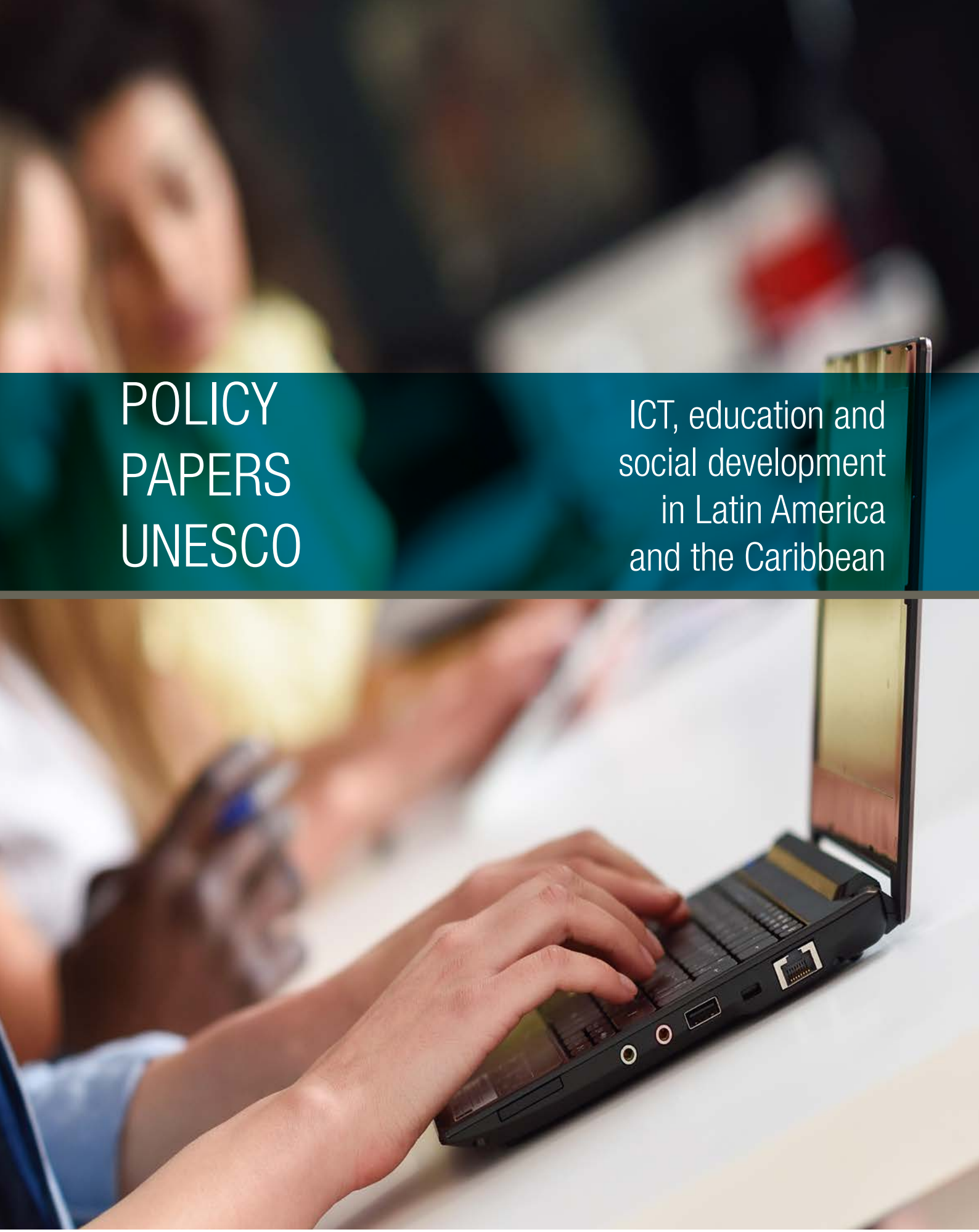

POLICY PAPERS UNESCO

ICT, education and social development in Latin America and the Caribbean

United Nations Educational, Scientific and Cultural Organization

Montevideo Office
Regional Bureau for Sciences in Latin America and the Caribbean

Regional Conference on Social Development in Latin America and the Caribbean
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UNESCO PROLOGUE

UNESCO is the agency of the United Nations System that is specialized in vital areas of human and sustainable development: education, natural sciences, social and human sciences, culture and communication and information.

In this context, we believe in the development of comprehensive policies that are capable of responding to the challenges of sustainable development in its various facets. As a laboratory of ideas - and contributing to the collective effort - UNESCO conceived the series of Policy Papers that you have in your hands today.

These documents seek to raise multidisciplinary debates, propose evidence-based analysis and formulate proposals for public policies in order to consolidate a strategy for sustainable development which is needed in Latin America and the Caribbean, under Agenda 2030.

This series includes the following discussions:

- "Digital Society: Gaps and Challenges for Digital Inclusion in Latin America and the Caribbean", by Hernán Galperin.
- "The role of social policy in facing disasters", by Alonso Brenes.
- "ICT, education and social development in Latin America and the Caribbean", by Enrique Hinostroza.

The Papers are not intended to conclude the discussion on such issues, on the contrary - they are aimed at stimulating the debate.

They are UNESCO's invitation to advancing the public debate on key issues related to the fight against inequalities and poverty, strengthening social inclusion in the region.

These texts are a further contribution of UNESCO, through its Intergovernmental Programme for Management of Social Transformations (MOST), to the Regional Conference on Social Development in Latin America and the Caribbean 2017 to be held in Montevideo, Uruguay, integrating the documents attached with the final declaration.

They were carried out under the coordination of the UNESCO Montevideo Office - in partnership with ECLAC - from an intersectoral and interinstitutional strategy of profound commitment to the region.

We are especially grateful to the Regional Center for Studies on the Development of the Information Society (Cetic.br), department of the Brazilian Network Information Center (NIC.br), and to the experts who made important contributions here presented, certain that they represent substantive inputs to the regional discussion and to the development of sustainable social policies in Latin America and the Caribbean.

Welcome to the debate.

Lidia Brito,

Director,
Regional Bureau for Sciences in
Latin America and the Caribbean - UNESCO

ICT, education and social development in Latin America and the Caribbean

J. Enrique Hinostroza

J. Enrique Hinostroza
Director of the Institute of Educational Computer Science of the *Universidad de la Frontera* in Chile. PhD in Philosophy, Institute of Education, University of London. His research areas include the development of 21st century skills among young people and teachers and the design and evaluation of public policies for the use of information and communication technologies in education. He has directed multiple research and development projects, published in several scientific journals and advised the Ministries of Education of a wide range of countries in Latin America and the Caribbean

EXECUTIVE SUMMARY

The sustained increase in the availability, access and use of digital technologies has had a major impact on our social organization, on how people learn, work, entertain themselves and communicate, affecting the way economies produce goods and services, stimulating the virtualization of culture and the creation of horizontal communication networks. Thus information and communication technologies (ICT) have long advanced from being tools at the service of education, work and other areas, to creating a context of "digital culture". However, the evidence points out that the participation in this culture is not equitably distributed in terms of access opportunities as well as the capacity to use and take advantage of the new technologies. This situation constitutes a risk not only for maintaining the existing social gaps, but potentially accentuating them. Within this context, the purpose of this document is to provide elements for the discussion on the design of policies for access and use of ICT in education, within the scope of social policies.

In terms of access, there are two main challenges: first, to reduce the great access gap to computers and to the Internet, in and between countries, in order to ensure that everyone, especially students and teachers, has access to computer connected to the Internet; and, second, to ensure good quality Internet connectivity to be able to access the resources and services of the digital culture, especially among the most vulnerable groups, and with special emphasis on lower socioeconomic and rural populations. As for digital content, given the increasing availability of Open Educational Resources (OER), the challenge is now to set quality standards that help users in the selection, use and development of OER.

Regarding their ability to harness the potential of these technologies, a growing number of studies point to a second emerging digital divide that accentuates the difference in competencies of children, youth and adults to access and use more and better the digital resources for learning, having access to jobs opportunities and developing themselves using these technologies. This will require a new set of strategies to level these skills among young people and adults of lower socio-economic groups. In addition, these competencies should be integrated into the school curriculum to ensure that future generations are able to take full advantage of this potential and to create the conditions and incentives for teachers to include the use of these technologies in their teaching practices.

Educational systems can contribute to meet these challenges by providing schools with computers and high-quality Internet, and by developing programs that enable the school community to develop the skills needed to be able to take advantage from the benefits of participating in the digital culture.

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INTERNATIONAL BACKGROUND

Over the last few years the Member States of the United Nations (UN) have agreed several international agreements related to facilitate and promote the use of information and communication technologies (ICT) to support the achievement of the Sustainable Development Goals (SDG). More specifically, the objective 4 of the SDG, agreed in the Incheon Declaration by the Member States reaffirms the commitment to, by 2030,

> "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all".

Particularly, the statement includes the objective 4.4, which suggests

> "substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship".

This objective is represented by indicator

> "4.4.1 – Proportion of youth and adults with information and communication technology (ICT) skills, by type of skill".

Moreover, the global indicator 4.a.1 encourages the monitoring the "proportion of schools with access to: (a) electricity, (b) the Internet for pedagogical purposes, (c) computers for pedagogical purposes, …" including the commitment to provide ICT infrastructure and connectivity to schools (UIS, forthcoming).

In addition, the Qingdao Declaration[1] (2015), also signed by the UN States Members, includes a set of commitments regarding the use of ICT in education, covering the areas of access and inclusion[2] and the adoption of open educational resources (OER)[3], with the aim of ensuring the quality of learning, promoting lifelong learning paths[4]; promoting innovations for e-learning; developing mechanisms to ensure the quality and recognition (certification) of e-learning, develop strategies that enhance accountability and multisectorial partnerships, as well as to stimulate international cooperation. In addition, in the declaration, countries are being urged to devise "national monitoring and evaluation systems to generate sound evidence for policy formulation on the integration, use and impact of ICT in education."

From a regional perspective, the "eLAC2018: Digital Agenda for Latin America and the Caribbean" proposed mission is

> "to develop a digital ecosystem in Latin America and the Caribbean that builds on a regional integration and cooperation process to strengthen the policies underpinning a society based on knowledge, inclusion and equity, innovation and environmental sustainability." (p. 3).

In order to fulfill this mission, the agenda sets out 23 goals in five areas of action: 1) Access and infrastructure; 2) Digital economy, innovation and competitiveness; 3) Electronic government and citizenship; 4) Sustainable development and inclusion; and 5) Governance for the Information Society.

Overall, in each of these areas, the agenda seeks to generate conditions for ensuring that all have a timely and high-quality access to these technologies, especially to the Internet, and that all can take advantage to access public procedures, services and information, to health services and to participate in the digital economy, promoting citizen participation and a safe and ethical use of these technologies, specially emphasizing the in-

1 See: http://www.unesco.org/new/en/education/resources/in-focus-articles/qingdao-declaration

2 The commitment aims to ensure that "all girls and boys have access to connected digital devices and a relevant and responsive digital learning environment by 2030, irrespective of their disabilities, social or economic status, or geographic location"p.1).

3 UNESCO in its 2012 declaration defines OER as "teaching, learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions. Open licensing is built within the existing framework of intellectual property rights as defined by relevant international conventions and respects the authorship of the work". (see: http://www.unesco.org/fileadmin/MULTIMEDIA/HQ/CI/WPFD2009/English_Declaration.html)

4 Lifelong learning refers to all learning activities developed in the course of life aimed at improving knowledge, skills and competences from a personal, civic, social and / or work-related perspective (OECD, 2001).

clusion of vulnerable groups and mainstreaming gender perspective in policy implementation.

Specifically, in the area of action of the sustainable development and inclusion, eLAC2018 includes two objectives regarding education. Objective 14 proposes

> "to include or strengthen the use of ICTs in education and promote the development of programmes that include teacher training, new pedagogical models, the generation, adaptation and exchange of open educational resources, the management of educational institutions and educational evaluation".

and objective 18 proposes

> "ensure ICT access for vulnerable groups, in order to improve their social, educational, cultural and economic integration."

In terms of inclusion, objective 17 explicitly incorporates a gender perspective, pointing out the need to

> "promote an integrated gender equality perspective in public policies on digital development, ensuring full ICT access and use for women and girls, and advancing women's participation and leadership in public and private spaces where decisions are made on digital matters".

Adapting this objective to the concrete reality of the region includes some relevant aspects to public policies. To some extent, considering the existing quantitative evidence in terms of the reduced female access to ICT and to the jobs associated with them, plus their underrepresentation in the enrollment in carriers such as Mathematics, Science and Technology; as well as the qualitative evidences that reveal the construction of female self-image as not belonging to such areas, a notion reinforced both at home and at school (Huyer et al, 2012; Malcom, 2010; Pavón, 2015; UIS, 2010), it seems clear that these factors must be considered while designing and implementing digital inclusion policies in the region. And this is particularly crucial in the case of the population where disadvantages of gender and socio-economic origin overlap.

In short, it seeks to guarantee that everyone has access to these technologies, that there are conditions to assure the services and resources quality, and ensuring that everyone is able to participate in the potential benefits of these technologies. Fulfilling these commitments depends on the multiple sectors responsible for developing the telecommunications infrastructure, the framework and regulations for its use, government and private digital services and resources, their quality standards, and the required skills to be able to use and take advantage of technologies for their own benefit.

In this context, and in order to contribute with the fulfillment of these commitments, this document presents a summary of the available international evidence, considering the various sources of information. The paper is divided into three sections: the introduction presents the overall policy perspective, a review of key trends on basic policy components, and key emerging challenges and opportunities.

1. INTRODUCTION

The steady growth in the availability, access and use of digital technologies in developed and developing countries (ITU, 2016) has had a profound impact on our social organization, on the way people learn, work, communicate, and entertain themselves, affecting the way economies produce goods and services, stimulating the virtualization of culture and the creation of horizontal communication networks (Castells, 2004, Katz, 2015, Mominó and Carrere, 2016). As the use of these technologies expands, this also affects family life, generating changes in the dynamics of interaction, lifestyle and cultural expectations (Facer, 2012; Facer, Furlong, Furlong & Sutherland, 2003; Livingstone & Helsper, 2007).

These changes represent a new scenario permeated by the digital culture that provides new opportunities for economic and social development, but also presents new challenges, in especial to those regarding inclusion and equality within the opportunities of participating in this culture (access), and the ability to take advantage of such opportunities (learning and digital skills). These challenges include the population as a whole, including children, youth and adults.

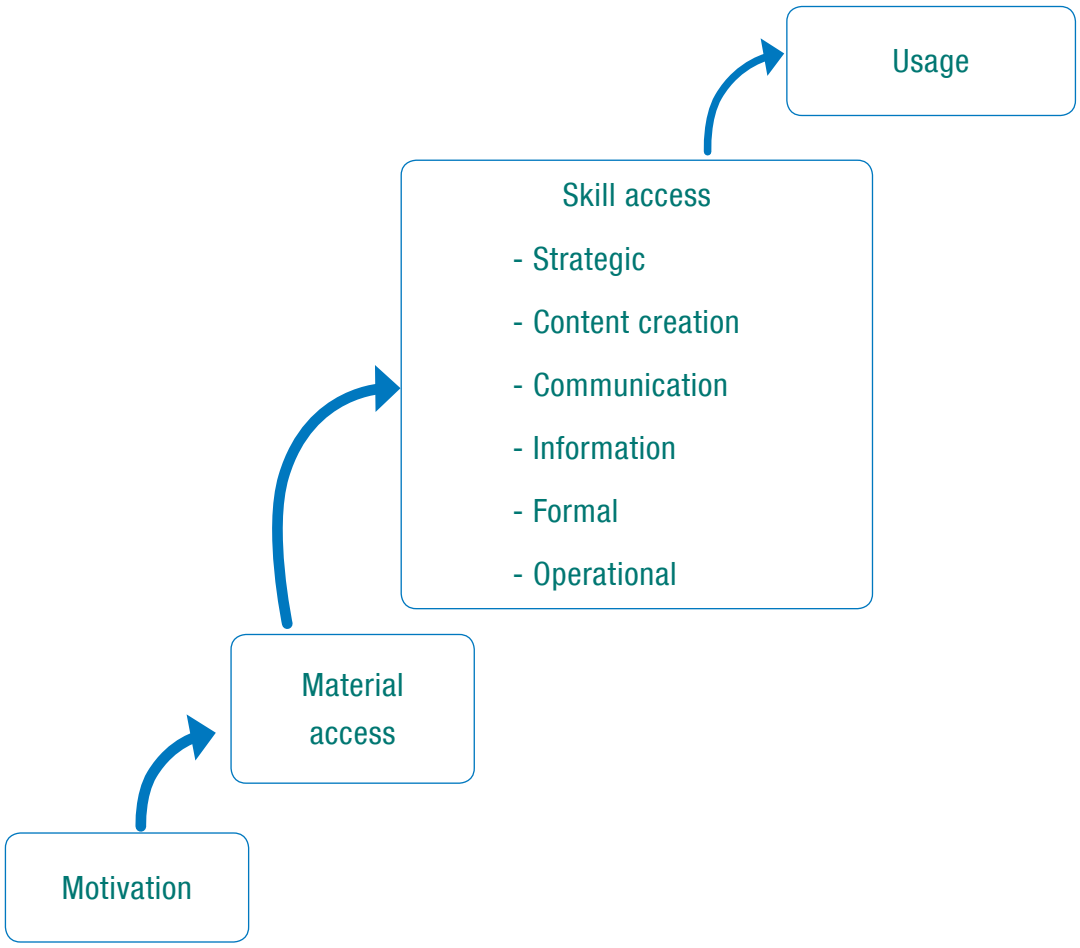
Bearing these challenges in mind, as shown in Figure 1, van Dijk & van Deursen (2014) describe the process of ICT appropriation by society considering four stages for its effective use (consumption). The authors argue that the process starts with the motivation to use these technologies, therefore, physical access to the ICT is needed and, from there, to have a set of skills that allow their effective use.

The motivation for accessing and using digital technologies must be considered as largely dependent on the potential benefits that users can perceive from such use. Thus, the greater the provision of useful and relevant digital resources and services for various groups of people in the population, the higher the motivation to adopt ICT.

Regarding the access to ICT, although the access to devices has increased, especially in the case of mobile devices, as well as the indicators of use, the gap between the more and lesser developed countries has remained relatively constant for the recent years (ITU, 2016). For example, in terms of access, Figures 2 and 3 show the evolution of the proportion of households with access to computers and to the Internet between 2005 and 2016. As noted, the differences between developed and developing countries have experienced relatively little variation. In fact, while in developed countries today about 80% of households have access to a computer or to the Internet, in developing countries this number drops by half.

One way in which progress has been made in this regard is through the use of mobile devices. In this sense, the Figure 4 shows the progress in the number of active mobile broadband subscriptions in every 100 inhabitants in developed and developing countries. As the data shows, since the year 2013 the difference in the Internet access through mobile devices has diminished, representing an opportunity with regards to digital inclusion.

Figure 1: Stages of access and use of digital technologies



Source: translated from the original by van Dijk & van Deursen, 2014, p. 2

However, while developing countries have made progress in providing access to ICT closing the gap in relation to the developed countries requires faster and further progress.

Despite these overall differences, the analysis of the situation among the countries of the region reveals significant differences. As shown in Figure 5, while in Uruguay 70% of households have computer access and 60% have Internet access, in Bolivia, El Salvador and Cuba these numbers are below 30%.

In addition, countries have significant internal differences comparing the Internet access between urban and rural regions. For example, according

Figure 2 Proportion of households with access to computers (2005-2016).

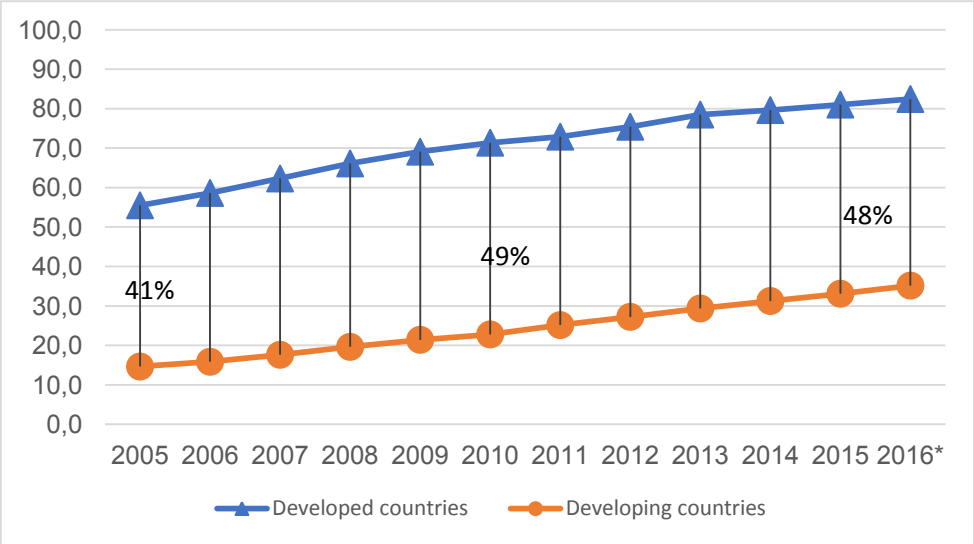
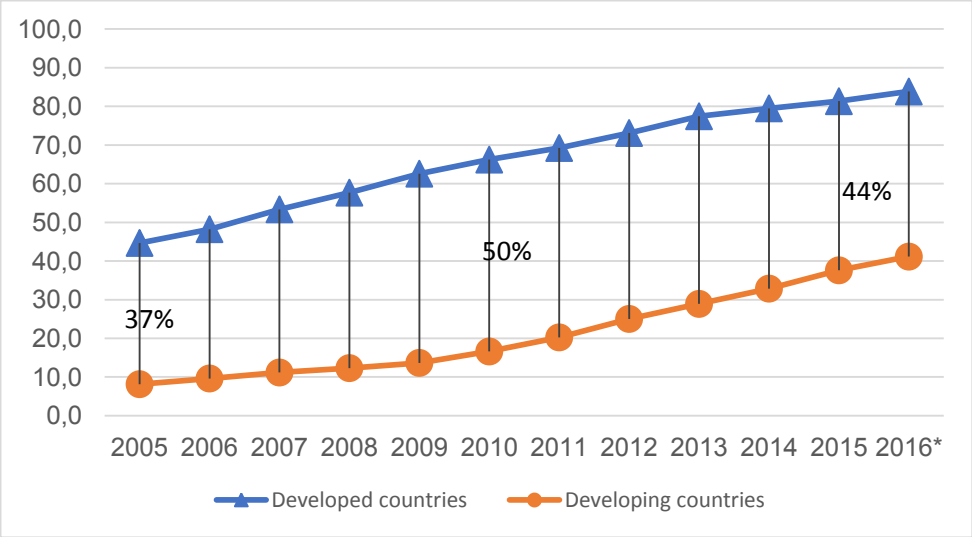


Figure 3 Proportion of households with Internet access (2005-2016)



* The data from 2016 is estimated
The developed and developing countries classification is based on the Standard M49 used by the United Nations (see: https://unstats.un.org/unsd/methodology/m49/)
Source: ITU (2016).

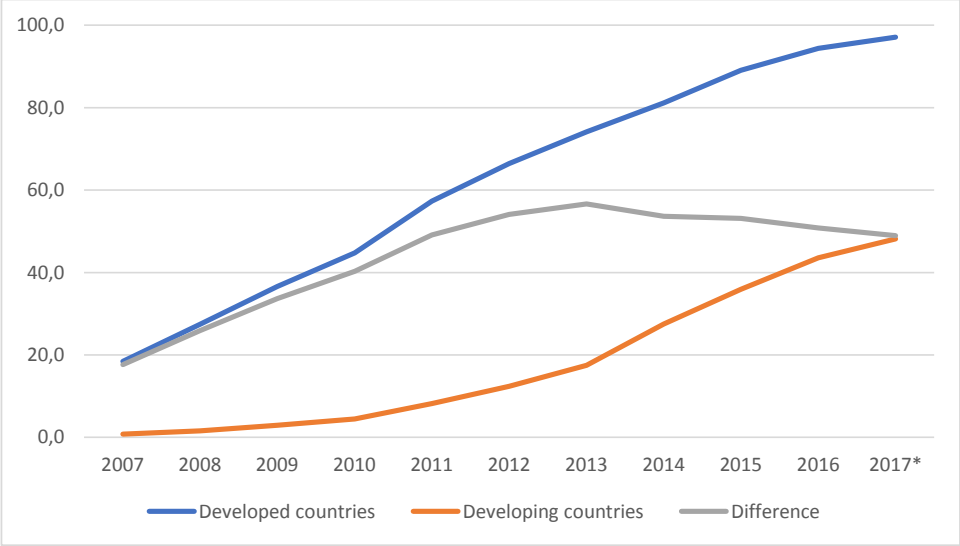
to data from ECLAC (2016), the wider Internet access gaps between urban and rural households are seen in Colombia and Brazil, with 41 and 36 percentage points respectively; while the narrower ones are verified in Uruguay, Costa Rica and El Salvador, with a difference of 13 to 20 percentage points.

A growing number of studies point out the second latent digital divide that, beyond the ICT barrier gaps, reveals a clear divide in the skills of youths and adults to access these resources and harness their potential for learning and self-development of these technologies (OECD, 2010, Van Deursen & van Dijk, 2013). In terms of digital skills, inequality is associated with social, cultural and economic variables that can not only replicate traditional social inequalities, but also accentuate them (Hargittai & Hinnant, 2008, Toyama, 2011, van Dijk & van Deursen, 2014).

Regarding the last stage of access and use of digital technologies (Figure 1) in the context of education, in the last decades countries have designed and implemented policies on the use of ICT in education, which are based on three types of goals: guaranteeing students' and teachers' access to these technologies; reshaping both teaching and learning practices in the classroom; and, in some cases, enhancing educational system administration by means of information systems.

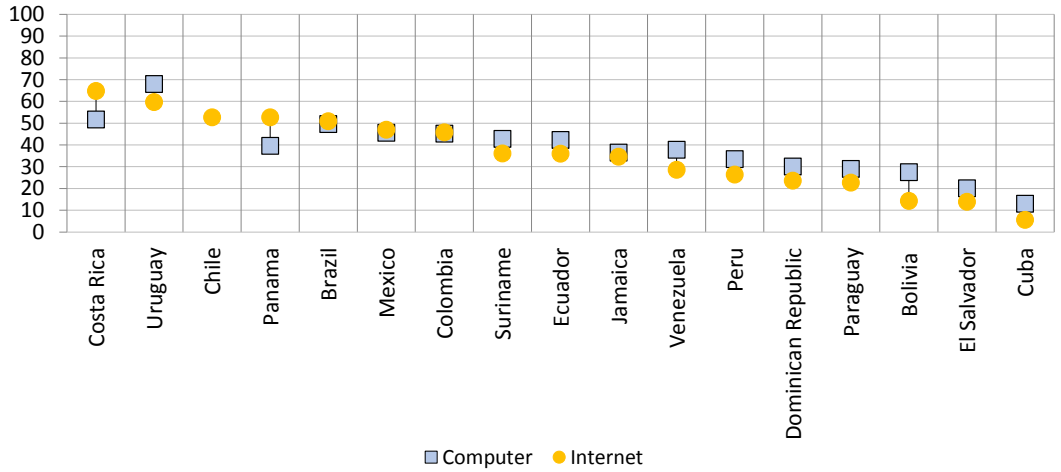
Concerning the impact of ICT on learning, evaluations have usually focused on measuring their impact on traditional subjects such as Mathematics and Language, and there is relatively little national-scale research to explore the impact on the development of other areas such as Art, History etc. Thus, international studies propose that "despite considerable investments in computers, Internet connections, and software for educational use, there is little solid evidence that greater computer use among students leads to better scores in mathematics and reading " (OECD, 2015, p.145). These studies further suggest that "limited use of computers at school may be better than no use at all, but levels of computer use above the current OECD average are associated with significantly poorer results " (OECD, 2015, p.146). Respective of this, OECD (2015) points out that the lack of competence of both teachers and students to locate digital resources with quality Internet, the lack of clarity in learning objectives, and the lack of preparation to integrate the use of ICT in teaching practices result in a drop in expectations and results.

Figure 4 Number of active mobile broadband subscriptions per 100 inhabitants



* The data from 2017 is estimated.
The classification of developed and developing countries is based on the M49 standard of the United Nations (see: https://unstats.un.org/unsd/methodology/m49/).
Source: Own compilation based on data from ITU 2017.

Figure 5 Proportion of households with computer access and Internet in LAC countries (2016 or closer)



* Source: ITU (2016)

Current challenges of ICT policies in education also include the need to ensure that all students have the required digital skills to benefit from them, and to ensure their participation and development in the knowledge society.

2. STATUS AND TRENDS OF POLICY COMPONENTS

Traditionally, ICT access and use policies in education address the areas of infrastructure, professional teacher development, digital resources, curriculum, and assessment and monitoring. The main trends on each of these areas are described below.

2.1. ICT infrastructure

In the last decades, the focus on ICT in education policies has been the provision of computer labs to schools, for students to use. Thus, from the mid-2000 on, some countries started to deliver personal computers for students, and occasionally, to teachers as well. Also, some countries began stimulating their students to bring their own devices into the classroom (Jara, 2015).

Considering the increase on the penetration rates of ICT on society, today it is reasonable to point out that all students and teachers have free access to digital devices connected to the Internet (UNESCO, 2015). That holds true either through a personal computer or with freely available equipment both at school and at home, making sure that the students have constant access.

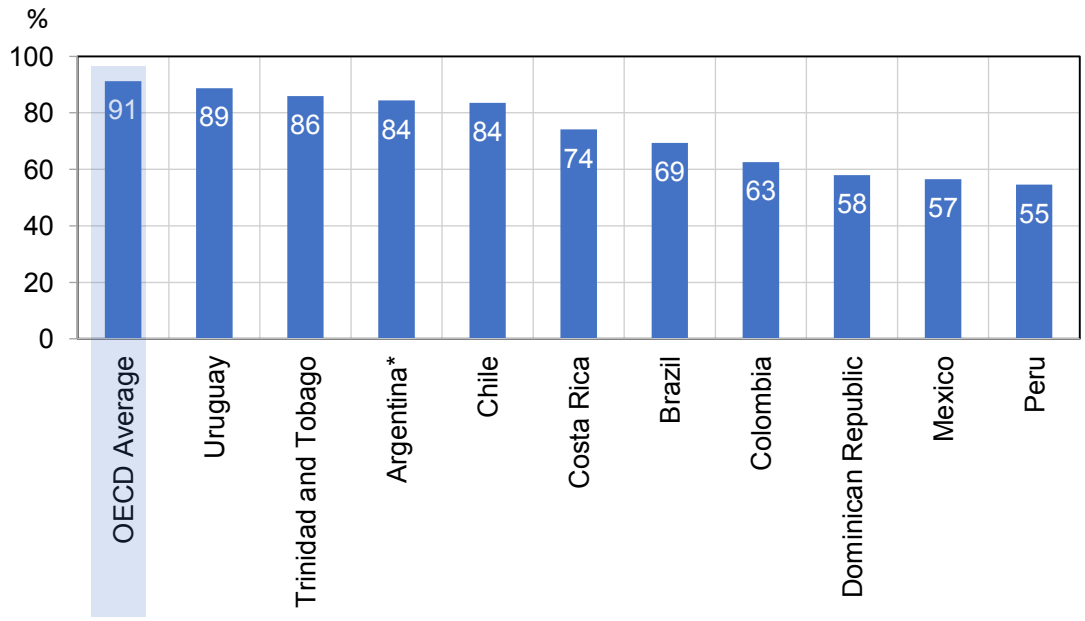
Then, as Figure 6 reveals, several countries have achieved penetration rates much similar to those from developed countries. Nevertheless, in some countries there is still a significant percentage of students without access to computers at home.

Although in many cases the lack of access to computers at home can be supplemented at some extent with access to school equipment, its use is generally more limited in terms of availability of schedules, types of applications that can be used, and the contents that can be accessed. Within this context, the first infrastructural challenge is to guarantee to all students continuous access to a computer, so that they can truly be and feel part of the digital culture.

The second challenge is to ensure quality Internet access for all students and teachers, both in and out of school. In this regard, many countries have facilitated the population's online access by connecting schools to the Internet. For example, Figure 7 compares the percentage of schools and households connected to the Internet. Despite a difference of years of data, we may observe that in most countries the percentage of schools connected to the Internet exceeds that of households. Panama and Paraguay are exceptions.

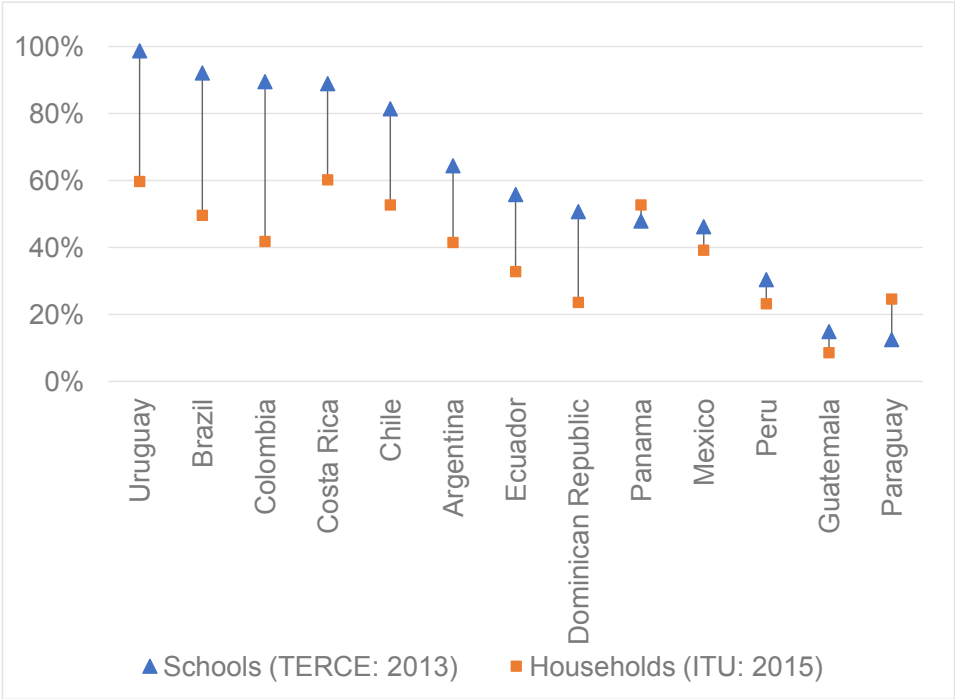
It is also necessary to consider that, although this may be a measure that helps to reduce the access gap, the fact that the school is connected

Figure 6 Percentage of students reporting having a computer to study at home



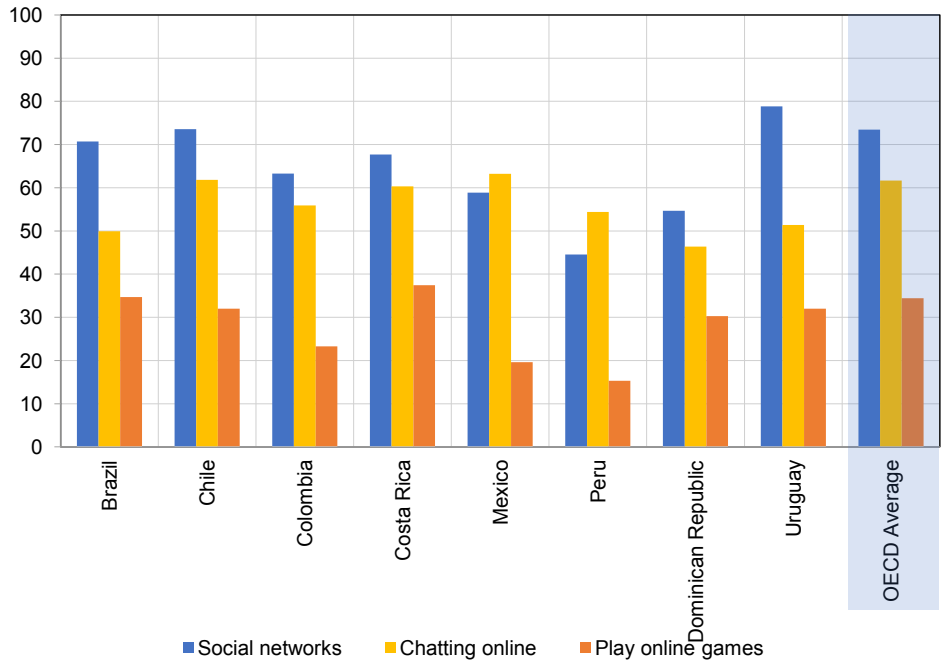
* Data from Argentina correspond exclusively to the Autonomous City of Buenos Aires (CABA)
Source: Own compilation based on data from PISA 2015 from the OECD (2017)

Figure 7 Percentage of schools and households connected to the Internet in Latin American countries (2013 and 2015)



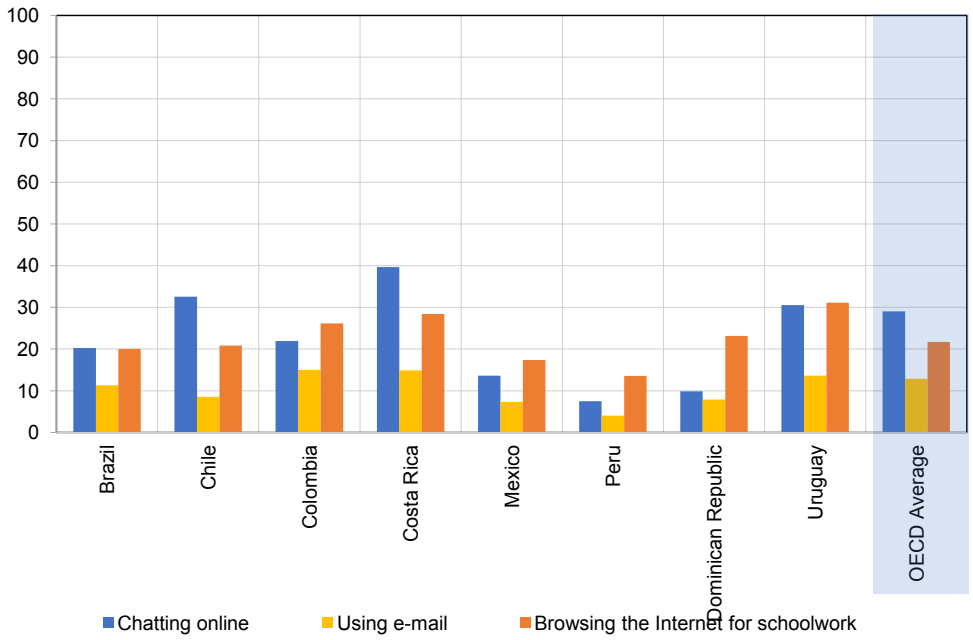
Source: Own compilation based on data from TERCE 2013 in Jara (2015) and from UIT (2016)

Figure 8 Percentage of students who perform some activity on Internet almost every day or every day, out of school



Source: Own compilation based on data from PISA 2015 from the OECD (2017)

Figure 9 Percentage of students who perform some activity on Internet almost every day or every day at school.



Source: Own compilation based on data from PISA 2015 from the OECD (2017)

does not mean that the students actually connect to the Internet as, as shown in Figures 8 and 9, the students who use ICT out of school exceed two or three times the number of those who do it in school.

Notwithstanding the above, there are still considerable disparities between schools in each country. For example, Figure 10 shows the gaps in Internet access between urban and rural schools in the countries included in the regional study TERCE[5].

As illustrated, in Peru, while 77% of urban schools have access to the Internet, only 1% of rural schools do; in Guatemala, the percentage ratio is 68% and 3%, respectively. In Costa Rica, however, the ratio is reversed, and 88% and 97% of urban and rural schools have access to the Internet, respectively.

In addition to the lack of Internet connectivity for a significant percentage of schools (mainly rural), as illustrated in UIS report (2012), many of those who claim to be connected do not have broadband, thus preventing them of using the Internet effectively. In this sense, the percentage of schools that aren't able to use the Internet as a teaching and learning tool is substantially higher.

One of the proposed alternatives to address the Internet access is the use of mobile phones to promote "mobile learning". In this sense, UNESCO (2012) study shows that despite the increased penetration of such devices, the telecommunication infrastructure in the region is very limited, and access to broadband is either unavailable or too expensive for a large portion of the population, particularly the vulnerable and marginalized groups. Although there has been significant progress in recent years, especially regarding the cost of these services, there are still a few issues related to quality and equity Internet access (ECLAC, 2016). As described by ECLAC (2016), "No country in the region has at least 5% of its connections with speeds of more than 15Mbps" (while in advanced countries, this percentage is 50%) and "there are access differences between rural and urban areas and between income distribution quintiles" (p.6). In this regard, despite the potential use of mobile phones to promote "mobile learning", in order to begin taking advantage of it, it will be necessary to ensure high quality Internet access for all, especially for the most vulnerable groups.

Therefore, in terms of infrastructure, the recommendations are as follows: to ensure to students a continuous access (at school and at home) to computers, especially to students from lower socioeconomic levels; to provide Internet connection to schools that are far from urban centers; and to improve the quality of Internet access, that is, to ensure broadband connection at an adequate speed that allows everyone to benefit from available resources and services.

And, overall, it is advisable to encourage the initiatives providing better quality of Internet connectivity to students and teachers outside of school. To do so, there must be coordination among telecommunications, education and social development policies in a way to address topics such as the national telecommunications infrastructure, frameworks and regulations, training for the population about the use of ICT, developing the provision of public services, and so on.

From the perspective of inclusion, it is important to consider that providing ICT access to schools is not just an educational matter educational, as for in many cases it impacts the decrease of the digital divide through the facilitation of the access and training to families on the use of these technologies, (Hohlfeld, Ritzhaupt & Barron, 2010), especially in rural areas and among disadvantaged groups.

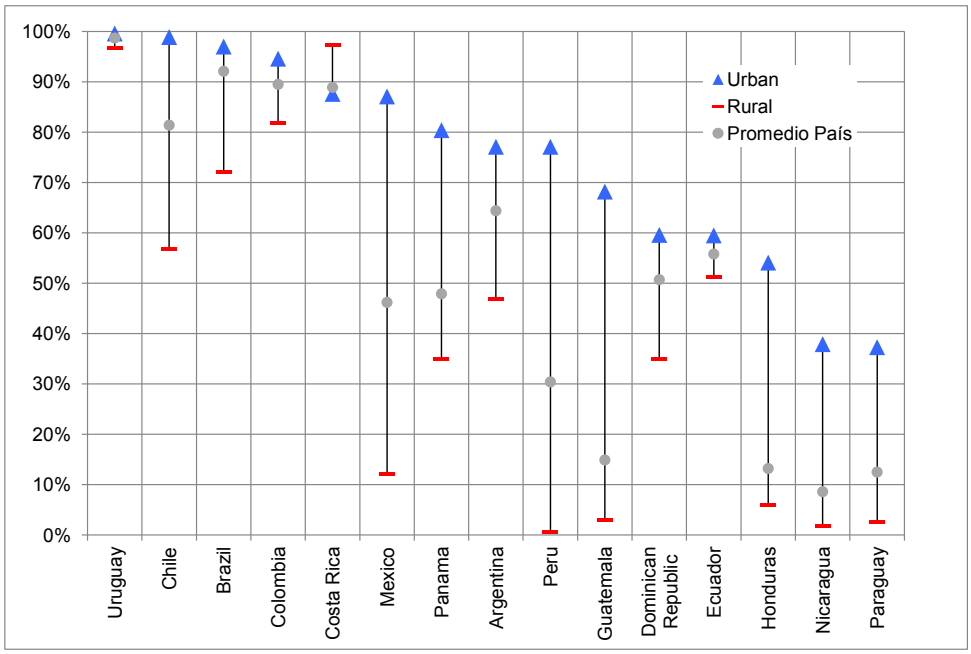
2.2. Teachers and the ICT

For more than three decades policies on ICT and education have been including training and professional development strategies on the pedagogical use of ICT. Despite these efforts, the results of the TALIS study[6] show that, according to teachers, two of the top three reasons for pursuing professional development are the skills and competences to use ICT for teaching, and

5 Third Regional Comparative and Explanatory Study (TERCE) conducted by the Latin American Laboratory for Assessment of the Quality of Education (LLECE).

6 *Teaching and Learning International Survey*. OECD International study on teaching and learning practices of teachers.

Figure 10 Internet access in urban and rural schools in Latin American countries



Source: Own compilation based on data from TERCE 2013 in Jara (2015).

the adoption of new technologies in their work (OECD, 2014). Research consistently shows that teachers lack the skills to use these technologies in the classroom (Krumsvik, 2012; Shin, 2015), which would explain, at least in part, that these efforts did not translate into greater frequency or quality of ICT use in the classroom (Fraillon, Ainley, Schulz, Friedman & Gebhardt, 2014, Law, Pelgrum & Plomp, 2008).

Notwithstanding the above, a growing number of reports show that teachers frequently use these technologies outside the classroom to plan and prepare lessons, seek resources, and develop projects and assignments for students (Hsu, 2011; Ibieta, Hinostroza, Labbé & Claro, 2017; Meneses, Fàbregues, Rodriguez-Gomez & Ion, 2012).

To guide teachers on how to use ICT in their professional practice, some countries have developed or adapted ICT competency standards for teachers. Regarding this, one of the most widespread milestones is the UNESCO ICT Competency Framework for Teachers (2011), which has been used as reference for the development of national standards in different countries. This framework is arranged in three successive stages of progress in the use of ICT: acquisition of basic ICT knowledge, knowledge deepening, and knowledge creation. At each of these stages, the competencies are specified according to the areas integrated in educational policies, curriculum and assessment, pedagogy, ICT, organization and administration, and professional development.

Regardless of the definition of this type of framework, very few countries link or include these standards to the pedagogical norms or "good practices". In fact, in the international study on teaching evaluation systems of the OECD (2013), it is observed that practically no country has included the ICT use as one of the aspects of its evaluation criteria or standards. Thus, from the point of view of professional development, teachers have few formal incentives to incorporate ICT regularly in their professional work.

In addition to this, evidence shows that teachers' formation training does not include the pedagogical use of ICT, in fact, the inclusion of these technologies in educational institutions that form the new teachers is basically limited to the use of computers and projectors as an aid to traditional teaching practices methods (Brun & Hinostroza, 2014, Rizza, 2011).

Within this context, the recommendations are as follows: to define standards for the use of ICT

in the teaching profession that are included in or, at least, in line with the pedagogical norms of the country; to incorporate the use of ICT (standards) in the teacher evaluation system, to include the use of ICT in the development of the teaching career; to incorporate ICT use standards for teaching into the new teacher's training curriculum, so as to ensure that future generations of professionals develop the necessary skills to exploit these technologies to their professional practice; and to develop support systems to the professional development that include both courses required to acquire the required competence and networks to ensure continued support during the process of adoption of these technologies.

2.3. Digital resources

Expanding access to quality resources and teaching materials for teachers and students is a major challenge for governments. One of the lines of action implemented by most Latin American countries is the development of educational portals as a way of organizing the delivery of digital resources to schools. In general, these initiatives, grouped within the framework of the Latin American Network of Educational Portals (RELPE, in Spanish), seek to offer to teachers and students concrete teaching support materials, including lesson plans and scripts, digital resources for subjects, references to websites etc. In general, these portals organize resources according to the structure and content of the national curriculum, which facilitates the search and selection of resources.

Discussions on how to license such resources are also linked to the creation of repositories of digital materials, and aim to allow teachers and students greater autonomy of use, so that they can appropriate the content and adapt it to their needs and realities, as well as reduce the inequalities of access to more diverse materials, mainly related to the socioeconomic characteristics of the users. In this sense, the Open Educational Resources (OER) have become increasingly relevant, especially in the scope of public policies. OERs are materials that use a variety of languages and means of communication for teaching, learning and research, distributed under open licenses, so that they can be freely reused, continuously improved, and distributed for educational purposes (Orr, Rimini & Van Damme, 2015). As to its use, the UNESCO (2015) warns that they can only be of value if they are of good quality, so the challenge is to establish quality standards to guide teachers (and other stakeholders) in the selection, use and development of OER.

In addition to the availability of resources, we must also pay attention to the fact that both students and teachers lack the necessary skills to seek out and select quality resources (van Deursen & van Diepen, 2013). In this sense, it is recommended to develop the necessary skills in teachers and students to search, select and effectively use the contents and resources available on the Internet.

2.4. Integrating ICT into curriculum and evaluation

From a general point of view, a curriculum defines (prescribes, suggests) what, when and how students should learn during their formal education process (van den Akker, 2003).

Digital competencies

With regard to what to learn, the need to develop digital skills has been established in the international context for many years, associated with the need to ensure that current or new generations make the most of ICT for both studying and working (OECD, 2006); in particular, those that go beyond the basic use of computers and focus on exploring their full advantages and potentialities, which requires knowing how and which tools to use to make the most of the proposed goals (Binkley, et al., 2012, Ferrari, 2013, Fraillon, Schulz & Ainley, 2013).

There are four main approaches to developing digital competencies within the school curriculum, namely: (i) functional competencies for ICT use, (ii) digital skills required for the effective use of technologies, (iii) higher order skills (usually called "21st century skills") and, emergently, (iv) computational thinking (associated with programming).

Functional competencies relates to knowing how to use the various tools (word processors, presentations, spreadsheets, browsers etc.) appro-

priately. In this sense, one of the standards used is set by the international computer skills certification[7], which defines the skills needed to use a set of productivity tools, offers courses to develop them and a certification model.

Regarding the digital skills, these generally include computational, informational and communicational literacy. The precise definition of these competences is still a matter of debate, however, at the international level, the ICILS study[8] of the IEA[9] proposed to define them as "individual's ability to use computers to investigate, create, and communicate in order to participate effectively at home, at school, in the workplace, and in society" (Fraillon, et al., 2013, p.17). For its part, the European Commission has proposed a digital competence framework for citizens that includes the following dimensions: Information; Communication; Digital content creation; Safety and Problem solving (Ferrari, 2013),

As for the skills of the 21st century, in addition to digital competences, they also include skills associated with problem solving, critical thinking and others. For example, a consortium of companies backed by the "Partnership for 21st Century Skills"[10] aims to promote the definition and development of this type of skills linked to the school activity. The consortium defines skills grouped into four areas: life and career skills; learning, and innovation skills (critical thinking, communication, collaboration etc.), key subjects and 21st century themes (language, mathematics, science, finance, ecology etc.); and information, media and technology skills.

Finally, in recent years, some countries have incorporated skills related to the development of "computational thinking" in their curricula (the best-known examples are the UK and Korea). Although the definition and scope of these skills still leaves room for discussion, there is an increasing consensus that includes a set of skills such as abstraction, algorithmic thinking, automation, decomposition, debugging, and generalization (Bocconi, Chioccariello, Dettori, Ferrari & Engelhardt, 2016).

On a deeper level, the findings of the survey of adult skills (PIAAC)[11] of the OECD that measures the reading, numerical and problem solving competences in technology-rich environments[12], carried out among young and adults between the ages of 16 and 65, showed that those with better skills in these areas are more likely to find a job and earn better wages (OECD, 2016). Therefore, the development of digital skills related to information processing for youth and adults is a priority theme.

From the perspective of inclusion, Figure 11 shows the results of problem-solving skills in technology-rich environments by age, for Chile[13], and for the average of the OECD countries that participated in the study. As illustrated, the likelihood among young people between the ages of 16 and 25 is that the older in the group showed higher skills. Nevertheless, among the group of adults between 25 and 65 years old, the relation is inverse, i.e., the older they are, the smaller the number of information processing skills verified.

This may indicate that, on one hand, school education at present has been failing to fully develop these skills among youths and, on the other hand, that a large part of the older adult's group has limited job opportunities, due to the lack of such competences.

The study also inquired about the level of schooling of the parents of the respondents, a proxy for

7 See: http://icdlamericas.org

8 International Computer and Information Literacy Study. See: http://www.iea.nl/icils

9 International Association for the Evaluation of Educational Achievement. See: http://www.iea.nl

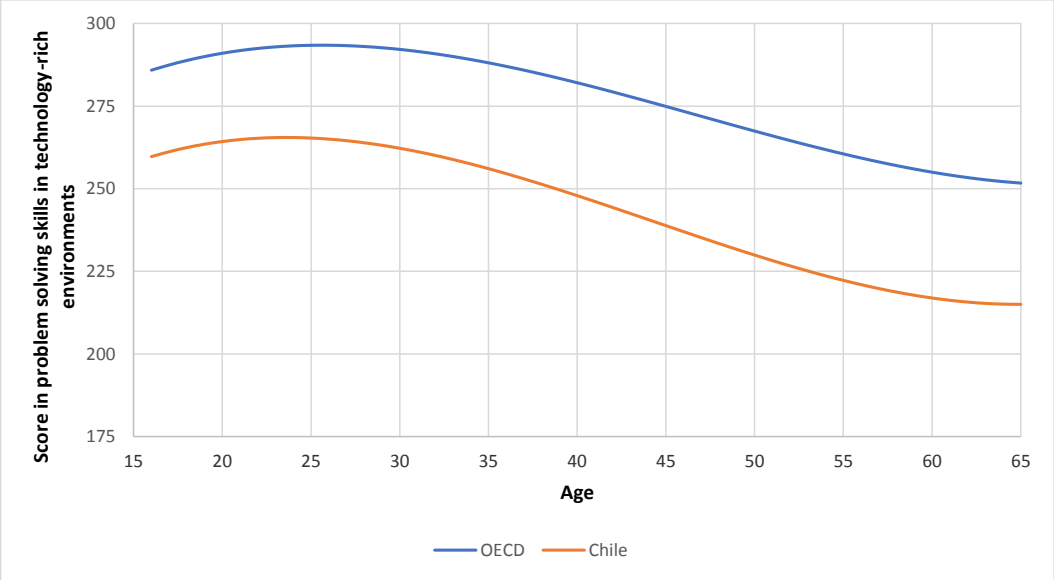
10 See: http://www.p21.org/index.php

11 See: http://www.oecd.org/skills/piaac/

12 The study defines it as "the ability to use technology to solve problems and perform complex tasks. It is not a measure of "digital literacy," but rather of the cognitive skills required for the information age, an era in which unlimited access to information made it essential for people to be able to decide what information they need, to critically appraise it, and use it to solve problems "(http://www.oecd.org/skills/default-assessments/principles-of-valuation.htm#competitions).

13 Chile was the only Latin-American country that participated in the study.

Figure 11 Ability to problem solving in technological environments and age



Source: Own elaboration based on data from the OECD (2016)

the socioeconomic group (OECD, 2016). In this regard, Figure 12 shows the percentage of individuals who could not reach level 1 on the solving-problems skill in tech-rich environments[14], according to the level of education achieved by the parent. As shown, 71% of young people and adults from lower socio-economic groups did not reach the minimum levels of skills[15].

These data reveal a significant divide in digital skills related to information processing between young people and adults associated with their socioeconomic level. In this context, developing strategies to level these skills among youth and adults from lower socioeconomic levels is nothing but a priority.

Furthermore, a recommendation for ICT use in education policies, and as acknowledged by UNESCO Member States in the Qingdao Declaration[16], it is advisable to integrate basic ICT skills and information literacy into primary and secondary education curricula.

Finally, in a broader perspective, to the extent of this being a priority for the educational system, it is also advisable to analyze the options and the potential of ICTs to acquire the skills related to problem-solving, i.e. the capacity of students to identify relevant information or restrictions, to represent possible alternative or solution paths, to develop solution strategies and to solve the problem, and communicate the solutions (OECD, 2004).

Integration of the ICT into the curriculum

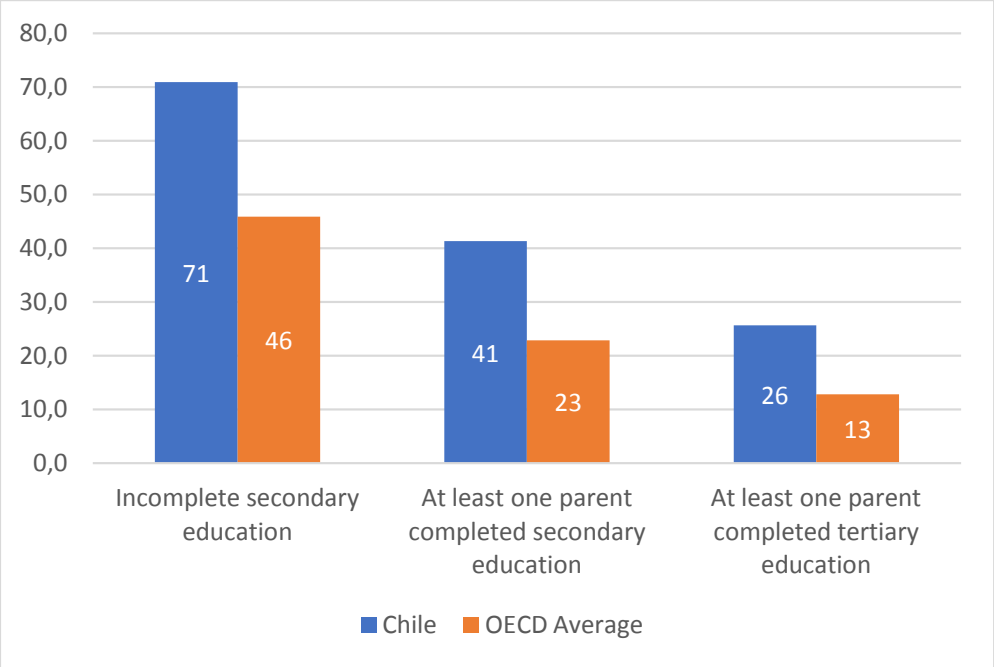
Regarding how to integrate these skills in the curriculum, countries have opted for different approaches, including the incorporation of additional subjects to teach these skills, their incorporation as a cross-reference goal to all subjects, and

14 In level 1 it is expected that they know how to use common software tools, as email and browser. To solve the problems is required to browse very little or to use simple commands. To achieve the solution a few steps and operations are needed. The goal to achieve can be directly inferred from the statement and apply simple criteria and procedures, such as allocating items to categories; there is no need to, for example, contrast or incorporate information.

15 See: http://www.unesco.org/new/en/education/resources/in-focus-articles/qingdao-declaration

16 See: http://www.unesco.org/new/en/education/resources/in-focus-articles/qingdao-declaration

Figure 12 Percentage of young people and adults below level 1, according to the parents' educational level



Source: Own elaboration based on data from the OECD (2016).

Notice: Percentages include those who reported having no experience in using ICT, or did not have the basic skills to operate a computer (e.g. keyboard or mouse).

their incorporation as an explicit objective in each subject. While there is no strategy that has proved to be more effective, it is reasonable to assume that the strategy will depend on the type of digital skill that are sought to develop, and on the characteristics of each country's curriculum. In this sense, it is advisable to consider a combination of these approaches, so that the integration of skills associated with the ICT use is aligned with the current curricular approach and is consistent with the most important learning goals.

Integrating ICT into teaching and learning

With regard to how to learn and evaluate using technologies, the trend in recent decades has been to associate the use of these tools with innovation and change in teaching (Fullan, 2012), particularly in the classroom, approaching them as a catalyst (McDonald & Ingvarson, 1997) or as a kind of Trojan horse (Olson, 2000); however, to date, its use in the classroom has been rare and varied (Fraillon, et al., 2014, Law, et al., 2008), especially in comparison to the use of these technologies by students and teachers in teaching and learning outside the classroom (Hinostroza, Ibieta, Claro & Labbé, 2016, Meneses, et al, 2012, OECD, 2015, Wang, Hsu, Campbell, Coster & Longhurst, 2014).

More specifically, the evidence suggests that, as a result of the new scenario of broad access to digital devices and services, the real integration of ICT into teaching and learning has taken place outside the classroom, a space which polices on the use of ICT in education have not taken into account (Hinostroza, 2017).

This implies a number of challenges for policies, including the need for teachers to pedagogically manage these teaching and learning niches (UNESCO, 2015), and develop digital skills to make an effective use of these resources, with a special

focus on the underprivileged students who, in an autonomously manner, , cannot gain the same advantage over existing resources (Hatlevik & Christophersen, 2013, Jara et al., 2015).

Nevertheless, the challenge of harnessing digital technologies to improve classroom teaching and learning practices is still pending, and therefore, it is necessary to deepening the methods through which is possible to improve the performance of traditional learning at full potential, in order to promote, for example, deep learning[17] (Fullan & Langworthy, 2014). However, it is also necessary to consider that this is a pedagogical challenge, not a technological one; and therefore it is recommended that the designing of these new practices be approached together with other actors of the Ministries of Education, such as those responsible for designing and developing the curriculum.

2.5. Evaluation and monitoring

The evaluation and monitoring of public policies are important dimensions of the policy-making process that is currently gaining more relevance due to the trend to design evidence-based policies (De Marchi, Lucertini & Tsoukiàs, 2016).

With reference to ICT and education policies, the UNESCO Institute for Statistics has developed a framework with indicators to assess the status of the progress among countries in this area. The first set of results for Latin America was published in 2012 (see: UIS, 2012), and currently a second application of the study is being elaborated by the UIS.

One of the major challenges in this area is to gather reliable and up-to-date data for calculating national indicators, this is because, although it is common for statistical offices in the countries to collect data on the education system (enrollment, teachers etc.), collecting information on ICT infrastructure is a challenging task, and reports are often inadequate and/or outdated. Therefore, it is recommended to standardize instruments and methods of data collection regarding the variables associated with the basic ICT indicators (UIS, forthcoming).

In addition, considering the growing interest of the countries of the region in participating in international studies, it is reasonable to think of adding items relevant to the Latin American context in the questionnaires used in those studies and, in particular, to incorporate variables related to the use of ICT. One of these studies is the one developed by the Latin American Laboratory for Evaluation of the Quality of Education (LLECE) of ORELAC / UNESCO Santiago.

Furthermore, considering the specific information needs of the countries, it is recommended that each of them develop and apply sample-based surveys that broaden the view regarding the access, use and advantages of ICT in education. One of the alternatives is the "Methodological Framework for the Measurement of Access and Use of ICT in Education" (Cetic.br, 2016) developed by the Regional Center of Studies for the Development of the Information Society (Cetic.br) under the auspices of UNESCO, which seeks to propose a reference framework with dimensions and indicators for measuring the access and use of ICT in education with the purpose of establishing a shared view among the different countries of Latin America.

Thus, in line with the above, another recommendation is for countries to engage in the production of comparative data and statistics on ICT in education, which may serve as an input to the evidence-based policy-making. The above mentioned initiatives demonstrate the growing interest in the development of a regional instrument to assess ICT skills of students and teachers, enabling the production of comparable regional data on the subject.

2.6. Cross-cutting themes

Finally, there is a set of cross-cutting themes associated with this area that should be considered in the design of the policies, and which is described below.

Digital citizenship

Given the massive and varied ICT use by youths, several countries have begun to acknowledge the need to integrate the concept of digital

17 Deep learning is related to critically review new facts and ideas, linking them to existing cognitive structures, and making numerous associations between ideas (Biggs, 1987).

citizenship in their curricula. While in many cases this is associated with safe use of social networks, and the respect for intellectual property laws that protect available content on the Internet, increasingly the concept has been largely expanded to include different forms of participation in society which are facilitated by the networks, therefore encompassing the rights and duties of digital citizens (Jones & Mitchell, 2015). In this sense, the recommendation is to develop the required skills associated with digital citizenship, focusing at the same time on the safe use of the Internet, and on the relevant concepts related to the citizen participation of young people using digital media.

Within this context, several countries in the region (Argentina, Brazil, Chile and, more recently, Uruguay) are conducting studies on the use of ICT by children and youths, and creating a network to encourage research and exchange on the subject. The methodological and conceptual proposal was originated in the project "EU Kids Online", and more recently in the Global Kids Online project. The initiative seeks to contribute to the knowledge regarding the Internet use of children and young people with respect to the opportunities, as well as associated risks and safety[18].

Inclusive education

The ICT have proven to be an effective means of supporting people with some form of disability, and in that sense represent an opportunity for governments to take concrete measures to look after them. In this regard, the 2015 "*The New Delhi Declaration on Inclusive ICTs for persons with disabilities: Making empowerment a reality*" proposes a set of measures to take advantage of ICT in favor of people with disabilities, including ensuring the provision of open distance learning within the reach of learners, detailing the characteristics that ICT must have to be accessible in a way that responds to the variety of specific needs of people with disabilities. In addition, some countries are promoting the use of assistive technologies, such as screen readers, voice recognition systems etc. In this sense, and considering the fundamental role of the State in this issue, the recommendation is to incorporate progressive requirements so that the different actors become aware of the need for inclusion, and to integrate functionalities into the devices, services and contents that allow and facilitate the access and use of these by persons with disabilities.

In addition, the ICT access, use and benefit among different groups in society is inequitable and many countries have specific policies to address these challenges, including strategies to empower girls and women in ICT use, creating content in different languages and that are relevant to different cultures, such as indigenous peoples across different countries, among others.

3. CHALLENGES AND OPPORTUNITIES FOR ICT IN EDUCATION POLICIES

As shown in previous sections, the design and implementation of ICT policies in education have been gaining importance by the very evolution of the supply of digital technologies in society. In addition, according to the findings presented in the previous sections, there is a significant number of young people and adults who are not participating in the digital culture, and who require specific policies to take advantage of the opportunities offered by ICT.

Evidence points out that access to this digital culture is not equitably distributed in terms of both access and the skills to use and benefit from ICT by youths and adults. This situation constitutes a risk of not only maintaining the existing social gaps, but potentially intensifying them (Toyama, 2011).

In this regard, the priority is ensuring access to high-quality Internet to the most vulnerable groups, with a special emphasis on the population of rural areas and those with lower socio-economic background. On this basis, it is also mandatory to enhance the digital skills of young people and adults so that they can make the most of the Internet to learn and develop throughout life.

This raises challenges that extend beyond the educational sector, for it requires the participation of public and private stakeholders responsible for supplying connectivity, including the legal aspects associated with the regulation of the

18 Global Kids Online: http://blogs.lse.ac.uk/gko/ and Latin America Kids Online network: http://blogs.lse.ac.uk/gko/latin-america-kids-online/.

telecommunications market, and for the development of digital resources and services relevant to the needs of the population.

This particular aspect calls for the definition of a framework of digital skills for the population in general that guides development and training strategies. To that end, a good starting point is the digital competence framework for the population proposed by the European Commission (Ferrari, 2013), described in the previous sections.

In this regard, as for the educational system, it is necessary that the curricula and evaluation tools are aligned, so as to integrate digital skills and new teaching and learning strategies into the different sujects. It is also necessary to adapt the frameworks of the professional teaching skills (and of other professions or occupations), so that the use and benefit of ICT be incorporated into the formal working practice, be recognized and valued during the training processes in general, and in particular of teachers; and be included in the teacher's evaluation systems.

In short, along with the potential benefits of digital technologies, there are a number of emerging challenges that need to be addressed, with respect to the equality and quality of ICT access, and the development of digital skills among vulnerable youth and adults.

What follows is a brief summary. Table 1 shows the set of recommendations mentioned in the previous sections.

Table 1 Summary of Recommendations

Scope	Recommendations
Infrastructure	• Ensure fluid access to computers by students, especially the group of students of lower socioeconomic status. • Provide Internet connection to schools that are far from urban centers. • Improve the quality of Internet access, that is, ensure the broadband connection, fast enough for the effective use of all available resources and services. • Promote initiatives for the provision of quality Internet access outside school to students and teachers. To this end, policies on telecommunications, education and social development must be coordinated.
Teachers	• Define standards of ICT use in the teaching profession that are integrated, or at least aligned, with the country's pedagogical norms. • Incorporate the use of ICT (standards) into the teacher's evaluation systems, in such a way to integrate the use of ICT in teaching career development. • Integrate ICT use standards for teachers into the curriculum for the training of new teachers, so as to ensure that future generations of teachers have the necessary skills to take advantage of these technologies in their professional practice. • Develop systems to support professional development that include relevant courses to develop the skills required, as well as support networks that provide ongoing support during the adoption process of these technologies.
Resources	• Provide teachers and students with the necessary skills to research, select and take advantage of the contents and resources available on the Internet. • Establish quality standards that provide guidance to teachers (and other stakeholders) in the selection, use and development of open educational resources (OER).

Scope	Recommendations
Curriculum	• Integrate basic ICT skills and digital literacy into primary and secondary school curriculum. • Analyze the options and potentialities of ICT to develop in students the skills related to problem solving. • Address the design of new teaching and learning practices of traditional subjects together with other actors of the Ministry of Education, such as those in charge of designing and developing the curriculum
Evaluation and monitoring	• Standardize the tools and methods of data collection for the variables associated with the basic ICT indicators. • Explore the application of sample-based surveys that enlarge the picture regarding the access and use of ICT in education, as well as the benefits derived from them. • Engage in the production of comparable data and statistics on ICT in education, which may serve as input for evidence-based policy-making
Digital citizenship	• Develop the skills associated with digital citizenship, focusing on the safe use of the Internet as well as on the concepts associated with the citizen participation of young using digital media.
Inclusive education	• Incorporate progressive demands so that the different stakeholders acknowledge the need for inclusion and take steps to integrate functionalities into the devices, services and contents that allow and facilitate their access and use by people with disabilities

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Oficina Regional de Ciencias de la UNESCO
para América Latina y el Caribe
UNESCO MONTEVIDEO
Luis Piera 1992, piso 2 (Edificio MERCOSUR)
Montevideo 11200
Tel. (598) 2413 2075
Uruguay

montevideo@unesco.org
www.unesco.org/montevideo