, library or principal's office. And 41% of the countries report their computers as being located elsewhere (see details in table A.9).

FIGURE 19
LATIN AMERICA AND THE CARIBBEAN (13 COUNTRIES): PERCENTAGE OF COUNTRIES REPORTING WHERE THEIR COMPUTERS ARE LOCATED

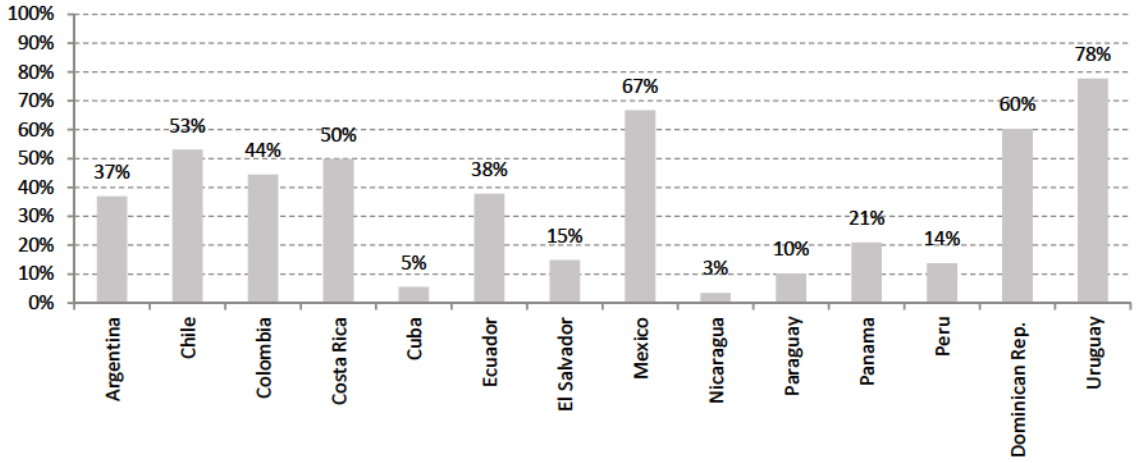


Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICT in education.
Note: Colombia, El Salvador, Guatemala and Honduras do not have information available for determining the percentage of establishments with computers in different locations.

Figure 17 shows that for this set of countries of the region, 36% of educational establishments, on average, have Internet access. Even though 78% of educational establishments in Uruguay have Internet

access and 67% of Mexico's do, these percentages are still relatively low, particularly considering that in 2008 100% of public schools in the United States had Internet access (Gray, Thomas and Lewis, 2010).

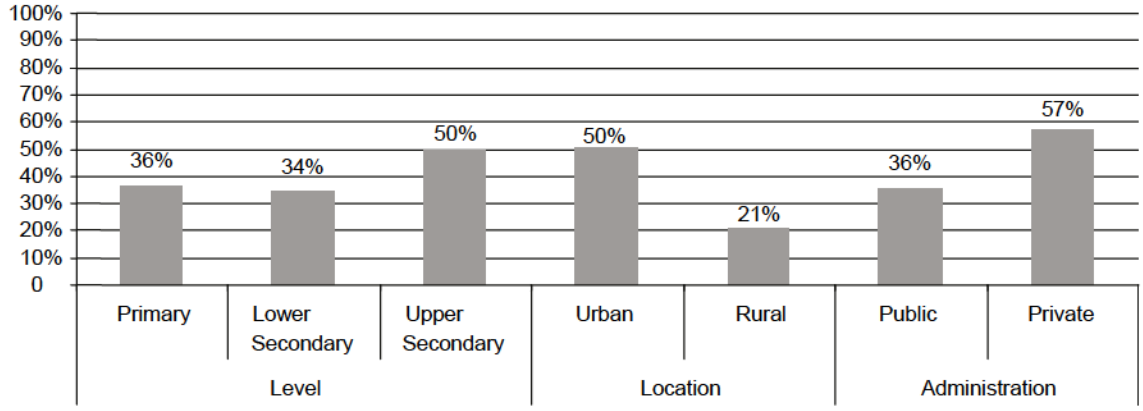
FIGURE 20
LATIN AMERICA AND THE CARIBBEAN (14 COUNTRIES): PERCENTAGE OF SCHOOLS WITH INTERNET ACCESS



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.
Note: The Plurinational State of Bolivia, Guatemala and Honduras do not have information available for calculating the percentage.

An analysis of the distribution of Internet access according to context variables (Figure 18) shows that they follow the same pattern seen in earlier variables, that is, private, urban and secondary educational establishments have greater Internet access (see details in table A.10).

FIGURE 21
LATIN AMERICA AND THE CARIBBEAN (13 COUNTRIES): PERCENTAGE OF EDUCATIONAL ESTABLISHMENTS WITH INTERNET ACCESS, ACCORDING TO LEVEL, LOCATION AND ADMINISTRATION

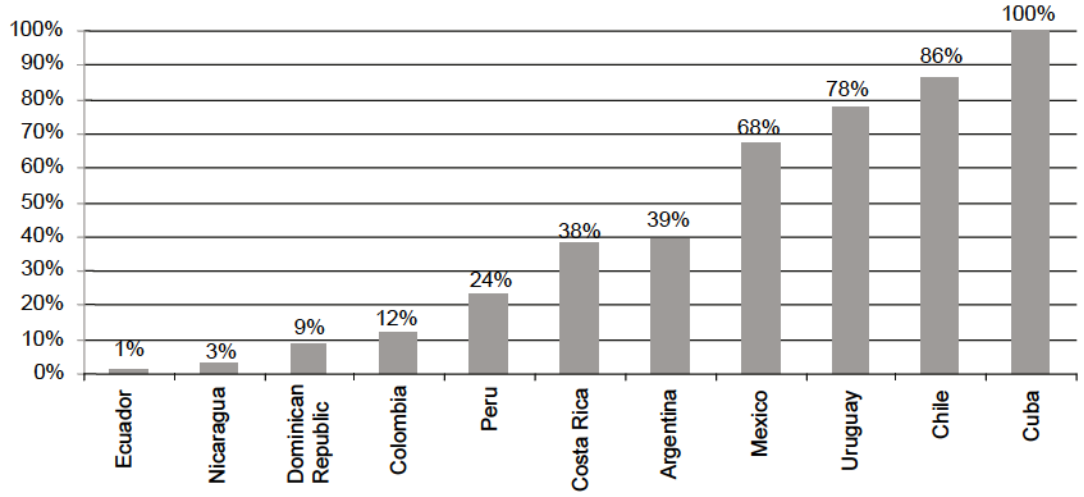


Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.
Note: The Plurinational State of Bolivia, Colombia, Guatemala and Honduras do not have information available for calculating the percentage.

Figure 19 addresses the availability of digital educational resources and shows that 42% of educational establishments, on average, have such resources. The highest percentages are for Cuba,

where all establishments are equipped with digital educational resources, and Chile, at 86%. The lowest percentages were in Ecuador and the Dominican Republic, where only 3% and 9%, respectively, of educational establishments have digital educational resources.

FIGURE 22
LATIN AMERICA AND THE CARIBBEAN (11 COUNTRIES): PERCENTAGE OF EDUCATIONAL ESTABLISHMENTS THAT HAVE DIGITAL EDUCATIONAL RESOURCES



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

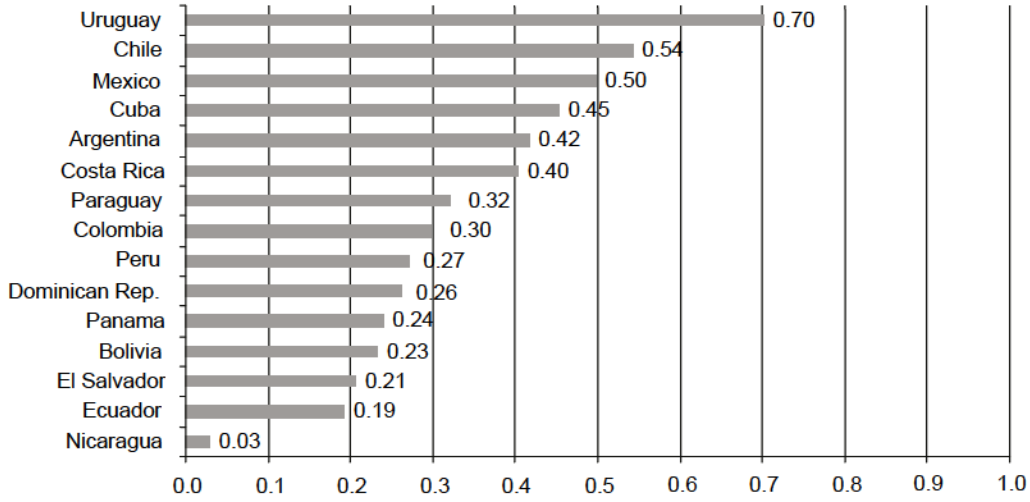
Note: The Plurinational State of Bolivia, Ecuador, El Salvador, Guatemala, Honduras, Panama and Paraguay do not have information available for calculating the percentage.

Figure 20 provides an infrastructure implementation index that summarizes the survey data on the percentage of educational establishments with computers, the student-to-computer ratio,[24] the percentage of establishments with Internet access and the percentage of establishments that have digital educational resources.

Uruguay shows the greatest degree of implementation as measured by the infrastructure component, followed by Chile. The countries with the lowest indices are Ecuador and Nicaragua. For some countries there is no—or only partially—compiled data. Caution must be applied when making comparisons, to avoid misleading or unfair conclusions.

[24] For purposes of calculating the index, the inverse of the student-to-computer ratio was used.

FIGURE 23
LATIN AMERICA AND THE CARIBBEAN (BETWEEN 11 AND 15 COUNTRIES): INFRASTRUCTURE IMPLEMENTATION INDEX



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

Note: Guatemala and Honduras do not have the necessary data to calculate this index, while other countries have only partial data. The countries that have complete data are Argentina, Chile, Colombia, Costa Rica, Cuba, the Dominican Republic and Peru.

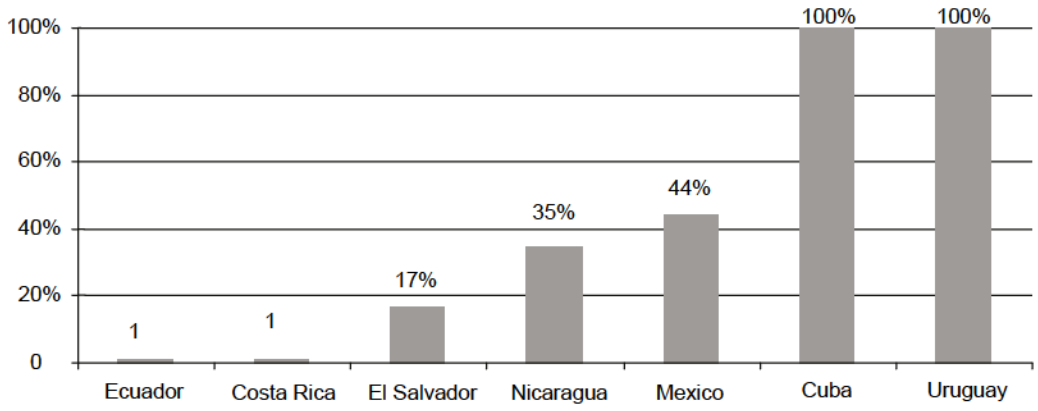
B. Technical Support

The survey found that, on average, 42% of the region's educational establishments receive technical support at least once per semester (Figure 21).

In Cuba and Uruguay, all establishments receive technical support. In contrast, in Ecuador and El Salvador only 1% and 17%, respectively, receive technical support once per semester.[25]

[25] The number of responses does not allow for analysis by context variables.

FIGURE 24
LATIN AMERICA AND THE CARIBBEAN (7 COUNTRIES): PERCENTAGE OF SCHOOLS THAT RECEIVE TECHNICAL SUPPORT AT LEAST ONCE PER SEMESTER



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

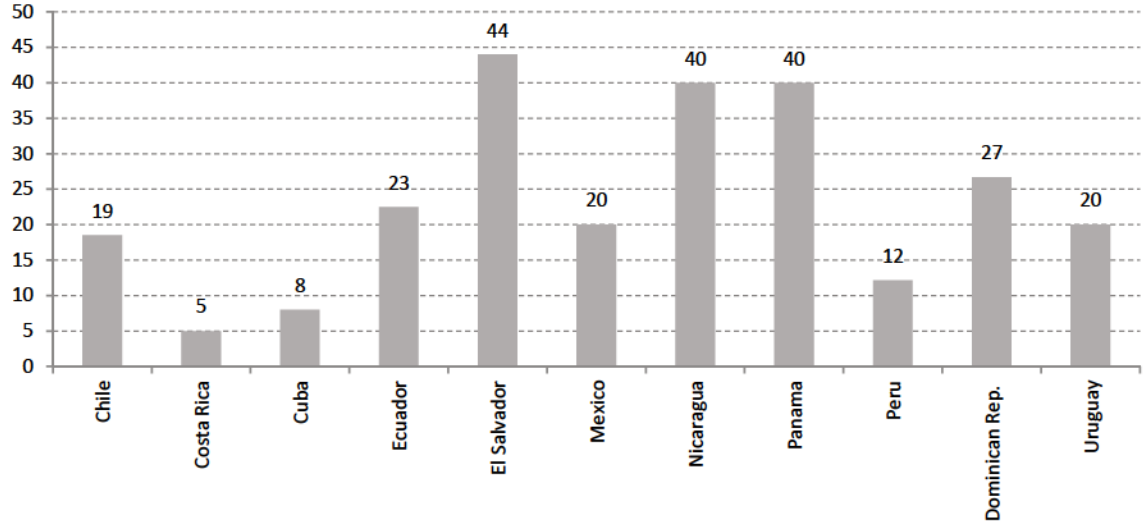
Note: Argentina, the Plurinational State of Bolivia, Chile, Colombia, Guatemala, Honduras, Panama, Paraguay, Peru and Dominican Republic do not have data available for calculating the percentage.

As for availability of support personnel in educational establishments, Figure 12 shows the average number of hours an ICT coordinator is employed per week. The overall average is 23 hours.

El Salvador, Nicaragua and Panama report that ICT coordinators are employed for an average of 40 or more hours per week. In contrast, Costa Rica and Cuba engage coordinators for less than 10 hours per week.

Overall, these findings represent a challenge, particularly when compared with countries such as Finland and Singapore where, in 2006, 97% and 95% of their educational establishments, respectively, reported having an ICT coordinator (Law *et al.*, 2008).

FIGURE 25
LATIN AMERICA AND THE CARIBBEAN (11 COUNTRIES): AVERAGE NUMBER OF HOURS AN ICT COORDINATOR IS EMPLOYED PER WEEK

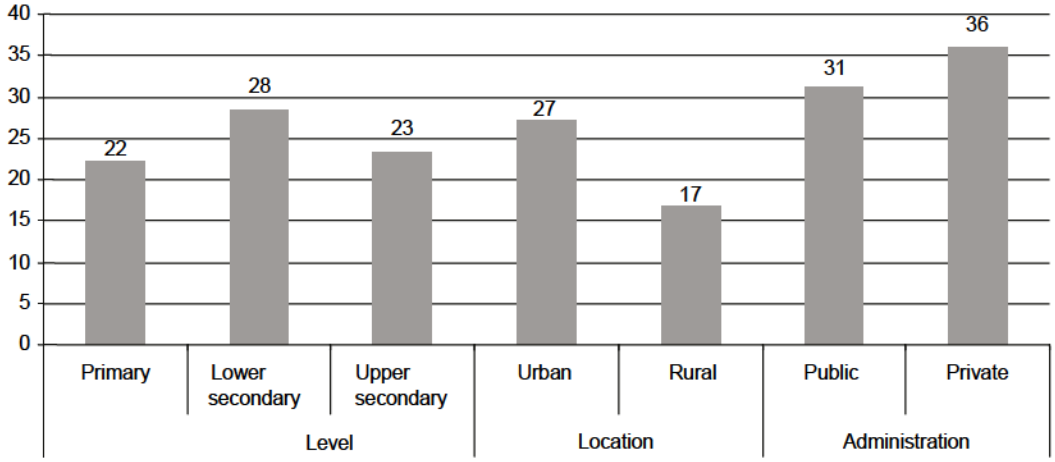


Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

Note: Argentina, the Plurinational State of Bolivia, Colombia, Guatemala, Honduras and Paraguay do not have available data for calculating the average number of hours.

Figure 23 analyses, on the basis of context variables, the number of hours an ICT coordinator is employed and shows that there is relatively little difference between public and private educational establishments. On the other hand, a comparison of the same factor among urban and rural establishments reveals a significant difference. And while there are differences between levels, they are relatively small (see details in table A.12).

FIGURE 26
LATIN AMERICA AND THE CARIBBEAN (11 COUNTRIES): AVERAGE NUMBER OF HOURS AN ICT COORDINATOR IS EMPLOYED PER WEEK ACCORDING TO LEVEL, LOCATION AND ADMINISTRATION

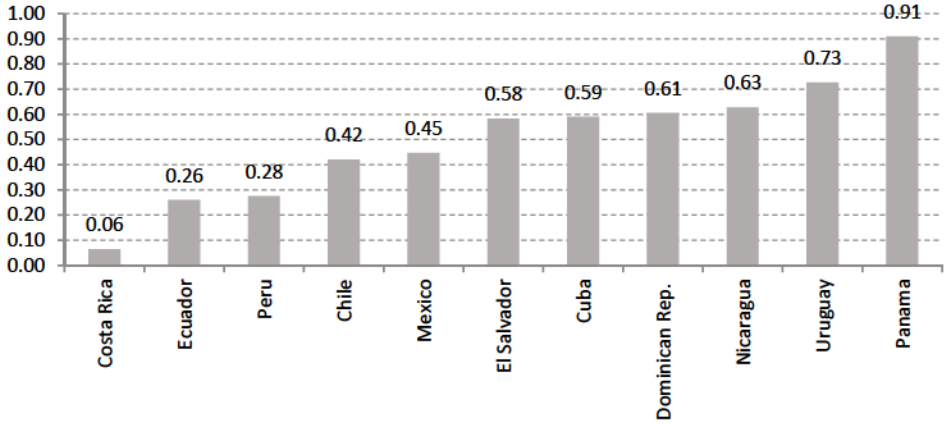


Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICT in education.

Note: Argentina, the Plurinational State of Bolivia, Colombia, Guatemala, Honduras and Paraguay do not have available data for calculating the average number of hours.

Figure 24 considers the percentage of schools that have technical support and the number of hours an ICT coordinator is employed to arrive at an implementation index for the technical support component.

FIGURE 27
LATIN AMERICA AND THE CARIBBEAN (11 COUNTRIES): IMPLEMENTATION INDEX FOR THE TECHNICAL SUPPORT DIMENSION



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

Note: Argentina, the Plurinational State of Bolivia, Colombia, Guatemala, Honduras and Paraguay do not have available data for calculating this index, and other countries only have partial data. The countries that have complete data are Costa Rica, Cuba, Ecuador, El Salvador, Mexico, Nicaragua and Uruguay.

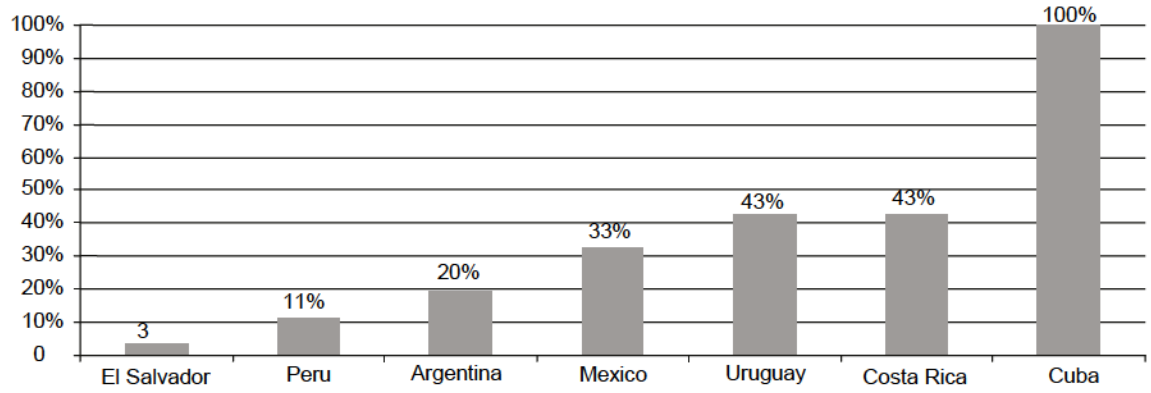
Panama and Uruguay are the countries with the highest degree of implementation in this area, while Peru, Ecuador and Costa Rica rank lowest in implementation. Because some countries have no — or only partially— compiled data, caution must be applied when making comparisons, to avoid misleading or unfair conclusions.

C. Training

The survey found that 36% of teachers are trained in the use of ICTs (Figure 25); 100% of teachers in Cuba have been trained, as have 43% in Costa Rica and Uruguay. However, only 3% and 11% of teachers in El Salvador and Peru, respectively, have received training in ICT use.

Internationally, this is a critical area for the development of ICT policies. As the results of the TALIS[26] study show, teachers report their need for training in the use of ICTs in education as the second most important factor. In this context, it is important that priority be given to actions in this area.[27]

FIGURE 28
LATIN AMERICA AND THE CARIBBEAN (7 COUNTRIES): PERCENTAGE OF TEACHERS TRAINED IN ICT USE IN EACH COUNTRY



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICT in education.

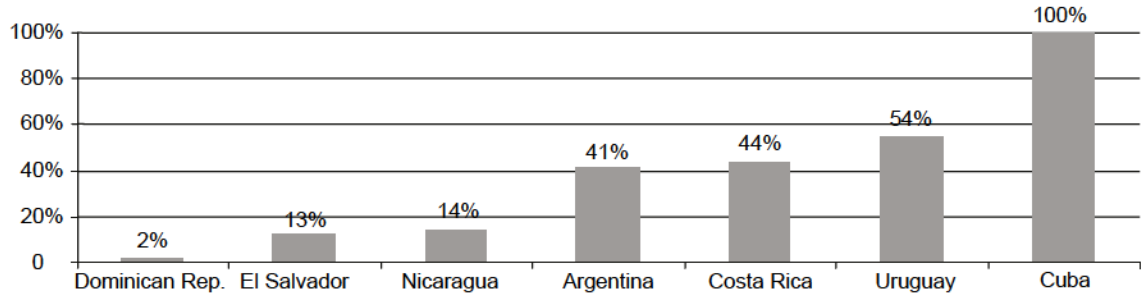
Note: the Plurinational Bolivia, Chile, Colombia, Dominican Republic, Ecuador, Guatemala, Honduras, Nicaragua, Panama and Paraguay do not have data available for calculating the percentage.

Figure 26 shows that 38% of students have received training in the use of ICTs. Cuba and Uruguay stand out, with 100% and 54% respectively. El Salvador and Panama show rates of 13% and 14%, respectively. In the Dominican Republic, only 2% of students have received formal training in the use of ICTs.

[26] Teaching and Learning International Survey (TALIS) is an international survey conducted by the OECD on teaching and learning, given to teachers and principals of secondary schools in the following countries: Australia, Austria, Belgium, Brazil, Bulgaria, Denmark, Estonia, Hungary, Iceland, Ireland, Italy, Republic of Korea, Lithuania, Malta, Malaysia, Mexico, the Netherlands, Norway, Poland, Portugal, Spain, the Slovak Republic, Slovenia and Turkey.

[27] The first factor mentioned was the need of training in strategies for teaching students with special needs.

FIGURE 29
LATIN AMERICA AND THE CARIBBEAN (7 COUNTRIES): PERCENTAGE OF STUDENTS TRAINED IN ICT USE IN EACH COUNTRY

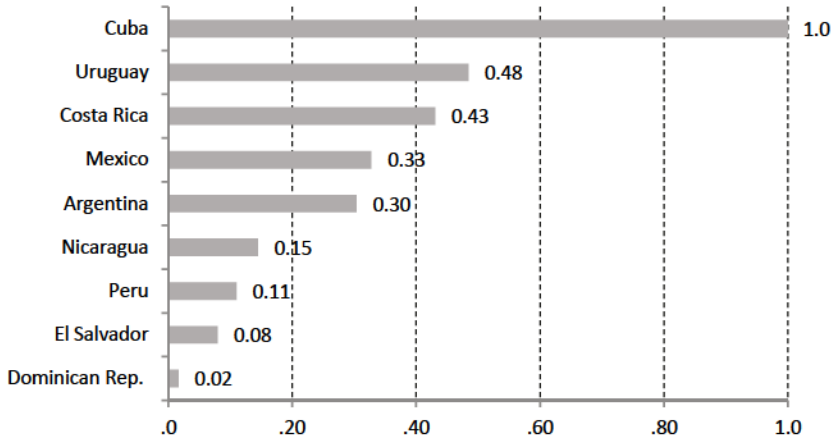


Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

Note: The Plurinational State of Bolivia, Chile, Colombia, Ecuador, Guatemala, Honduras, Panama and Paraguay do not have data available for calculating the percentage.

Using an index for the percentage of students and teachers that have received training, Figure 27 shows that Cuba and Uruguay are the countries with the highest degree of implementation as measured by the training dimension, while Peru, El Salvador and the Dominican Republic show much lower indices. As in the previous case, because some countries have no —or only partially— compiled data, caution must be applied when making comparisons, to avoid misleading and/or unfair conclusions.

FIGURE 30
LATIN AMERICA AND THE CARIBBEAN (9 COUNTRIES): IMPLEMENTATION INDEX FOR THE TRAINING DIMENSION



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

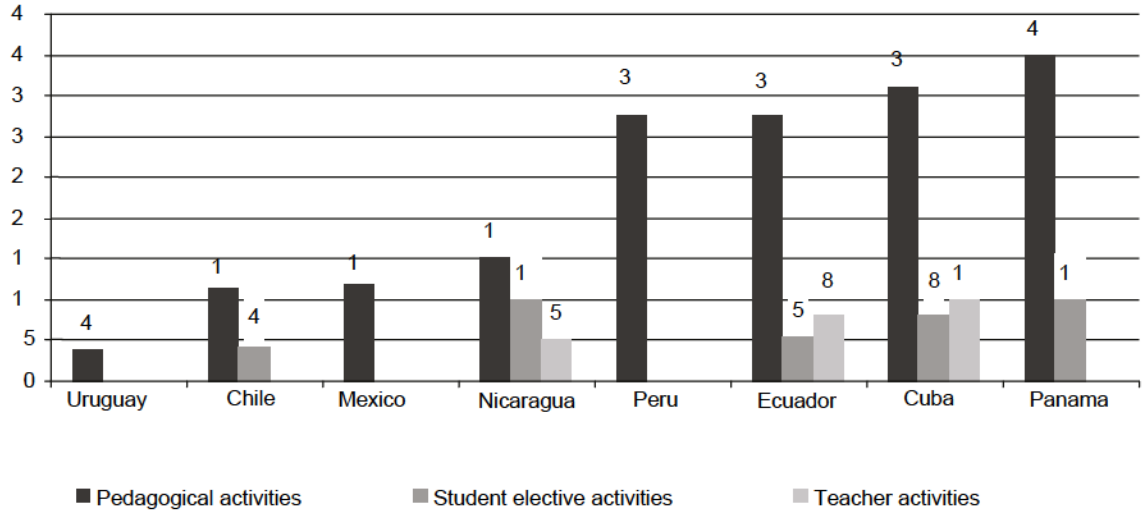
Note: The Plurinational State of Bolivia, Chile, Colombia, Ecuador, Guatemala, Honduras, Panama and Paraguay do not have data available for calculating the percentage, and other countries only have partial data. The countries that have complete data are Argentina, Costa Rica, Cuba, El Salvador and Uruguay.

D. Usage

In measuring usage of ICTs in schools, the survey shows that, on average, the computer laboratory is used about 23 hours per week for pedagogical activities, 8 hours for student elective activities and 8 hours for teacher activities. Figure 28 shows that these figures vary significantly among the countries. For example, in Cuba laboratory usage breaks down as follows: 36 hours spent in pedagogical activities,

8 hours for student elective activities and 10 hours for teacher activities. By contrast, in Nicaragua the breakdown is 15, 10 and 5 hours, respectively.

FIGURE 31
LATIN AMERICA AND THE CARIBBEAN (8 COUNTRIES): ESTIMATED COMPUTER LABORATORY USAGE BY STUDENTS AND TEACHERS, IN HOURS PER WEEK

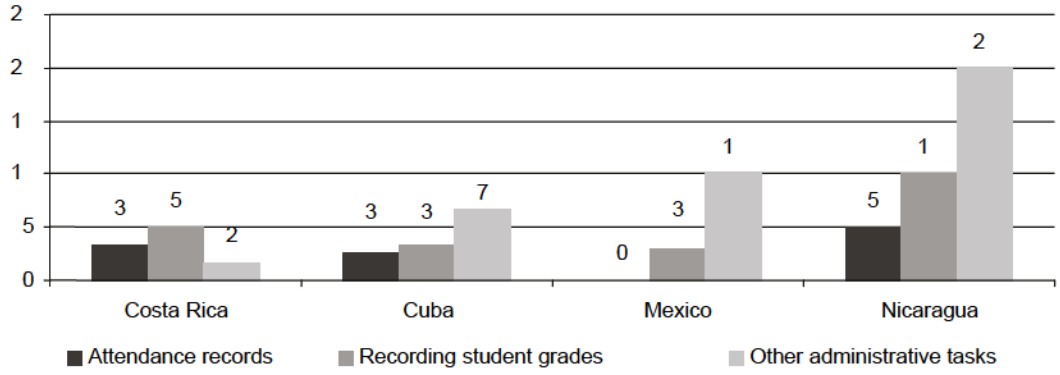


Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

Note: Argentina, the Plurinational State of Bolivia, Colombia, Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras, Panama and Paraguay do not have available data for calculating hours of usage.

Figure 29 reflects the findings of the survey as it relates to the use of ICTs in school management. ICTs are used, on average, 4 hours for keeping attendance records, 5 hours for grading students and 10 hours for other administrative tasks. In Nicaragua, ICTs are used 5 hours for keeping attendance records, 10 hours for grading students and 20 hours for administrative tasks, while in Cuba these figures are 3, 5 and 2 hours, respectively.

FIGURE 32
LATIN AMERICA AND THE CARIBBEAN (4 COUNTRIES): ESTIMATED NUMBER OF HOURS PER WEEK THE COMPUTER LABORATORY IS USED FOR SCHOOL MANAGEMENT

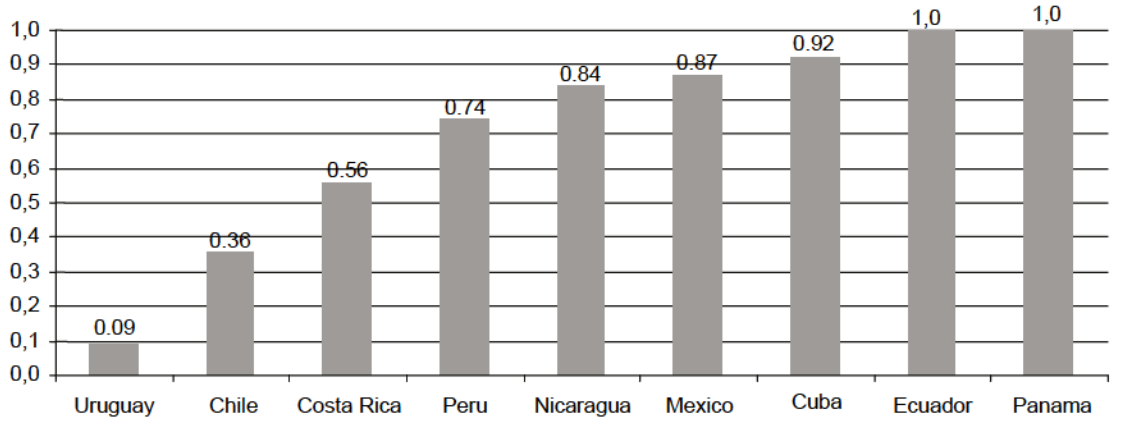


Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

Note: Argentina, the Plurinational State of Bolivia, Chile, Colombia, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Panama, Paraguay, Peru and Uruguay do not have available data for calculating the number of hours.

Using the estimated potential hours ICTs can be used for pedagocial activities (44 hours per week) and for management (15 hours per week), Figure 30 shows the index for usage of ICT infrastructure. The greater the index value, the higher the potential a country has for using its ICT infrastructure.

FIGURE 33
LATIN AMERICA AND THE CARIBBEAN (9 COUNTRIES): INDEX OF ICT INFRASTRUCTURE USAGE



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

Note: Argentina, the Plurinational State of Bolivia, Colombia, the Dominican Republic, El Salvador, Guatemala, Honduras and Paraguay do not have available data for calculating this index, while other countries have only partial data. The countries that have complete data are Cuba and Nicaragua.

Panama and Ecuador have the highest indices of implementation as measured by usage, while Chile and Uruguay are at the other extreme. Some of the data reported exceeded the range, in which case the maximum allowable on the scale was applied. Also, some countries just reported usage for pedagogical activities, so management usage was not considered for calculating the average.

E. Summary of the implementation of policies for ICTs in education

According to the survey data, the extent to which policies for ICTs in education have been implemented in the region is quite heterogeneous. The most critical findings for each of the components used to measure the extent of implementation were the following:

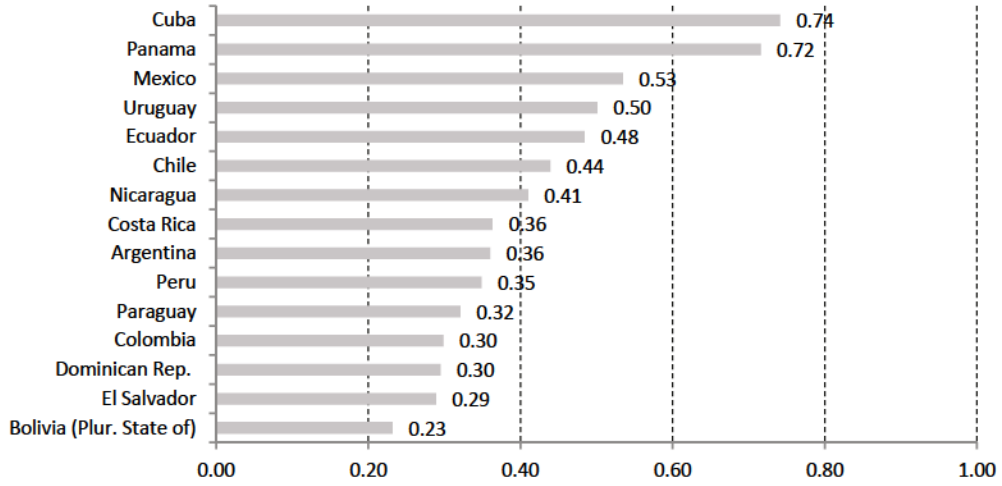
1. In ICT infrastructure, the survey findings show that most countries have made progress in providing computers. However, despite the fact that 57% of educational establishments have at least one computer, only 31% have five or more computers. Thirty-six percent of schools have Internet access, and 42% have digital educational resources provided by the ministry of education.
2. Forty-two percent of educational establishments have some type of technical support, which is consistent with coverage in terms of computers installed and has proven to be essential for the sustainability of investments in this area.
3. Little more than one third of teachers and students in the countries have received training in ICT use: 36% and 38%, respectively. A comparison of these findings with coverage reveals that training has not kept up with the provision of infrastructure.
4. As for ICT infrastructure usage, the data show that, on average, the countries utilize computer laboratories at 50% of their capacity (23 hours per week out of a possible total of approximately 44 hours).

When these findings are analysed in light of context variables, in all cases it is obvious that significant gaps exist between private and public educational establishments, secondary and primary ones and urban and

rural ones. This disadvantage confirms that deep-rooted gaps in the educational systems of the region are being reproduced (Sunkel and Trucco, 2010) and call for strategies geared towards achieving equity.

Figure 31 shows the index for implementation of policies for ICTs in education, based on average implementation for each dimension of the survey.[28] Cuba, Panama and Mexico stand out (see details in table A.13).

FIGURE 34
LATIN AMERICA AND THE CARIBBEAN (BETWEEN 4 AND 15 COUNTRIES): INDEX OF IMPLEMENTATION OF POLICIES FOR ICTS IN EDUCATION



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

Note: Guatemala and Honduras do not have available data for calculating this index, and most countries have only partial data. The countries that have data on all of the subcomponents are Costa Rica, Cuba, Mexico, Nicaragua, Peru and Uruguay. The only country that has complete data for all of the subindices and their variables is Cuba.

Generally speaking, the extent to which policies are being implemented can be seen as medium to low (approximately 40%). But the fact that in many cases no information is available makes it difficult to get a clear picture of the situation. Therefore, it is essential that consensus be reached for the implementation of systems for collecting and analysing data of this sort.

[28] The index is the average of the indices for infrastructure, technical support, training and usage, based solely on reported data.

V. Discussion

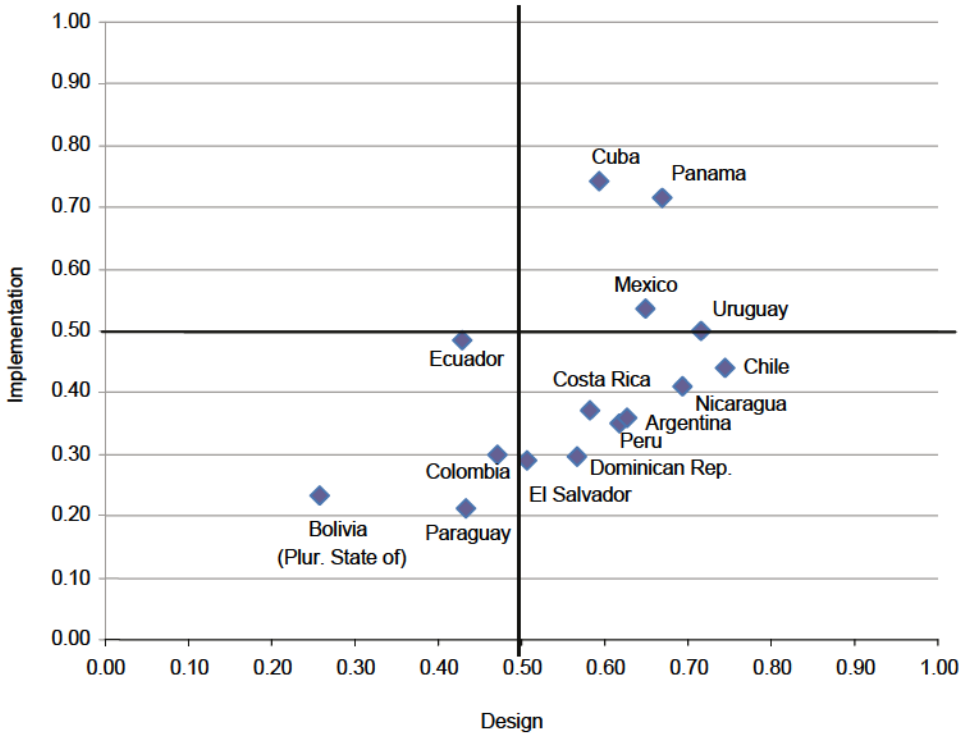
Several authors and international organizations (see, for example, International Telecommunication Union, 2009; Law *et al.*; Selwyn, 2004) suggest the importance of specific conditions of context, access and use of ICTs to produce concrete and perceived impacts. Particularly in school settings, the macro characteristics of the education system significantly condition the level of access and usage by actors in the education system. Therefore the design and implementation of public policies for ICTs in education in developing countries are an essential tool for creating the levels of ICT access and usage that can have concrete and perceived impacts and consequences for the school system.

Diagram 3, which is presented within a theoretical framework, proposes a set of indicators for measuring digital development in the school context. It includes aspects of design and implementation of policies for ICTs in education, the school context and impacts. The results of this survey are the product of data from a set of countries in Latin America and the Caribbean that have been the object of a study on the design and implementation of policies for ICTs in education.

Therefore, as the preceding sections have shown, both the design and implementation of policies for ICTs in education in the various countries are very heterogeneous. In general terms, the countries show better indices in policy design (an average index of 0.58) than in policy implementation (an average index of 0.42). Note that the availability of data for each of these components is significantly different, which means the findings must be taken with caution.

As can be seen in Figure 32, there is a correlation between policy design and policy implementation. Mexico, Panama, Uruguay and Cuba stand out in this respect, with relatively high indices of policy design and implementation (upper right quadrant). In contrast, the Plurinational State of Bolivia, Colombia, Paraguay, and Ecuador have lower ICT policy design and implementation indices (lower left quadrant). The last group, made up of Argentina, Chile, Costa Rica, the Dominican Republic, El Salvador, Nicaragua and Peru have higher design indices than implementation indices (lower right quadrant).

FIGURE 35
LATIN AMERICA AND THE CARIBBEAN (15 COUNTRIES): CORRELATION BETWEEN DESIGN AND IMPLEMENTATION OF POLICIES FOR ICTS IN EDUCATION



Source: Prepared by the authors using ECLAC data, Survey on policies and practices for ICTs in education.

No country is located in the upper left quandrant (high implementation and low design). This attests to the scenario in many countries that have the necessary policy design but have yet to implement the policies. Though the most likely explanation for this is the lack of funds to invest in policy implementation, it can be assumed that in some cases the shortfall is tied in with the very difficulty of implementing initiatives, that is, the lack of institutional capacity for policy implementation.

As has been mentioned, this study is exploratory in nature. In many cases the response rates were relatively low while in others the responses amounted to estimates because the countries do not have records that would allow the calculation of data, particularly when it comes to the variables related to implementation. This finding is, on its own, of value because by verifying the relative lag in monitoring and evaluating these policies, this study could serve as a foundation for enhancing such initiatives in the countries. This would yield data for evaluating progress in policy implementation, as well as comparisons of progress among the countries.

One of the takeaways from this study, from the standpoint of the design of a digital development index for the educational system that would allow measurement and comparison of progress in the design and implementation of policies by the countries, is that there is a need for a consensual set of definitions and indicators to facilitate consistent measuring of each component in the countries. The findings presented in the previous sections could serve as an empirical basis to inform the debate. These

findings provide concrete evidence of the discrepancies and consonance in the definitions of each indicator and, therefore, provide a framework for discussing the semantics of each one.

Once consensus has been reached on the definitions, as these findings make clear, systems for recording data that provide the information needed to calculate the indicators will have to be defined and developed.

On the whole, this study sheds light on issues of design and implementation of policies for ICTs in education, including some aspects related to school setting, education levels, types of administration and geographic location. However, though the study attempted to consult countries on the educational achievements of their students, dropout rates, educational lag and other factors, it does not provide information on outcomes or impacts. This latter aspect should be reinforced in future research by seeking correlations that might explain, at least partially, the impacts ICTs have on education.

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Annex

Annex 1
Tables of findings by country

TABLE A. 1
UNITS INVOLVED IN IMPLEMENTING INITIATIVES FOR ICTS IN EDUCATION

Country	Formal policies	ICT (or technology) unit in the ministry of education	Curricular development unit of the ministry of education	Unit for professional development of teachers, in the ministry of education	Educational achievement assessment unit, ministry of education	Universities and/or institutions of higher education	Foundations or NGOs (separate from ministry of education)	Private institutions	Others
Argentina	❍	●	❍	❍	❍	●	❍	❍	●
Bolivia (Plurinational State of)	●	●	❍	❍	❍	❍	●	❍	❍
Chile	●	●	●	●	●	●	●	●	❍
Colombia	●	●	❍	❍	❍	❍	❍	●	❍
Costa Rica	●	❍	●	❍	❍	❍	●	❍	❍
Cuba	●	●	●	●	❍	●	❍	❍	❍
Ecuador	❍	❍	●	●	●	❍	❍	❍	●
El Salvador	●	●	❍	❍	❍	❍	❍	❍	❍
Guatemala	●	❍	❍	❍	❍	❍	●	●	●
Honduras	❍	❍	❍	❍	❍	❍	❍	❍	●
Mexico	●	●	●	●	❍	●	❍	❍	❍
Nicaragua	●	●	●	●	❍	●	●	●	❍
Panama	●	●	●	❍	❍	❍	●	❍	●
Paraguay	●	●	●	❍	❍	❍	❍	❍	●
Peru	●	●	●	❍	❍	❍	❍	●	●
Dominican Republic	❍	●	●	❍	❍	❍	❍	●	❍
Uruguay	●	<	<	<	<	<	●	<	●
Percentage	76%	75%	63%	31%	13%	31%	41%	38%	

❍ Yes

● No

< No answer

Source: Prepared by the authors.

TABLE A. 2
ACTIONS INCLUDED IN THE IMPLEMENTATION OF POLICES FOR ICTS IN EDUCATION IN EACH COUNTRY

Country	Providing computers to schools	Providing computers to students	Providing computers to teachers	Internet connection in schools	Training teachers in ICT use	Training students in ICT use	Integration of ICTs in initial teacher training	Technical support at schools	Providing digital educational software directly to schools	Assessment of outcomes or impacts
Argentina	●	●	●	●	●	❍	●	●	●	●
Bolivia (Plurinational State of)	●	❍	❍	●	●	●	❍	❍	●	❍
Chile	●	●	●	●	●	❍	●	●	●	●
Colombia	●	●	❍	●	●	●	●	●	●	●
Costa Rica	●	❍	❍	●	●	●	❍	●	❍	❍
Cuba	●	❍	❍	●	●	●	●	●	●	❍
Ecuador	●	●	●	●	●	●	●	●	●	●
El Salvador	●	●	●	●	●	●	●	●	●	❍
Guatemala	●	❍	●	●	●	❍	❍	●	●	❍
Honduras	●	●	❍	●	●	●	❍	●	●	❍
Mexico	●	●	●	●	●	●	●	●	●	●
Nicaragua	●	<	<	●	●	●	●	●	●	●
Panama	●	●	●	●	●	●	●	●	●	●
Paraguay	●	●	●	●	●	●	●	●	●	●
Peru	●	●	●	●	●	●	●	●	●	●
Dominican Republic	●	●	●	●	●	<	●	●	●	❍
Uruguay	●	●	●	●	●	●	●	●	●	●
Percentage	75%	69%	100%	100%	81%	76%	94%	94%	59%	0%

❍ Yes
● No
□ No answer

Source: Prepared by the authors.

TABLE A. 3
SPECIFIC OBJECTIVES INCLUDED IN POLICIES FOR ICTS IN EDUCATION IN EACH COUNTRY

Country	Enhance student learning	Develop student competencies in ICT use	Develop cognitive aspects (motivation, self-esteem, etc.)	Professional development of teachers	Innovation and/or change in teaching- learning practices	Improve school management	Improve management in ministry of education	Improve educational coverage (enrolment, retention, educational lag, etc.)
Argentina	❍	●	●	●	●	●	●	●
Bolivia (Plurinational State of)	❍	❍	❍	❍	❍	❍	❍	●
Chile	●	●	❍	●	●	●	❍	❍
Colombia	❍	❍	❍	●	●	●	●	●
Costa Rica	●	●	●	❍	●	●	●	●
Cuba	●	●	●	❍	❍	●	●	❍
Ecuador	❍	●	●	●	●	●	●	●
El Salvador	❍	●	●	●	●	●	❍	●
Guatemala	❍	❍	❍	❍	❍	❍	❍	❍
Honduras	❍	❍	●	❍	●	●	❍	●
Mexico	●	●	●	●	●	●	●	❍
Nicaragua	●	●	❍	●	●	●	❍	❍
Panama	●	●	●	●	●	●	●	●
Paraguay	●	●	❍	●	●	●	❍	❍
Peru	❍	●	●	●	●	●	●	❍
Dominican Republic	●	●	❍	●	<	❍	●	❍
Uruguay	●	●	●	●	●	❍	❍	❍
Average	53%	76%	59%	71%	81%	76%	53%	47%

❍ Yes
● No
□ No answer

Source: Prepared by the authors.

TABLE A. 4
ICT OBJECTIVES INCLUDED IN THE CURRICULUM OF EACH COUNTRY

Country	Standalone content		Complementary content		Specialized competencies		Use in classroom		Use outside of classroom	
	Primary	Secondary	Primary	Secondary	Primary	Secondary	Primary	Secondary	Primary	Secondary
Argentina	❍	❍	●	●	●	●	●	●	●	●
Bolivia (Plurinational State of)	<	<	<	<	<	<	<	<	<	<
Chile	❍	❍	●	●	●	●	●	<	❍	❍
Colombia	❍	❍	❍	❍	❍	❍	❍	●	❍	❍
Costa Rica	❍	●	●	●	●	●	●	●	❍	❍
Cuba	●	●	❍	❍	❍	❍	❍	❍	●	●
Ecuador	<	<	<	<	<	<	<	●	<	<
El Salvador	❍	●	❍	●	❍	❍	❍	●	❍	●
Guatemala	❍	●	❍	❍	❍	●	❍	❍	❍	❍
Honduras	<	<	●	●	●	●	❍	●	●	●
Mexico	❍	❍	❍	●	❍	❍	❍	●	●	●
Nicaragua	●	●	●	●	●	❍	●	●	●	●
Panama	❍	●	●	●	●	●	●	●	●	❍
Paraguay	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Peru	❍	●	●	●	●	❍	●	●	❍	❍
Dominican Republic	❍	❍	❍	❍	❍	<	❍	●	●	●
Uruguay	❍	●	●	●	●	●	❍	●	●	❍
Percentage	14%	57%	53%	67%	53%	50%	40%	80%	53%	47%

❍ Yes
● No
□ No answer

Source: Prepared by the authors.

TABLE A. 5
ICT COMPETENCIES INCLUDED IN THE CURRICULUM OF EACH COUNTRY

Country	Functional		Learning		Information society	
	Primary	Secondary	Primary	Secondary	Primary	Secondary
Argentina	❍	❍	●	●	●	●
Bolivia (Plurinational State of)	<	<	<	<	<	<
Chile	●	●	●	●	●	●
Colombia	❍	❍	❍	❍	●	●
Costa Rica	●	●	●	●	❍	●
Cuba	●	●	●	●	❍	●
Ecuador	❍	❍	❍	❍	❍	❍
El Salvador	❍	●	❍	●	❍	●
Guatemala	❍	●	❍	❍	❍	❍
Honduras	❍	❍	❍	❍	❍	❍
Mexico	❍	●	❍	❍	❍	❍
Nicaragua	●	●	●	●	❍	●
Panama	<	<	●	●	<	<
Paraguay	❍	❍	❍	❍	❍	❍
Peru	❍	●	●	●	❍	❍
Dominican Republic	❍	●	●	●	❍	●
Uruguay	●	●	●	●	●	●
Average	33%	67%	56%	63%	27%	60%

❍ Yes

● No

< No answer

Source: Prepared by the authors.

TABLE A. 6
PERCENTAGE OF EDUCATIONAL ESTABLISHMENTS IN EACH COUNTRY WITH AT LEAST ONE COMPUTER, BY LEVEL, LOCATION AND ADMINISTRATION

Country	Level			Location		Administration		Total
	Primary	Lower secondary	Upper secondary	Urban	Rural	Public	Private	
Argentina	73%	77%	91%	80%	63%	70%	87%	78%
Bolivia (Plurinational State of)	30%		34%	28%	30%	25%	58%	31%
Chile	79%		58%	55%	70%	63%	16%	72%
Colombia								47%
Costa Rica	45%	189%	201%					86%
Cuba	100%	100%	100%					100%
Ecuador				71%	50%	52%	87%	
El Salvador	10%	49%	181%	102%	48%	57%	109%	39%
Guatemala								
Honduras								
Mexico	63%	87%						63%
Nicaragua	4%	8%						5%
Panama	52%							42%
Paraguay	15%	50%	50%			29%		32%
Peru	49%		60%	30%	23%	26%	31%	52%
Dominican Republic						87%		54%
Uruguay	100%		100%	100%	100%	100%	100%	100%
Average	52%	80%	97%	67%	55%	57%	70%	57%

In the case of Colombia, though data exist as to the number of computers per geographical region, there are no data about the number of educational establishments in each zone; therefore it is impossible to calculate a partial percentage, but rather only a total.

TABLE A. 7
PERCENTAGE OF EDUCATIONAL ESTABLISHMENTS IN EACH COUNTRY WITH AT LEAST FIVE COMPUTERS, BY LEVEL, LOCATION AND ADMINISTRATION

Country	Level			Location		Administration		Total
	Primary	Lower secondary	Upper secondary	Urban	Rural	Public	Private	
Argentina	34%	55%	81%	59%	21%	36%	76%	49%
Bolivia (Plurinational State of)	11%		34%	16%	9%	9%	40%	15%
Chile	51%		55%	50%	23%	42%	15%	52%
Colombia								41%
Costa Rica	22%	71%	75%					36%
Cuba		100%	100%					17%
Ecuador				44%	20%	24%	60%	34%
El Salvador	1%	22%	154%	80%	17%	27%	91%	22%
Guatemala								
Honduras								
Mexico								
Nicaragua								
Panama	26%		50%	89%	22%	22%	101%	31%
Paraguay								
Peru	37%		44%	24%	17%	19%	24%	39%
Dominican Republic						12%		7%
Uruguay								
Average	26%	62%	74%	52%	18%	24%	58%	31%

In the case of Colombia, though data exist as to the number of computers per geographical region, there are no data about the number of schools in each zone; therefore it is impossible to calculate a partial percentage, but rather only a total.

TABLE A. 8
STUDENT-TO-COMPUTER RATIO IN EACH COUNTRY, BY LEVEL, LOCATION AND ADMINISTRATION

Country	Level			Location		Administration		Students per computer
	Primary	Lower secondary	Upper secondary	Urban	Rural	Public	Private	
Argentina	34	14	9	31	25	41	18	19
Bolivia (Plurinational State of)								
Chile	16		12	21	11	19	42	14
Colombia				34	11			22
Costa Rica	31	17	12					22
Cuba	28	25	34					29
Ecuador	12			20	21			20
El Salvador	25	10	7	69	19	72	6	15
Guatemala								
Honduras								
Mexico	27							46
Nicaragua				89	373	312	39	121
Panama	79		27	34	123	105	9	46
Paraguay								
Peru	10		23	25	9	19	17	13
Dominican Republic						101		130
Uruguay	2					3		4
Average	27	17	18	40	74	84	22	

TABLE A. 9
PERCENTAGE OF INSTITUTIONS THAT HAVE COMPUTERS AT VARIOUS LOCATIONS IN EDUCATIONAL ESTABLISHMENTS

Country	Computer laboratory	Classrooms	Library	Teachers	Principal	Elsewhere
Argentina	42%					56%
Bolivia (Plurinational State of)	8%	71%	12%	6%	41%	21%
Chile	62%	34%	40%	40%		34%
Colombia						
Costa Rica	26%		7%			6%
Cuba	100%					
Ecuador	40%					
El Salvador						
Guatemala						
Honduras						
Mexico		55%				
Nicaragua	5%					
Panama	26%					
Paraguay					4%	2%
Peru	31%	14%		7%		28%
Dominican Republic	6%				8%	57%
Uruguay	22%	78%				
% of countries responding	65%	29%	18%	18%	18%	41%

TABLE A. 10
PERCENTAGE OF ESTABLISHMENTS THAT HAVE INTERNET ACCESS, BY LEVEL, LOCATION AND ADMINISTRATION

Country	Level			Location		Administration	
	Primary	Lower secondary	Upper secondary	Urban	Rural	Public	Private
Argentina	27%	39%	62%	46%	11%	23%	70%
Bolivia (Plurinational State of)							
Chile	53%		54%	52%	23%	44%	14%
Colombia							
Costa Rica	50%						
Cuba	2%	19%	23%				
Ecuador				55%	15%	12%	46%
El Salvador	2%	16%	94%	69%	6%	17%	78%
Guatemala							
Honduras							
Mexico	78%	42%					
Nicaragua	4%						
Panama	18%		34%	52%	7%	14%	77%
Paraguay				16%	5%	10%	
Peru	10%		25%	13%	0%	4%	17%
Dominican Republic	57%	57%	57%			97%	
Uruguay	100%			100%	100%	100%	100%
Average	36%	34%	50%	50%	21%	36%	57%

TABLE A. 11
PERCENTAGE OF ESTABLISHMENTS THAT HAVE DIGITAL EDUCATIONAL RESOURCES, BY LEVEL, LOCATION AND ADMINISTRATION

Country	Level			Location		Administration	
	Primary	Lower secondary	Upper secondary	Urban	Rural	Public	Private
Argentina	29%	41%	65%	49%	11%	25%	72%
Bolivia (Plurinational State of)							
Chile	97%		63%	61%	95%	77%	17%
Colombia	12%	12%	12%				
Costa Rica	25%	72%	77%				
Cuba	100%	100%	100%				
Ecuador				1%	0%	1%	
El Salvador							
Guatemala							
Honduras							
Mexico	63%	109%					
Nicaragua	2%	7%					
Panama							
Paraguay							
Peru	26%		16%	9%	16%	16%	
Dominican Republic	14%		14%			14%	
Uruguay	100%						
Average	47%		50%	30%	31%	27%	45%

TABLE A. 12
AVERAGE NUMBER OF ICT COORDINATOR HOURS PER WEEK, BY LEVEL, LOCATION AND ADMINISTRATION

Country	Level			Location		Administration	
	Primary	Lower secondary	Upper secondary	Urban	Rural	Public	Private
Argentina							
Bolivia (Plurinational State of)							
Chile	15		22	21	10	19	24
Colombia							
Costa Rica	6		4				
Cuba	4	8	12	8	4	8	
Ecuador	15	30		23	1	45	
El Salvador	44	44	44	44	44	44	44
Guatemala							
Honduras							
Mexico	20	20					
Nicaragua	40	40		40	25	40	40
Panama	40	40	40				
Paraguay							
Peru	14		11				
Dominican Republic	25	25	30				
Uruguay		20					
Average	22	28	23	27	17	31	36

TABLE A. 13
INDEX VALUES AND SUBDIMENSIONS FOR EACH COUNTRY

Country	Policy objectives	Policy actions	Institutionalization	ICT objectives in curriculum	ICT competencies	Policies	Infrastructure	Technical support	Training	Usage	Implementation
Argentina	0.47	0.77	0.43	0.80	0.67	0.63	0.42		0.30		0.18
Bolivia (Plurinational State of)	0.30	0.37	0.63			0.26	0.23				0.06
Chile	0.40	0.77	1.00	0.56	1.00	0.74	0.54	0.42		0.36	0.33
Colombia	0.53	0.77	0.63	0.10	0.33	0.47	0.30				0.07
Costa Rica	0.47	0.38	0.53	0.70	0.83	0.58	0.43	0.06	0.43	0.56	0.37
Cuba	0.40	0.56	0.78	0.40	0.83	0.59	0.45	0.59	1.00	0.92	0.74
Ecuador	0.67	1.00	0.48			0.43	0.19	0.26		1.00	0.36
El Salvador	0.44	0.67	0.53	0.40	0.50	0.51	0.21	0.58	0.08		0.22
Guatemala	0.33	0.38	0.50	0.20	0.17	0.32					
Honduras	0.42	0.50	0.10	0.88	0.00	0.38					
Mexico	0.80	1.00	0.88	0.40	0.17	0.65	0.50	0.45	0.33	0.87	0.53
Nicaragua	0.36	0.50	0.88	0.90	0.83	0.69	0.03	0.63	0.14	0.84	0.41
Panama	0.73	0.83	0.65	0.80	0.33	0.67	0.24	0.91		1.00	0.54
Paraguay	0.42	1.00	0.75	0.00	0.00	0.43	0.21				0.05
Peru	0.47	0.77	0.75	0.60	0.50	0.62	0.27	0.28	0.11	0.74	0.35
Dominican Republic	0.53	0.75	0.55	0.33	0.67	0.57	0.26	0.61	0.02		0.22
Uruguay	0.38	1.00	0.50	0.70	1.00	0.72	0.70	0.73	0.48	0.09	0.50

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