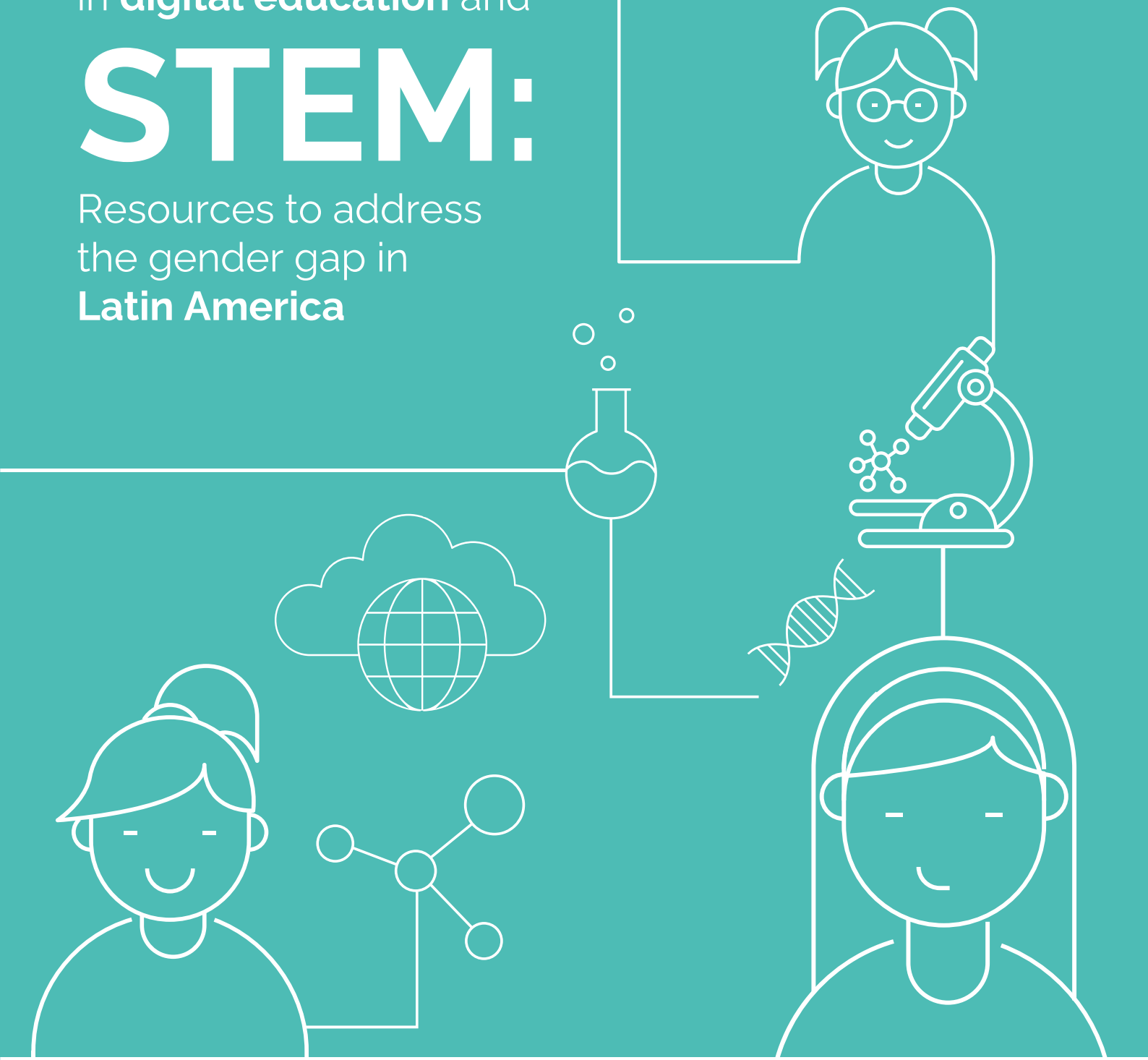
Fundación Ceibal

Gender and Covid
in **digital education** and

STEM:

Resources to address
the gender gap in
Latin America



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FOREWORD

María Florencia Ripani, Director of the Ceibal Foundation, Uruguay

The gender divide problem affecting Latin America in digital education and STEM areas (Science, Technology, Engineering and Maths) has become more dramatic during the COVID-19 pandemic due to an exponential increase in the essential use of digital technologies to mediate and continue education and almost all social practices. We need to leverage public policies, research, innovation and dissemination to create opportunities for girls and young women in Latin America to access the digital world on an equal footing with men.

According to the UN Women report (2020), only 3% of scientific Nobel Prizes have been awarded to women, and only 35% of higher education students in STEM-related fields are women. The report also mentions that the proportion of female researchers working in the field of engineering and technology in Latin America is much lower than that of men. The same happens with the possibilities of accessing STEM-related jobs.

Today there are very few women leading the field of digital technology, and their participation is largely limited to stereotyped roles. This reality calls for a revision of the gender constructions reproduced in all social practices and, in particular, those proposed by education systems. Even though most of the teaching and leading roles of educational institutions are occupied by women, technology-related spaces exhibit gender divides and biased representations, with spaces of greater technological knowledge and technical production restricted to men. For instance, there is a proliferation of female virtual tutors but a shortage of educational solutions developers. Similarly, in countries with statistics disaggregated by gender, the proportion of female teachers is much lower in areas such as computer science than in the rest of the fields of knowledge, which paves the way for the reproduction of gender divides in the education system.

Compulsory education plays a key role in the search for a solution that can reduce the gender divide, in line with the 2030 Agenda for Sustainable Development, where girls and women are proposed as drivers of change rather than mere beneficiaries. Education, as a fundamental human right, is a space for construction and social transformation. In this context, the region is faced with the challenge of designing and implementing, from the earliest levels of formal education, specific strategies in pursuit of gender equality in all aspects of digital culture. This includes addressing various dimensions, such as men's dominance in the area of knowledge related to the technological material base - "hard" knowledge -, and women's self-limitations. It is also necessary to question the representation practices of technological metaphors and gender – such as the proliferation of male robots –, including the setting of school assignments more or less closely linked to the ownership of technologies depending on gender.

Construction towards gender equality is a challenge shared by the entire education community, whether female or male, for the building of a more egalitarian society, which we at the Ceibal Foundation want to strengthen and promote today. As part of the Alliance for the Digitalization of Latin America (ADELA) project, funded by IDRC Canada, the Foundation has tasked the CoreWoman organization with an analysis of the challenges and possible ways to meet them, with a view to providing concrete resources in the development of more equitable education policies in the region.

Part I

1 INTRODUCTION

Source: Flickr

1.1 The resulting crisis

Even before the outbreak of COVID-19, gender gaps were evident in the use of Information and Communication Technologies (ICTs) in education systems in Latin America. According to the Methodological Guide to Measuring ICTs in Education, developed by Martínez-Restrepo, et al. (2018), rural schools already had less access to technological devices. Female teachers, for their part, had lower rates of digital inclusion or educational use of technology than their male counterparts. The same study actually found that female teachers had lower levels of self-efficacy in the use of technology for teaching. On the other hand, girls and female adolescents already accessed and used the internet in similar proportions to their male peers, but with less intensity and fewer skills than would allow them to learn and actively participate in the development of ICT-mediated knowledge (Martínez- Restrepo et al., 2018). Martínez-Restrepo et al., (2018) also found that in educational spaces, girls preferred ICT for communication and boys for gaming.

The gaps between men and women in standardized maths and science tests already showed the roots of the significant gender gap in access to university courses in STEM areas. As regards printed and virtual educational content, both formats incorporated gender biases, with negative impacts on girls' aspirations to study STEM programmes or reach leading positions (Martínez-Restrepo et al., 2018).

The transformations in digital inclusion and the technological endowment and equipment that governments in the region had been providing for some decades (Martínez-Restrepo et al., 2018) have not been enough to face the changes caused by the COVID-19 health crisis. At first, educational institutions closed down their facilities and promoted emergency distance education[1]. However, the number of devices per student was not enough for each child to take one home. In fact, according to data from the Ministries of Education of each country for the years prior to the pandemic, the average number of students per computer was 8 in Colombia, 10 in Chile, and 9 in Mexico. Furthermore, only 67.4% of educational institutions in Latin America believed that their teachers (men and women) had the necessary skills to mainstream digital devices into teaching processes (OECD-PISA, 2018).

Digital inclusion (access to devices and internet connectivity) in households did not lead to an easy transition to online education either[2], especially in lower-income households and those located in rural areas. According

1 Emergency education policies or emergency distance education are a temporary shift in education to an alternative model due to the crisis. The main goal is not to create an effective education ecosystem but to provide temporary access to instruction and educational support that will be available during the crisis (Hodges et al., 2020).

2 Online education refers to teachers and students participating and interacting synchronously in a digital environment through technological resources (Ibañez, 2020).

to OECD-PISA figures (2018), only 80.6% of students in Latin America had access to a computer or tablet. The situation was more critical for female-headed, single-parent households; in Colombia, for instance, 52.3% of them had no internet service (GEIH survey, 2020).

Like other sectors, education adapted to the shock caused by COVID-19 in a matter of weeks, with differential effects depending on the level of skills and digital inclusion of teachers, students and parents. Many questions have arisen about the adaptability of these stakeholders to ICT-mediated distance teaching and learning strategies (Ripani, 2020) during the pandemic: Were the strategies in the responses of the different governments designed to close gender divides? Is there any evidence of divides narrowing or widening between male and female teachers and students? What actions are necessary to close these divides?

1.2 Objectives of the report

This report seeks to put forward hypotheses in response to the questions in the foregoing paragraph, analyzing whether the crisis caused by COVID-19 may have contributed to closing divides or, on the contrary, it increased them. It also analyzes the approach of the interventions implemented in Latin America in the context of the health crisis to identify whether they were adopted from a gender perspective or contributed to closing divides in some way. Furthermore, a best practice review was carried out of distance[3] and digital[4] education initiatives (mostly pre-COVID) that seek to close the gaps between boys and girls and include more women in STEM areas. Finally, policy recommendations are provided and a call is made for more measurements with a gender perspective in surveys, administrative databases, standardized tests, and other instruments.

1.3 Limitations of the report

The three indices of adaptability in terms of ICT Resources in the Home, Widespread Use, and Educational Use, which were devised exclusively for this report, show that before COVID-19, the ICT Resources in the Home dimension was the most developed, followed by Widespread Use and, finally, Educational Use. This implies that although Latin America managed to develop a relatively robust technological infrastructure, the use of ICTs in teaching and learning strategies before the pandemic was still lagging behind noticeably. The proposed methodology involving gender parity visualization and indices, which are addressed in the second part of this report, reveal the nuances in these dimensions.

It should be noted that the PISA 2018 tests, on which the three indices were built, are aimed at 15-year-old students who have completed the international equivalent of compulsory education worldwide, who usually live in urban areas, and with no participation of students enrolled in rural schools[5]. Therefore, the data from this kind of test do not reflect the performance of the student body at the national level. Despite these limitations, the results of the PISA tests provide an estimate that allows a comparison among the countries in the region, with variables that show characteristics of access to ICT resources, use of ICTs at home and in educational institutions.

It was also found that government interventions, most of them as part of a state of emergency, did not seek to close gender divides, but rather to respond to the crisis. Although education initiatives in this context do not usually try to solve existing gender gaps, considerations can certainly be taken so that they will not widen them, especially if this involves the use of ICTs in education.

3 In broad terms, distance education combines face-to-face and virtual lessons. This method gives the student control over the time, space and pace of their learning, since technological resources such as the internet or devices are not required. The education materials are CDs, USB flash drives, brochures, books, among others, which are commonly sent to every home (Ibañez, 2020).

4 Digital education requires mandatory technological resources (device, internet, multimedia platform). This method works asynchronously and focuses on technology as an educational medium, that is, it does not feature face-to-face education, unlike distance education (Ibañez, 2020).

5 In Colombia, the cities representing the country in the PISA tests are Bogotá, Medellín, Manizales and Cali, all of them with between 7-1 million inhabitants. No rural municipality participates.

Although COVID-19 has exposed the gender gaps that existed before the pandemic in rural and urban areas, public and private schools, girls and boys, and male and female teachers, the effects on ICT-mediated education are still unknown, not least because the surveys on digital education in the region lack the gender perspective that can provide this information in a disaggregated way.

1.4 How to read this report

This four-part report calls for action on this data gap, which must be filled in order to contextualize the barriers facing girls and female adolescents in Latin America in their access and use of ICTs for distance learning during the COVID-19 pandemic. The first part of this document introduces the context Latin America was in in terms of digital education after the outbreak of coronavirus. The second part includes the design of three adaptability indices for ICT-mediated distance learning[6] with the aim of registering the state of countries in the region in terms of Access to ICT Resources in the Home, their Widespread Use and its Educational Use, as well as showing the status of gender parity for each of them. The third part presents a detailed analysis of the pre-COVID-19 gender gaps in ICT-mediated education in Latin America as regards educational institutions, teachers, students, families or households, and content. Finally, the fourth part features a toolkit that includes policy recommendations according to the kinds of gender perspective and a roadmap for policymakers that allows them to design and assess interventions that will articulate the different levels of ICT-mediated education (Educational Institutions, Teachers, Students, Families or Households) with the aim of closing the divides in ICT access and use among girls and female adolescents and ensuring that in the future they will have a greater representation in STEM disciplines.

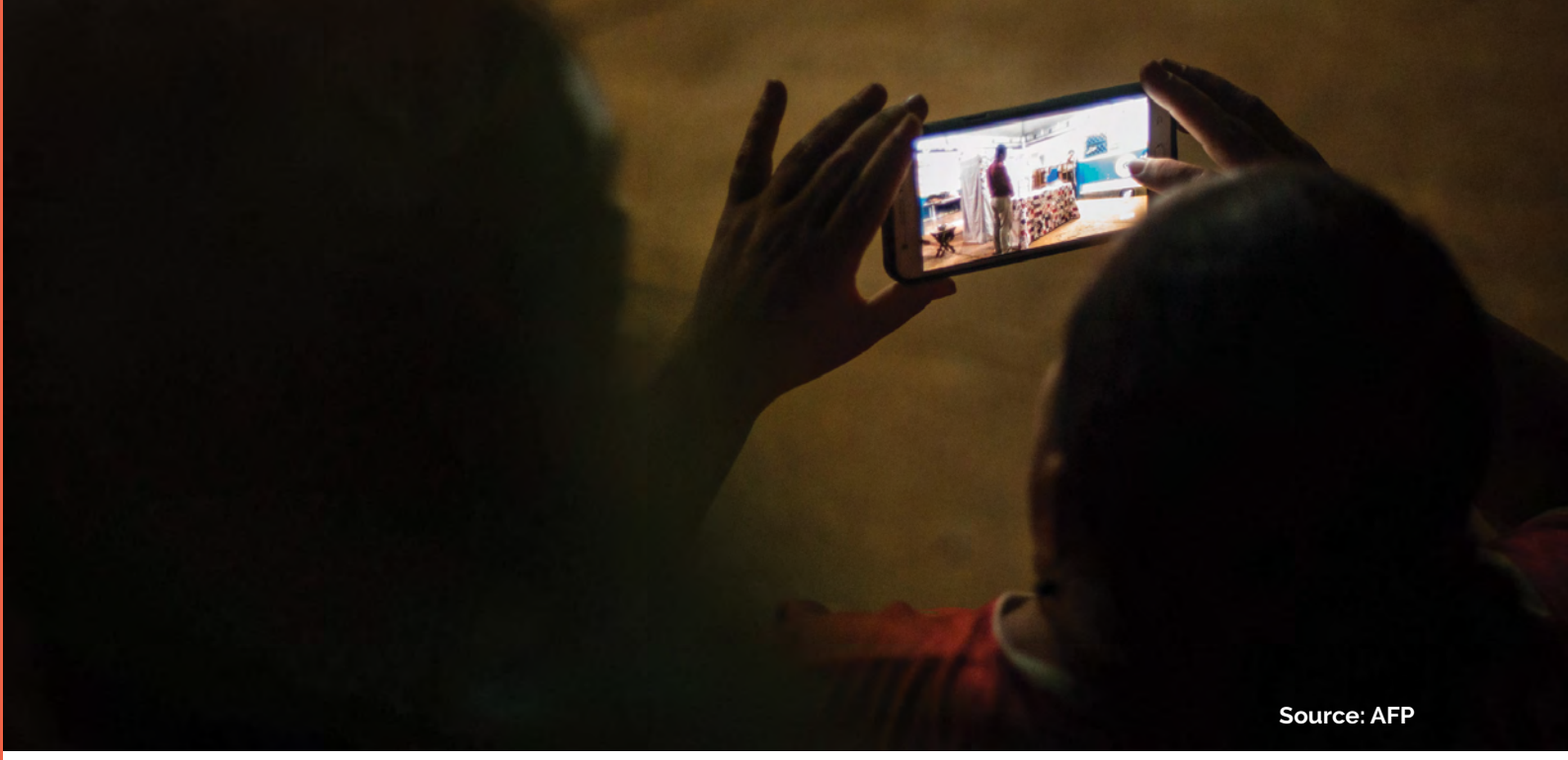

Source: Flickr

6 Reference is made throughout the text to ICT-mediated learning, which includes distance, online and digital education but emphasizes ICTs as the means for teaching and learning.

Part II

2

OVERVIEW OF DIGITAL EDUCATION IN LATIN AMERICA AFTER THE OUTBREAK OF COVID-19



Source: AFP

Over the last 10 years, Latin America has made significant progress in terms of building infrastructure for internet access. This is the result of public and private investments that have expanded the connection networks and democratized their access (UIS, 2011). Similarly, countries in the region have devised a number of specialized schemes that have ranged from the purchase of digital devices (computers, tablets, among others) to the design of learning platforms for students, teachers and parents that seek to mainstream ICTs into teaching and learning processes. Such is the case of platforms or programmes such as "Ceibal en Casa", by Plan Ceibal in Uruguay; "Perú Educa"; "Aprendo en línea" in Chile; or "Aprendo en Casa" in Costa Rica, among others. Initiatives such as the above have promoted the adaptation of emergency distance education as a result of the state of emergency declared by the different Latin American authorities due to the COVID-19 health crisis.

The strategies adopted by the Ministries and Secretariats of Education in the region include the use of learning platforms and learning management systems[7], printed material, WhatsApp, text messages, calls, and different mass media, such as radio and TV. These resources have facilitated the transmission of school material for distance learning (Cobo, Hawkins, Rovner, 2020)[8]. However, the new education scenario, which has relied heavily on ICT access and use, poses a paradox: just as it has allowed millions of students in the region to continue their school studies, it has also been one of the scenarios in which the education gaps in the region have been largest and most evident.

Before COVID-19, some Latin American countries had a learning poverty index[9] of 51%, which is expected to increase by an additional 10 percentage points (pp) due to school closures and the virtual or blended modality adopted by most educational institutions, for which teachers and students had received little or no previous training in implementing ICT-mediated learning and teaching strategies.

Additionally, the students who were not able to reach a basic level of reading ability were faced with a high risk of dropping out of school, which interacted with other factors that

7 Learning management systems represent an innovative teaching tool that facilitates the teaching-learning process and communication with students through Information and Communication Technologies (ICTs) (Palma Ruiz et al, 2019).

8 These methods are understood as learning management systems as they enable connection between students and teachers (World Bank, 2020).

9 The Learning Poverty Indicator, developed by UNESCO and the World Bank (2019), comprises two components: the learning component, which refers to the proportion of 10-year-old children who are capable of reading proficiently, and the participation component, which refers to the out-of-school rate for children or primary school age.

Source: Pixabay

increased their vulnerability, such as being educated in a rural context, educational level of their parents or carers, and coming from to a low-income household (World Bank, 2020).

One year into the pandemic, the expectation would have been that Latin American countries would have experienced accelerated changes in ICT-mediated teaching and learning strategies. However, the reality is different, and most countries in the region with the exception of Uruguay do not yet have a national digital education strategy for the development of distance education models that take advantage of ICTs (Marinelli et al. al., 2020). In addition, the effects of technology as a mediator of learning and teaching processes analyzed from a gender perspective are unknown.

2.1 Conditions for digital education in Latin America before COVID-19: Vulnerability in ICT-mediated distance learning

ICTs are priceless tools that complement traditional education and make up for its most common deficiencies, such as high rates of absenteeism of the teaching staff and student body, the students' low levels of motivation, and the differences occurring between males and females at the same school level (World Bank, 2018; The Economist, 2018; Brookings, 2019). A successful ICT-mediated learning programme must include the definition of objectives, specific educational software or platform, a certain number of hours of weekly use (Arias Ortiz and Cristia, 2014), feedback schemes, and the possibility of customizing the teaching pace to suit the students' learning style and speed (Muralidharan et al., 2019). However, before COVID-19, policies on digital education in most Latin American countries were not implemented in this way.

The actions prioritized by governments before COVID-19 basically focused on the provision of ICT devices and internet connectivity rather than on the educational use of ICTs for the development of 21st century competences[10] or skills[11] (Martínez-Restrepo, et. al, 2018). Even in digital education programmes in Colombia, such as Tita or the TESO Digital Plan, whereby ICTs were indeed mainstreamed into the processes for learning these skills or competences, there is no evidence that traditional teaching practices have been transformed or that strategies based on Project-Based Learning[12] have been adopted.

10 Competences are individual characteristics (motivation, values, traits, etc.) allowing a person to perform in a work and/or educational environment. Competences make it possible to perform a task with experience and knowledge.

11 Skills determine a person's ability to do something correctly and easily. Skills make a person capable of performing a task.

12 Project-Based Learning is a teaching method whereby students learn actively, interacting with the world through projects that put forward solutions to world problems or complex questions. Students demonstrate their knowledge and skills by working on a product or public presentation. This method promotes the development of skills such as critical thinking, collaboration, creativity, and effective communication (PBLWorks, nd).

2.2 Adaptability Indices for ICT-Mediated Distance Learning in the face of COVID-19

This report proposes three Adaptability Indices for ICT-Mediated Distance Learning in the face of COVID-19 whose development was based on the data of the Programme for International Student Assessment (PISA) carried out among 15-year-old students in 2018. These indices aim to assess and categorize Latin American countries in terms of Access to ICT Resources in the Home, Widespread Use, and Educational Use. Simultaneously, each of these dimensions was gender-parity indexed.

The indices, which range between 0 and 100 – with 0 being the lowest score and 100 the highest – are an adaptation of the conceptual framework of the Methodological Guide to Measuring ICTs in Education, developed by Martínez-Restrepo et., al (2018)[13] around the (1) ICT Resources in the Home; (2) Widespread ICT Use, and; (3) Educational ICT Use indices. The first index addresses the availability in the home environment of ICT resources, which are essential, for instance, for attending and staying connected to an online lesson.

The second index addresses the frequency of widespread use of ICTs by students outside the institutional and educational environment. Finally, the third index explores the pedagogical use of ICTs in institutional and educational spaces. The results of each of the indices are presented on Maps 1, 2 and 3.

It must be noted that the indices are first presented without disaggregation by gender in order to identify each country's level of adaptability for ICT-mediated distance learning in terms of ICT Resources in the Home, Widespread Use of ICTs, and Educational Use of ICTs, followed by a display of the gender gaps in each of these dimensions, presented on maps 4, 5 and 6.

The results of each index show that Latin America has greater development in terms of access to ICT resources in the home, with the highest score in the ICT Resources in the Home index, at 71 points, followed by the Widespread Use index, at 61 points and, finally, the Educational Use index, at 60 points.

In general, the ICT Resources in the Home index presents the best performance levels of the three, Chile and Uruguay being the leading countries in this dimension with 88 and 85 points respectively. As mentioned above, access to resources is a precondition for the active use of ICTs[14] and the resulting cognitive, educational, and work improvements. In addition, access must be distinguished by the "medium" (device type) and the "context" (rural or urban), since both affect learning in different ways. In this regard, the reduction of certain barriers in the medium can reduce the gaps in the context.

For instance, in China, where there are differences between students who live in rural and urban contexts too, it was found that students who used a device such as a computer

Table 1. PISA questions used for the development of the adaptability indices for ICT-mediated distance learning

ICT Resources in the Home Index	Widespread Use of ICTs Index	Pedagogical Use of ICTs Index
Do you have an available computer to do assignments? Do you have internet connection?	How often do you look for practical information online? How often do you use online chat apps?	Has your school taught you to filter information on search engines? How often do you look for online information to learn about a particular topic?

13 The categories were based on the Methodological Guide to Measuring ICTs in Education, by Martínez-Restrepo et al., 2018, an initiative by Fedesarrollo and the International Development Research Centre (IDRC): http://www.medicionesticeducacion.org/. However, Active Use was defined as Educational Use in this brief.

14 The use is "active" if the students undertake group activities based on group project learning whereby they actively participate in ICT-mediated development of knowledge. The difference between "passive" and "active" use is important in understanding whether ICTs are being used as effective alternatives as opposed to the heavily criticized traditional education model, in which students are only passive recipients of information (Martínez-Restrepo et al. al., 2018).

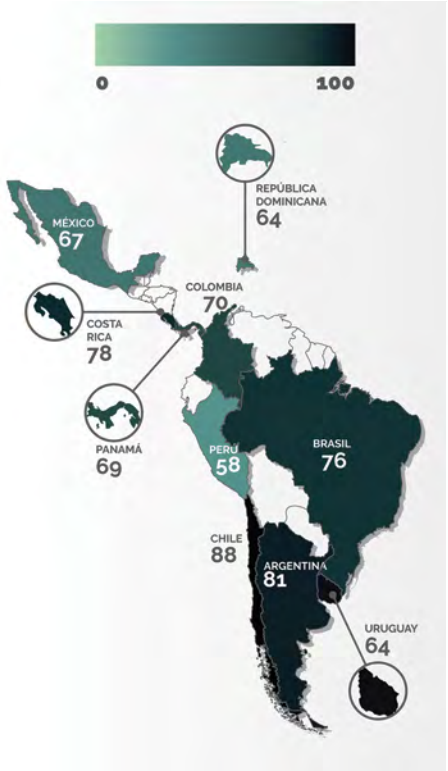
or tablet for distance learning from home – regardless of whether they were in the city or in a rural area – achieved better academic performance than those who only used a smartphone (Clark et al., 2020).

The use of ICTs can be divided into general use and educational use. General use is the result of practical use of ICTs, for instance, for communication by means of applications such as email, text messages and phone calls. It also encompasses the ability to create events on digital calendars and read information online, such as news or educational material. Educational use, on the other hand, tends to be didactic, and refers specifically to the teaching or learning of various topics in such a way that it is possible to create and/or innovate through it.

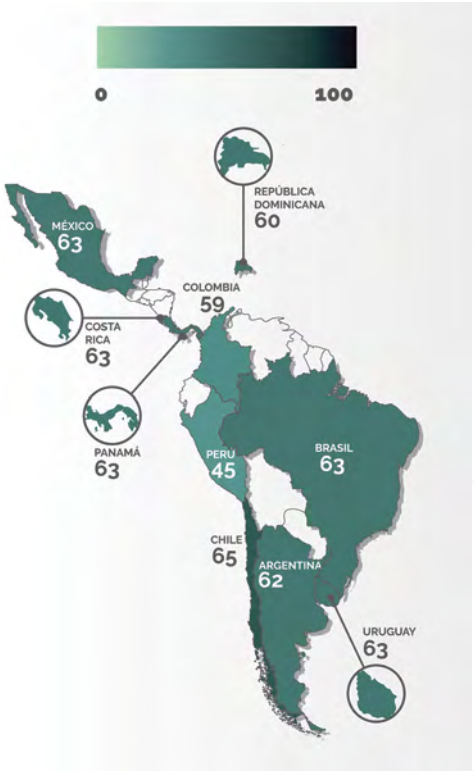
Based on the above, the Widespread Use of ICTs index presents a higher score than the Educational Use index for the cases of Uruguay, Argentina, Brazil, Chile, Colombia and Costa Rica, while the greatest vulnerability is observed in educational integration of ICTs. In the case of Peru, Panama, Mexico and the Dominican Republic, educational use presents a higher score compared to widespread use. In Latin America, according to the PISA 2018 tests, 31% of teachers stated they never resorted to widespread use of ICTs (for instance, reading digital texts). As regards educational use, only 17% of the teachers had used ICTs at some point, 24% twice or three times, and 22% used ICTs many times in their teaching (PISA - OECD, 2018).

Adaptability Indices for ICT Mediated Distance Learning (2018)

Map 1 - ICT Resources in the Home Index

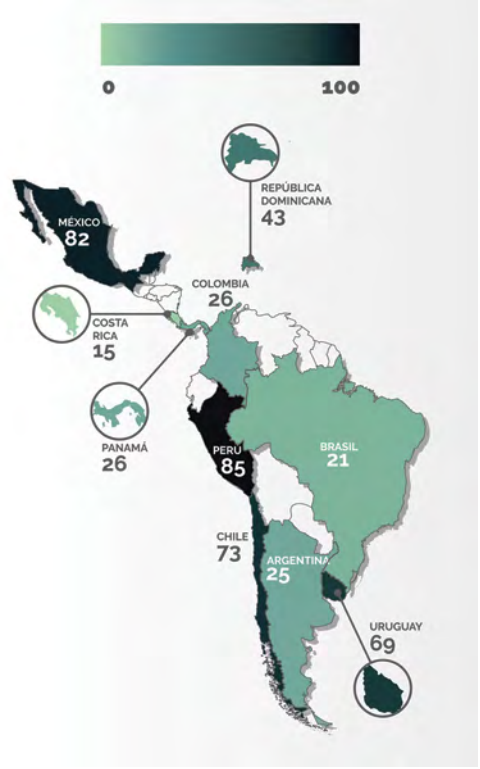


Map 2 - Widespread Use of ICTs Index

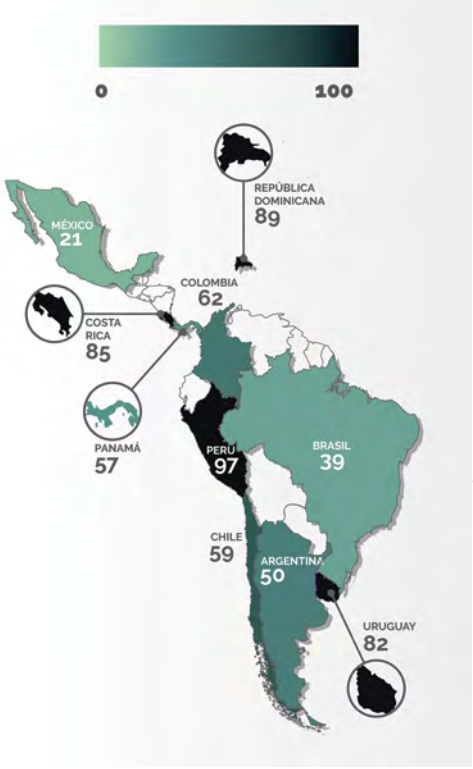


Map 3 - Educational Use of ICTs Index

Map 4 – Gender-parity indexed ICT Resources in the Home



Map 5 – Gender-parity indexed Widespread Use of ICT



Map 6 – Gender-parity indexed Educational Use of ICT

Source: Devised by the author based on PISA-OECD data.

2.3 Gender-parity indexing

As mentioned above, the three proposed indices -ICT Resources in the Home, Widespread Use of ICTs and Educational Use of ICTs – are gender-parity indexed[15]; that is, the criterion for ordering the results is the size of the existing gender gaps for each dimension. As stated in the introduction, this document seeks to analyze both the adaptability of ICT education in the face of COVID-19 in Latin America, and the gender equity situation in the region for each of the indices. It should be pointed out that the latter provides an insight into the differences in ICT access or use among adolescents in the region, but it does not mean that the country has optimal ICT access and use. The closer to 100 in the indices, the greater the gender parity in each of the dimensions, which are displayed on maps 4, 5 and 6.

According to the questions used in devising the indices, Latin America exhibits greatest gender equity in terms of Widespread Use (Map 5), followed by Educational Use (Map 6) and, finally, access to Resources (Map 4). This is an indication that both men and women in the region – possibly due to the democratization of mobile devices – have been allowed to acquire certain basic skills in terms of ICT access and use, such as the use of online search engines and instant messaging applications. The Resources index is not actually the one with the highest score, probably, in part, because the questions in the index ask about computers and connectivity rather than about mobile devices, where the gender divide in the region has been narrowing (GSMA, 2020).

Based on the ICT Resources in the Home Index (Map 4) it is safe to say that, on average, Latin America has a low level of gender equity in this dimension. Although the region has made progress in terms of access to mobile devices (The Mobile Gender Gap Report, 2020), this is not synonymous with internet access with stable, uninterrupted connectivity. The cost of the internet may be indicative of a financial barrier to access in households, especially among those located in rural areas and those at the

15 This index was devised on the basis of UNESCO's Gender Parity Index, which seeks to measure the differentiated access to education between men and women at the global level.

lowest socioeconomic levels in cities (Barria, 2020). A study by cable.co.uk (2020) found that Chile and Brazil are the only countries in Latin America among the 50 countries with the most cost-efficient internet[16]. There are cases in which monetary value is not a barrier but the operator's poor signal is, especially in rural areas (Barria, 2020; Duque Vergara, 2020). Although internet access per se is not decisive in achieving structural changes in terms of gender equity, it is a fundamental condition for women to use it strategically to stimulate their knowledge, creativity and capacity for innovation and transform their life opportunities, for instance in terms of education or employability (Castaño, 2008).

Map 4 also suggests that there is a gender gap in computer ownership (desktop or laptop), which creates barriers to ICT ownership among adolescent girls, especially if one considers the fact that these devices are necessary for developing more complex digital skills that will facilitate the transition to STEM disciplines (Castaño, 2008).

As regards the Widespread Use index shown on Map 5, although Peru is presented as the country with the best performance in gender equity with 97 points, it should be noted that this score is overestimated in view of the country's poor development in terms of widespread use of ICTs, as shown on Map 2. Greater equity in overall use could be due to an increase in access to devices in Latin America (The Mobile Gender Gap Report, 2020), as has been the case with smartphones, which have allowed some households in the region to access the internet for the first time and use ICTs more intensively, especially instant messaging (Mariscal et al., 2018). In fact, some experts point out that this technological change in Latin America has helped the focus of education policies to shift to students' digital skills (Trucco and Palma, 2020). However, this process has not taken place in the same way in rural areas. According to the Global System for Mobile Communications Association (GSMA) (2020), the rural-urban gap in mobile internet use in Latin American during 2019 remained above 24 percentage points (pp) on average.

Of the three indices, the smallest gender gap is in the Widespread Use index. One possible explanation is that although women, on average, have similar access to ICT resources, gender differences are not noticeable in this dimension, but they are in their use. (Brown, 2008; Baron-Cohen, 2003). The evidence points to women making more social use of ICTs and focusing on the skills that will help them in that area, such as learning to use social networks and sending messages through platforms (Castaño, 2008; Unicef, 2020).

Finally, as regards the Educational Use index, Map 6 shows a gender-parity-indexed score of 54 points, which may be due to the poor development of this dimension in the region in general. This can indeed account for why this index does not show the development of a significant gender gap. As far as the Educational Use index is concerned, the country with the greatest gender equity in this dimension is Chile, with 77 points. In this regard, it should be noted that in a context of emergency digital education, as was the case with COVID-19, the disadvantage girls and adolescent females are expected to face is twofold, since, as the literature indicates, girls, female adolescents and women do not use ICTs in the same proportion as men, nor do they benefit equally from their educational use (WEF, 2016).

According to UN Women (2018), the proportion of adolescents and adults who possessed basic digital skills such as copying and pasting a folder, performing basic arithmetic operations on a spreadsheet or sending an email was below 40% for a specific group of Latin American countries[17]. Although statistics on the gender gap in these skills for the entire region are not available, the gap is noticeable. For instance, in the case of Brazil, which scores lowest on the Educational Use index, the proportion of women who could manage a spreadsheet was 9.9%, compared to 15.1% for men. (UN-Women Data Hub, 2018).

16 The average internet cost in South America is 6 USD per gigabyte.

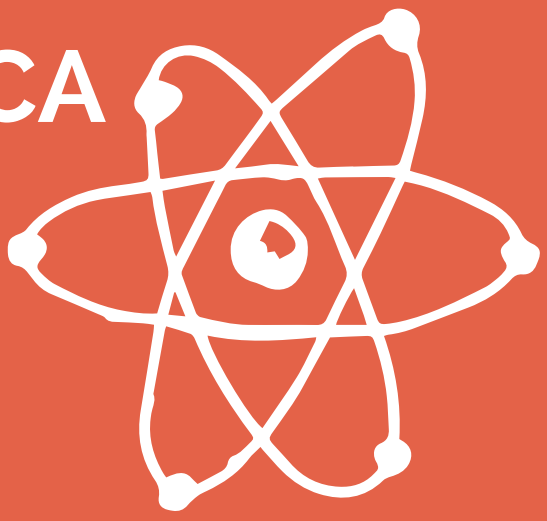
17 This group includes Chile, Uruguay, Costa Rica, Argentina, Colombia, Panama, Mexico, Brazil, Peru and the Dominican Republic.


Source: CoreWoman

Part III

3

PRE-COVID GENDER DIVIDES TO BE CLOSED IN LATIN AMERICA



Although the currently available disaggregated data are not enough to determine the impact of the COVID-19 crisis on digital education and gender gaps in Latin America, it is possible to infer some of its effects on the educational process of girls and adolescent females based on the significant ICT and STEM gaps that were evident before the pandemic. This second part also includes case studies and policy recommendations that may help counteract the potential effects of COVID-19 at the Educational Institution (IE), Teacher, Student, Digital Content/Resource, and Family or Household levels. Table 2 summarizes these levels of analysis, with a description of the pre-COVID-19 gaps by gender, what it is desirable to know or measure, and the best practices and recommendations that may help address the respective gaps.

Table 2. Summary of gender gaps by level of analysis

Level	Pre-COVID-19 gender gaps	What it is desirable to know or measure	Best practices / recommendations
Educational Institutions (EI) 	There were rural-urban gaps and gaps between cities with specific ICT programmes, but no differences were evident in ICT access or use between boys and girls.	How did the EIs adapt to ICT-mediated distance education? Did their responses take into account the differentiated needs of boys and girls for learning at home through ICTs?	EIs should have ICT use strategies that will allow them to tackle gender gaps emerging in primary school and are reinforced in secondary school and affect the self-confidence of girls and female adolescents and their preference for STEM subjects?
Teachers 	There was evidence in some countries of less digital inclusion, poorer digital skills, and less educational use of ICT among female teachers.	How did the teachers adapt to working from home? Did female teachers (with children) have more difficulty than their male colleagues in closing the divides in digital skills and educational use that were evident before COVID -19?	Teaching staff should be trained in educational use of ICTs, including how gender stereotypes at the individual level can influence the educational development of girls.
Students 	Gender differences were not noticeable in ICT access, but they were in the area of use: on average, boys and adolescent males showed greater self-efficacy in ICT use and better outcomes in science and mathematics, while girls and adolescent females showed less interest in STEM.	How were digital resources distributed in the home when only one device (mobile phone, tablet, computer) was available? Was there privileged access for boys and male adolescents compared to girls?	Female students should be given a space to familiarize themselves with and understand the possibilities afforded by ICTs. This kind of initiative can be implemented outside the school curriculum (especially in secondary education) to explore ICT use and identify role models for prospective STEM careers. An additional recommendation is partnerships with the private sector, universities or technological educational institutes to support the transition of female students to higher education, especially those venturing into STEM areas.

Level	Pre-COVID-19 gender gaps	What it is desirable to know or measure	Best practices / recommendations
Pictures and representations in educational content	Biases that historically reproduced gender-related stereotypes were evident in printed and digital educational content.	Was gender-equitable representation taken into account in the use of pictures and the digitization of new educational content? Is there evidence of gender-based occupational segregation in the new representations in digital content?	Representations and stories in educational content must remove any gender stereotypes, especially those related to ICT use and STEM subjects. Programmes introducing ICTs should be attractive, dynamic and didactic enough to arouse and maintain the interest of girls and adolescent females in STEM subjects. Practices or games involving specific situations usually serve this purpose.
Families/households	Existence of gaps in the parents'/guardians' digital skills to support education at home depending on location (rural/urban) and the families' socioeconomic status.	What are the desirable attributes of adults for adequately supporting children in ICT-mediated distance education? How can education systems help families develop these attributes?	Families or carers, especially mothers, could participate in digital literacy courses under the guidance of EIs. These initiatives should ideally incorporate practices that will question gender stereotypes and social standards limiting the strategic use of ICTs among girls and female adolescents.

3.1 Divides to be closed in educational institutions

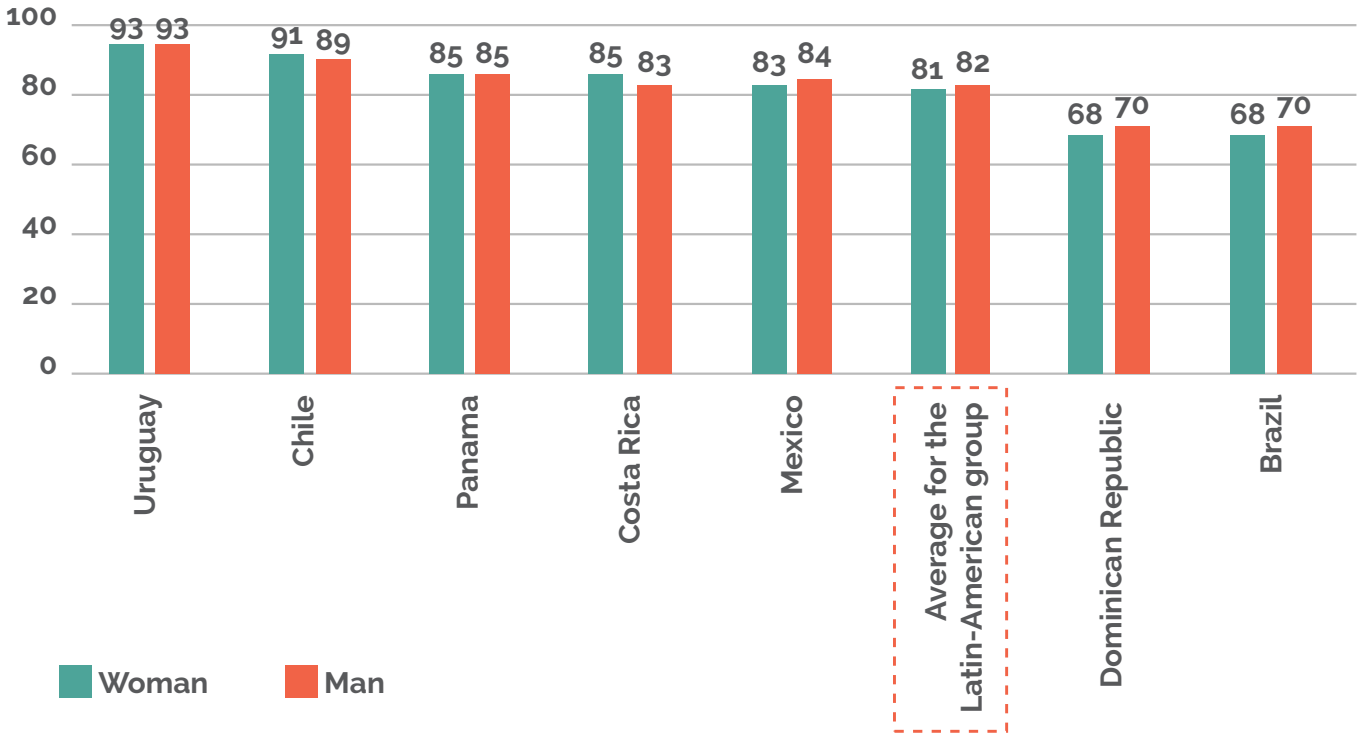
As stated above, in the pre-COVID-19 scenario, most Latin American governments focused on equipping educational institutions with technological tools. Progress is therefore evident in terms of coverage for access to devices and the internet on an equal basis for boys, girls, and adolescents, but less noticeable in terms of educational and strategic use for student learning.

In Latin America (Graph 1), the availability of computers or tablets for boys and girls in schools varies noticeably throughout the region. In countries such as the Dominican Republic, the availability of devices is 68%, while availability in Uruguay is as much as 93%, which means an estimated gap of up to 26 percentage points in Latin America. As regards ICT-mediated learning, there are serious gaps between urban and rural areas; a problem affecting both access and use of ICTs. According to calculations by IICA, IDB and Microsoft (2017), the average gap in the region in terms of connectivity penetration is 30.4 percentage points, which means that in urban areas the percentage of connectivity in some Latin American countries can be much lower in rural areas.

The availability of computers or tablets within EIs does not suggest the existence of statistically significant gender gaps, with the Latin American average being 81% for boys and 82% for girls. Nevertheless, between 2010 and 2015, the region had critical indicators of students per computer. The region's average was 27 primary school students per computer, and serious gaps between countries were noticeable, while Uruguay had one student per computer, one of the best figures at the global level. Argentina reached a ratio of 59 students per device of this kind.

The main gaps in the EIs are observed between urban and rural, and between the places that have strategies for ICT access and educational use and those that do not. While EIs in urban areas offered their education community access to more devices and higher-speed internet connection, those located in rural areas and in urban areas with lower socioeconomic

Graph 1. Percentage of students who stated that their educational institutions had available ICT devices (computers, tablets, laptops) by sex (2018)



Source: Devised by the author based on PISA-OECD data.

levels implemented more basic digital educational strategies or lacked any such initiatives (Barria, 2020; Duque Vergara, 2020).

In rural areas where EIs had been implementing ICT-mediated learning strategies, the digital gap with respect to urban areas is likely to persist. However, even if internet connectivity in rural areas of Latin America has improved during the pandemic, the digital divide between rural and urban EIs, on average, is more likely to widen as a result of ICT strategies being strengthened in the latter to ensure distance education. In 2018, only 37.6% of EIs in Latin America had a programme focusing on ICT use in teaching and learning. For the vast majority of EIs in Latin America, the incorporation of ICTs in these dimensions must therefore have been not only a challenge but also an emerging undertaking (PISA - OECD, 2018) that tested the resilience of all education systems in the region.

Very few initiatives in Latin America have managed to implement robust ICT-mediated education strategies in rural EIs. Among the most successful case studies are the Learning Circles of Escuela Nueva, Plan TESO – both in Colombia –, Enlaces in Chile, and Plan Ceibal in Uruguay.

The following case studies describe the resilience strategies for dealing with the COVID-19 crisis adopted by *Fundación Escuela Nueva* in Colombia, and the organization Educate in Uganda; both combine the use of ICTs in rural areas. It should be noted that the implementation of Learning Circles had started before the pandemic, and that they include an assessment of outcomes made by the World Bank. However, there are no recorded assessments of the Educate initiative, although it must be pointed out that ICTs were integrated into both initiatives.

Table 3. Case studies: Educational Institutions

Case studies		
Country	**Name**	**Initiative**
Colombia 	**Learning Circles of Fundación Escuela Nueva**	Since 2019, the Learning Circles of Fundación Escuela Nueva (FEN)[18] have supported students displaced by violence in Colombia and low-income immigrants living in rural and urban areas of Colombia, who are given quality education through self-learning guides, among others. The programme mainly uses the parents' mobile phones to make calls and send educational messages on WhatsApp, which is complemented with: - Sequenced lessons on community radio, where FEN has previously mapped each child's local and family context. - Learning material delivered to each child - Written guides for the parents or carers with information regarding the support provided by the tutors over the phone or other virtual media. - Rigorous use of the structure, schedules and activities of the learning guides so that children can learn at their own pace and their progress is monitored and supported The assessment of the pilot project (before COVID) showed improvements in the students' dropout rates and their performance in national standardized tests. It also strengthened democratic behaviours, peaceful coexistence in their families and the self-esteem of students. The adapted version of the Learning Circles has been assessed jointly by the World Bank and UNICEF, although the results are not available at the moment. (Cerdan, Velez Bustillo, Colbert, 2020).
Uganda 	**Educate**	Educate is an educational model that provides 21st century skills training directly to secondary school students in Uganda. One of the most effective solutions during the pandemic has been to collect information on the students to adapt the design of the programmes to their realities, and disaggregate the information by gender. They used low-tech means to collect data, including disseminating surveys to young people via SMS, WhatsApp and phone calls. In this context, telephone surveys were used to guide decision-making, and WhatsApp groups were used to obtain quick feedback on the design. Indicators were also developed that allowed the student database to be disaggregated by gender (Towne and Nabbuye, 2020).

Recommendations

It is imperative not to neglect ICT-mediated distance learning, especially in rural areas or poverty-stricken urban areas, where girls, adolescent females and women are more vulnerable. Although EIs must promote teacher training in ICT skills and, ideally, STEM disciplines, they should also have internal metrics that will allow EIs to identify the way in which boys and girls are experiencing distance learning and, depending on the situation, take action that will prevent a potential increase in gender divides. This, among others, is one of the most important preliminary steps and specific actions for EIs to take a more structured approach to arousing the interest of girls and female adolescents in STEM disciplines.

18 Escuela Nueva is a pedagogical model recognized for its potential to transform the quality of rural education on a large scale. The model turns the standard teacher-centred education model into a participatory and collaborative student-centred model. The four pillars making up the model are pedagogy and curriculum, teacher training, community participation and management.

3.2. Gaps to be closed between female and male teachers

In general, it was already clear that teachers played a key role that could influence gender gaps in STEM disciplines, since their attitude in class could reinforce the idea that men were better than women at science and mathematics. This was due to the reproduction of gender stereotypes and social norms in schools, where teachers may unconsciously promote gender inequality through their own stereotypes (Martínez-Restrepo et al., 2018; Baron Cohen, 2003).

Regarding the teaching staff's perception of the mainstreaming of digital devices into the classroom, before COVID-19, in 2018, less than 20% of school leaders in Latin American countries who participated in the PISA - OECD surveys[19] perceived their teachers as having the necessary skills to mainstream digital devices into their teaching practice. Similarly, less than 20% of school leaders strongly agreed with the assumption that teachers had enough time to adapt their content by using digital devices. This situation was more noticeable in public than in private EIs, and in rural than in urban EIs (Barria, 2020; Duque Vergara, 2020).

As regards pre-COVID data, they reveal some gender gaps in the teaching community. For instance, in Colombia, among educators who had already integrated ICTs into their teaching strategies, the percentage of those who used digital resources created autonomously for use in their classes was 13.3% among male teachers, and 10.8% among female teachers, which suggests gender differences associated with the didactic and active use of ICTs (*Observatorio Colombiano de Innovación Educativa con uso de TIC*, 2016). These gaps could be greater in the case of teachers in rural areas and, particularly, among women teachers with limited access to digital and technological tools. **In Latin America, only 37% of the**

19 The Learning Poverty Indicator, developed by UNESCO and the World Bank (2019), comprises two components: the learning component, which refers to the proportion of 10-year-old children who are capable of reading proficiently, and the participation component, which refers to the out-of-school rate for children or primary school age.


Source: Flickr

rural population had internet connection, compared to 71% of the urban population (Ziegler, 2021).

Due to the disruptive changes that introduced a new education scenario after the outbreak of COVID-19, some gaps among female teachers may have decreased, while others may have increased. Reliance on ICTs as mediators for distance education may have led to greater confidence for educational use among female teachers, bridging the gap with their male counterparts. This could have been the case of women with higher education levels living in urban contexts, without considering the effects of unpaid domestic work.

However, a study that analyzed the perception of the teaching community's digital aptitude for dealing with the Emergency Remote Teaching (ERT) that COVID-19 had made necessary in Spain found that although teachers in general have noticed greater skills in the use of ICTs for didactic communication, female teachers have a lower perception of digital skills for educational use and are more likely to be affected by a mixture of negative emotions and heavy workload during lockdown (Portillo, 2020). A study in Chile also revealed that women teachers, especially those with children at home, exhibit a high level of exhaustion, mainly as a result of the overload of caring for minors (Fundación Chile, 2020).

The possible scenarios that suggest potential increases or decreases in gender gaps with regard to the educational use of ICTs are ambiguous. In this regard, as long as there are no data painting a more informed picture of the differentiated experiences of male and female teachers for the implementation of ICT-mediated teaching and learning strategies during COVID-19, neither of the two scenarios will be conclusive. As of the closing date of this report, the World Bank – an institution with one of the most robust web portals with data revealing the differentiated impacts of COVID-19 between men and women for different topics in low- and middle-income countries – did not feature any official statistics or available resources that could allow its effects on digital education to be quantified nor any disaggregation for the teaching variable. However, the World Bank, in partnership with UNICEF and Johns Hopkins University, is about to launch a new web portal which is expected to report this type of information.

The following case studies provide some examples of how to quickly identify those challenges addressed by teachers during COVID-19 and how to provide tools to avoid the reproduction of gender stereotypes in the classroom, especially those associated with STEM disciplines. Although the School Education Gateway Platform was not designed from a gender perspective, tools of this type in Latin America could contribute to drawing attention to the differences between female and male teachers regarding their ICT-mediated teaching experience. Both case studies lack an assessment of findings.

Table 4. Case Studies: Teachers

Case Studies		
Region	**Name**	Initiative
Europe 	**School Education Gateway**	This online school education platform provides a practical, quick insight into the teaching community's reactions and perceptions in the face of immediate challenges. For instance, a survey conducted in April 2020 among 5000 people from over 40 countries – 86% of whom stated they were school teachers or leaders – found that after COVID-19, most teachers (66.9%) had to teach online for the first time. They also reported trouble accessing devices, software, uninterrupted internet connection, etc. (School Education Gateway, 2020) To date, the platform has been used to see the problems of teaching staff, but it is not known if these survey findings have influenced the design of interventions aimed at closing the divides reported during the pandemic.
Global 	**Gender4STEM**	The Gender4STEM platform has developed an assistant through AI that provides teachers with customized, concrete tools to implement practices with a gender perspective in their lessons. The platform makes the following recommendations for secondary school teachers: - Recognizing gender biases of teaching staff through a self-assessment tool - Devising strategies for addressing gaps in the classroom - Addressing stereotypes in the students' minds - Using videos presenting women leaders in STEM - Implementing activities that will arouse girls' interest in STEM

Recommendations
It is important to address the problems facing the teaching staff in order to deliver quality distance education. One way of doing this is through surveys with specific questions that will help identify, for instance, whether female teachers have had more trouble with the educational use of ICTs, or whether those who are mothers have been affected by heavier unpaid domestic work. It is important to provide solutions for female teachers in particular to counter the potential effects of gender gaps in the community. In order to identify these situations, a gender perspective should be included not only in surveys of students but also of teachers disaggregated by gender. The teaching staff should be trained in the active use of ICTs in their teaching practice. The training programmes must include, among others, ICT basics and enhancing and developing knowledge by means of ICTs (UNESCO, 2008). This training should focus on mainstreaming ICTs interactively to make them attractive for students. In addition, the use of AI may reduce costs and have a more powerful impact throughout the region, as the Gender4STEM teaching assistant has. Furthermore, training of female teachers should be promoted by means of incentives such as quotas in STEM classes. Although female teachers may on average report less self-confidence in the educational use of ICTs, evidence shows that they are more significant in the teaching of girls, as they have a greater effect on their preferences, such as those related to career choices (Zukerfeld and Yansen, 2013:2014).

3.3 Gaps to be closed between male and female students

As mentioned above, in Latin America, unlike other regions such as South Asia, no differences were noticeable between the ICT access of girls and boys in EIs or in the home before COVID-19. In Latin America, the percentage of children whose homes have a computer with internet access for their homework is 60.1% for girls, and 62.4% for boys.

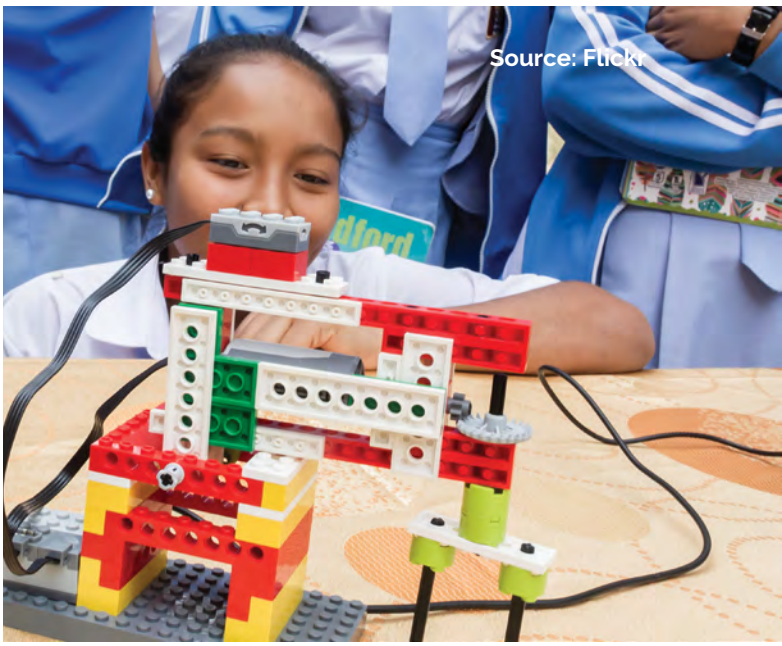
Although there were no differences between boys and girls in terms of access to devices, the evidence did show gender gaps with respect to ICT use among students. A pilot of instruments to understand possible biases in the use of ICTs in 5th and 9th grade teachers and students in Colombia found statistically significant differences in this regard. While girls reported using ICT more for the development of communication and social skills, which is reflected in more intensive use of social networks, boys reported using ICTs more often for gaming on digital platforms (Martínez-Restrepo et al., 2018).

Gender gaps in the use of ICTs stem from socialization processes. On the one hand, girls grow up practising empathy, while boys develop understanding and construction systems. It has been proved that before the age of five, people do not show any biases in their tastes or abilities. Rather, they develop during school life (Bian et al., 2017). The same study indicates that at the age of six, girls begin to doubt their intellectual abilities.

3.3.1 STEM divides and their implications

Over time, these biases affect the self-confidence of girls and adolescent females not only in honing their 21st century skills or competences[20] and ICT-mediated learning, but also in their decisions to pursue a career in STEM areas. As a result, the number of women working in these industries is lower. The labour market is swiftly moving towards digitalization and automation, which requires more and more specific digital, cognitive, and socio-emotional skills (UNICEF, 2020). The Global Gender Report 2021, published annually by the World Economic Forum, points out that if action is not taken now, the gender divide in STEM jobs will not be closed over the next few years but, rather, it will grow (WEF, 2021). To date, only 12.4% of female graduates decide to work in STEM disciplines, compared to 49.8% of male graduates in these areas (WEF, 2021). As shown in table 5, the highest percentages of women in the labour market are found in support roles that require less disruptive technological skills, while the lowest percentages are observed precisely in occupations that call for more disruptive technological skills.

STEM gaps between boys and girls begin in primary school, widen as they progress through


Source: Flickr

20 STEM and 21st Century skills are known as a set of skills that include: critical thinking, problem-solving, creative thinking, interpretation and analysis of information, emotional intelligence, cognitive flexibility, adaptation to change. These skills are necessary for personal and work development in the labour market of the 21st century (Martínez-Restrepo, et al., 2018).

Table 5. Representativeness of women by STEM career

0% - 25%	25% - 35%	35% - 45%	45% - 100%
Artificial intelligence specialist	Analytics Consultant	Analytics Specialist	Social Media Assistant
Big Data Developer	Business Intelligence Developer	Business Development Representative	Digital Marketing Manager
Data Engineer	Data Consultant	Marketing Director	Digital Product Manager
Javascript Developer	Data Scientist	Digital Specialist	E-commerce Specialist
Platform Engineer	Data Manager	Growth Manager	Product Analyst
Systems Management Engineer	Python Manager	Sales Representative	Content Analyst
Operations Development Engineer	Quality Engineer	Technological Analyst	Content Writer

Source: Global Gender Report 2021, World Economic Forum

secondary school -particularly at age 13- and persist among women during higher education. These are the findings of a study carried out in the United Kingdom which showed that the interest of girls and boys in STEM subjects is almost equal at 10 and 11 years old. However, at age 18, the difference in the interest of both groups in STEM increases to 14% (Kearney, 2016). The above may be a result of changes in the confidence and perceived efficacy of adolescent females as to their skills in science and mathematics, which start decreasing at the age of 13 (Heaverlo, 2011), higher levels of anxiety and, to a certain extent, the biases that teachers may unconsciously slip into their lessons. As regards the latter, it has been found that teachers tend to pass their gender stereotypes on to students when making decisions about instruction in the classroom. For instance, differentiating objectives or learning levels between girls and boys, especially when topics related to mathematics are concerned (Keller, 2001). There is also evidence of this phenomenon in teacher-student interaction (Flores, 2007).

Research suggests that consistent socialization rooted in gender stereotypes that put women at a disadvantage in STEM disciplines induces the development of adaptive preferences. This means that women's preferences reflect the internalization of external restrictions that limit their interest in STEM careers (Hill, et al., 2010; Duflo, 2012) but have nothing to do with their attitude towards these disciplines. In this regard, research shows that there are no statistically significant differences in the results of mathematics and science tests between boys and girls, but, as stated above, the interest and confidence of the latter in STEM areas starts decreasing early in the academic experience (Heaverlo, 2011).

A global survey by Aristovnik et al (2020) found that even at the university level, women continued to perceive less confidence in their computer skills, and this trend, in addition to the increased perception of a greater workload, prevented them from appreciating their progress in the new virtual learning environment resulting from COVID-19. (Aristovnik et al., 2020).

3.3.2 Other vulnerability factors increasing divides between male and female students

The vulnerability scenarios that girls and female adolescents from lower-income households in Latin America have been exposed to during the pandemic are not only associated with poor training in the use of ICTs for learning, but rather cover a number of situations that decrease their chances of academic success in a digital or non-digital environment. School dropout due to teenage pregnancy and domestic work stand out among these situations. Regarding the former, previous health crises such as the Ebola epidemic between 2014 and 2015 showed that school shutdowns contributed to an increase in teenage pregnancies and school dropout rates (Rissa-Gill and Finnegan, 2015; Peterman et al). This could also happen in Latin America if action is not taken to facilitate girls' and female adolescents' participation in and commitment to ICT-mediated distance learning. Regarding the latter situation, the evidence shows that, during the pandemic, girls and female adolescents have been overloaded with domestic work, caring for younger siblings and sick relatives (Save the Children, 2020), which disrupts their ICT-mediated distance learning environment.


Source: Flickr

The following case studies are examples of how some programmes by civil organizations and private companies, in partnership with the Ministries of Education, Technology, and educational institutions, can stimulate the preferences of girls and female adolescents in STEM disciplines through initiatives running concurrently with the curriculum. Although these experiences lack an assessment of results and are incipient in Latin America, they deserve to be considered by policymakers so that they can be analyzed and implemented on a larger scale.

Table 6. Case Studies: Students

Case Studies		
Country	**Name**	**Initiative**
Paraguay 	**Girls Code**	The programme adopted a paradigm shift from passive to active use of ICTs by seeking to get girls to go "from software consumers to software developers". Girls Code seeks to introduce girls to programming at an early age to: - help them develop abstract, computational, and scientific thinking - Encourage creativity - Prepare them for future employment - Strengthen their socio-emotional skills, such as confidence and self-esteem Other complementary activities undertaken as part of this programme: - After-school pilot plan for girls and teachers in partnership with public and private EIs - Weekend workshops and courses for girls to develop their own projects (Project Based Learning)
Global **Costa Rica**  **Peru** 	**DigiGirlz**	DigiGirlz es an initiative organized by Microsoft Education to engage girls in training for technological careers. The initiative involves two main programmes: DigiGirlz Day and High Tech Camp. DigiGirlz Day: - Provides female secondary school students with a better understanding of a career in technology through networking with company leaders. High Tech Camp: - Offers female adolescents a deeper insight into Microsoft and careers in technology. It includes an exhibition of the company's technological products and interaction with the company's top managers, who become role models in their career aspirations. Both programmes have been designed to remove stereotypes from high-tech industry and support career planning for girls participating in them. In Latin America, the programmes are operational in Costa Rica and Peru. (Digigirlz, nd)
Global 	**Digital Skills Badges**	EQUALS and the International Telecommunication Union (ITU) developed a digital program to train and certify female adolescents and young women (16-25 years old) in ICT skills with a gender-transformative approach. The certifications are expected to improve their prospects in the job market. The courses are free and designed for participants to complete them at their own pace, depending on their schedule availability. The program is being tested in five English-speaking countries with 5,000 adolescent girls and young women. In the coming years, it will be available in other countries and other languages.
United States 	**AspirelT**	The AspirelT K-12 education programme connects women in colleges and universities with kindergarten girls through 12th grade who are interested in computing. The programme aims to provide mentoring to girls and female adolescents, especially during their last years of school so that before they start higher education, they will choose STEM careers in their plans. An assessment of the programme showed that 75% of the girls who participated expressed an interest in taking computer lessons in the future. This suggests that mentoring relationships, especially between similarly-aged girls, can significantly influence their motivation to develop more advanced ICT skills (National Centre for Women and Information Technology, nd). 25

Recommendations

Spaces should be created for the use of computers or other ICT devices concurrently with traditional classes, with different thematic foci of interest to girls and female adolescents. Similarly, the EIs can consolidate partnerships with private companies and civil organizations that will encourage the participation of girls in programmes such as those mentioned above. The effects of such initiatives could be more far-reaching if girls were given the opportunity to find mentoring options as early as elementary school and prevent their interest in STEM from waning as they start secondary school.

Programmes for adolescent girls in secondary school should focus on strengthening the more disruptive technological skills, which are the ones that are driving emerging jobs in STEM areas. Such is the case of engineering, artificial intelligence and data, and cloud computing. This strengthening process can include live demonstrations of products and interaction with professionals in STEM disciplines, so that the girls can identify role models for a similar career path in those areas. For this purpose, it is essential that the Ministries or Secretariats of Education and Science and Technology partner with the private sector, universities and technological educational institutes to support female adolescents in their transition to higher education, show opportunities for professional development in these disciplines and, in this way, fight gender stereotypes in STEM careers.

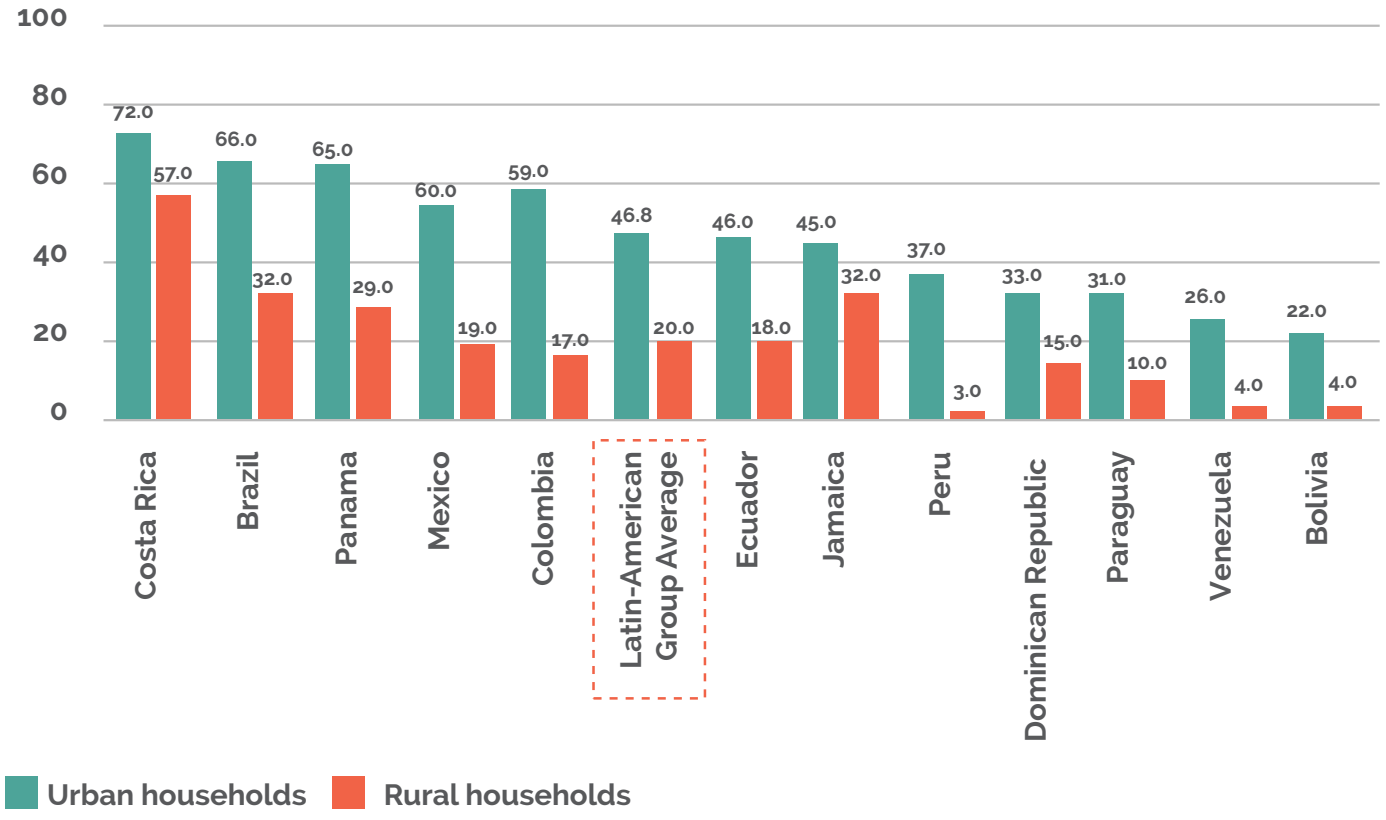
3.3.3 Students in rural areas: What are the gaps to be closed?

In most Latin American countries, the existing indicators regarding the use of ICTs make inequalities between girls and boys within countries and between them invisible (After Access, 2018). The literature on this matter is especially scarce for the region, and the analysis is much more complex when it comes to covering gender differences in all the dimensions that ICTs – access to and use of devices, internet access, digital material, among others – and STEM subjects involve. This is particularly important for the promotion of digital education among girls and female adolescents who live in rural areas or in the marginal neighbourhoods of Latin American cities. It is them in particular that are most likely to find themselves at the intersection of other factors of exclusion, such as immigration status, socioeconomic status or ethnicity, and, as a result, are more likely to experience greater inequality in access to ICTs compared to average girls and female adolescents in general. For instance, the internet access gap between rural and urban households in Latin America remains at 28 percentage points on average (Ziegler, 2021). As regards the effects of the COVID-19 crisis on academic performance in STEM subjects, the most disadvantaged students – particularly girls at the intersection of ethnic groups and immigration status – are likely to experience significant learning loss, especially in mathematics (Di Pietro et al, 2020).

Source: Flickr

21 The concept of hidden curriculum refers to the unwritten, unofficial, and often unintended lessons, values, and perspectives that students learn at school (Seminar, 2020).

Graph 2- Percentage of households with internet access by domain (2019)



Source: ITU and ICTs 2019

3.4 Gaps to be closed in the representations of educational content and digital resources

Before COVID-19, some experts warned about the existence of the so-called hidden curriculum[21] (Pacheco-Salazar & López-Yáñez, 2019) and the consistent reproduction of gender stereotypes in textbooks (Women's Institute for Equal Opportunities, 2015), such as regarding technological competence as a male attribute. This outlook, which was naturalized for many years with no analysis of its potential effects, can be problematic in educational settings, since it is believed that representations and models are not only a reflection of the world, but they also create it and maintain it (UNESCO, 2017).

Technologies are ideal resources for the communication, representation and expression of content, as well as the basis for the shared construction of knowledge (Prendes-Espinoza et al., 2020). Therefore, the digitalization of educational content during the pandemic is an opportunity to turn around those practices that had systematically ignored the significance of the representation of girls, female adolescents, and women in content for learning, particularly in STEM disciplines.

This is a historic moment for EIs to promote a transformation of content that will take account of the needs and interests of girls and female adolescents. For this transformation to succeed, it is essential that teachers, particularly women, be involved in rethinking the use of images and digital resources from a gender perspective. In this context, it is becoming increasingly important for women to participate in the development and management of digital content to ensure that it addresses the needs of girls and female adolescents and is free of gender stereotypes (Broadband Commission for Sustainable Development, 2017). It is also necessary to include the use of interactive programmes in education with content that will appeal to girls and female adolescents (Zukerfeld, 2013).

However, for teachers - especially women - to be able to incorporate this outlook into

the process, it is essential that, from their initial training on (Bejarano et al., 2019), and during their lifelong training (Gallardo and Gallardo, 2019), they not only report high levels of self-efficacy regarding the educational use of ICTs, but also bear in mind the differentiated effects of socialization processes on the learning of girls and boys. In this way, teachers could contribute to eradicating stereotypes, especially those whose contents underestimate the aptitude of girls and female adolescents for the use of ICTs and their relationship with STEM subjects.

Although most Latin American countries have strengthened their web portals, digital libraries and websites in response to COVID-19 for the administration of virtual educational content, there is no indication that this strengthening in the digitalization of academic resources was done from a gender perspective. Therefore, the new education scenario of COVID-19 provides an opportunity for change that will challenge the biases of those participating in the design and development of these resources and will promote greater inclusion and representation of girls, female adolescents and women in the use of ICTs and their experience with STEM subjects.

The case studies below show examples of how to include content with a gender perspective in educational material, especially material that focuses on STEM disciplines. The assessment of Fundación Paraguaya's Poverty Stoplight is a clear example of how to transform visual content to prevent the reproduction of gender stereotypes. In addition, the book *Brócoli Azul y los Nanobots* is an example of how to bring girls closer to STEM disciplines in a didactic and entertaining way and put an end to gender stereotypes that limit their development in these areas. As yet, the first example has not undertaken an assessment of results, while in the case of the second example, an assessment of the pilot was carried out.

Table 7. Case studies: Representations in digital content and resources

Case Studies		
Country	**Name**	**Initiative**
Paraguay 	**Fundación Paraguaya**	Fundación Paraguaya's Poverty Stoplight, whereby families use a Digital Platform to complete a self-diagnosis, includes indicators and pictures that allow them to represent their situation by choosing the colours green, yellow, or red. Green suggests that there is no poverty in the family, yellow indicates poverty, and red indicates abject poverty. An analysis carried out by CoreWoman of the pictures that make up the stoplight identified strong gender biases related to traditionally male and female roles. CoreWoman recommended including a gender perspective in the development of visual content to avoid the repetition of gender stereotypes, including projecting equitable gender representations in digital educational content, particularly those related to STEM areas, together with greater representation of men in disciplines or activities in which girls and women traditionally have greater representation (Fundación Paraguaya, nd)
Panamá 	**Brócoli Azul y los Nanobots: Carreras en STEM**	This book illustrates possible careers of the future – all of them STEM-related – and depicts girls and adolescent females as pioneers in them. This project, which began with the aforementioned book, is designed to promote and draw attention to girls in STEM disciplines to eradicate stereotypes that have historically underestimated women in those areas, while using stories to try to improve self-confidence among girls and adolescent females. The pilot of this initiative is underway, and it has been assessed in 10 public and private EIs in the country (Organization of Ibero-American States, nd).

Recommendations

The illustrations of educational content both in printed and digital material should be revised, especially when it is related to the use of ICTs by girls and female adolescents, since misrepresentations can perpetuate gender stereotypes and lay the foundations for preferences that will eventually create barriers to the inclusion of girls and adolescent females in the active use of ICTs and in STEM fields. Faced with this, it is important to stress that the representations of these contents should ideally maintain an identity with the culture. For instance, Sesame Street has partnered with local producers in India and Afghanistan to create new characters of girl promoters of change who serve as instruments to create role models and make girls in these countries identify with them. This is the case of the Chamki puppets on the show Galli Galli Sim Sim in India, and Zari, an Afghan girl in the Afghanistan version of Sesame Street, through whom they seek to create content for children which does not reproduce gender stereotypes (Mele, 2016). The representation of women interested in STEM disciplines can promote the use of ICTs in leisure time and awaken preferences for STEM disciplines. Stories and cartoons are usually found that represent digital heroines interested in STEM disciplines in English-language comics (Schoenberg, 2018), but hardly any in Spanish.

In view of the above, policies on introducing ICTs could include the use of devices in leisure time. This approach must include content without gender stereotypes that will appeal to girls and adolescent females (Zukerfeld, 2013), for instance, through publishing projects or books for girls that will address STEM issues and also create role models. An example of how this initiative could be implemented is the publishing project *Cuentos para Niñas Rebeldes*, a translation of the book Good Night Stories for Rebel Girls. With these publications as a benchmark, one could contemplate the adaptation of stories about Latin American women who are making history in STEM disciplines and whose experiences could help to draw attention to their achievements and inspire girls and adolescent females in the region.

3.5 Divides to be closed in families or households

In the context of COVID-19, access to devices and internet connection in educational institutions, which was one of the central themes in the discussions on digital education before the pandemic, has focused its attention on households.

The literature shows that when digital resources are in short supply in the home, access to them is more likely to be prioritized by the males as a long-term investment for the family, since it is assumed that, due to their gender, they have better prospects and will be able to generate a higher income (World Bank, 2020). However, this behaviour was not noticeable – or at least not widely documented – in Latin America before COVID-19. The percentage of children in the region whose homes had any kind of digital device on which they could do their assignments was 80% among girls, and 82% among boys, with Uruguay reporting the greatest availability of devices in households, with 94% among girls and boys, followed by Chile with 93% among girls, and 94% among boys (OECD-PISA, 2018).

However, in both Latin America and most regions of the world, family attitudes – established by gender role perceptions – can reinforce or break down stereotypes about intelligence, aptitude and fields of study that are regarded as "suitable" for women. These behaviours can become counterproductive for the development and professional future of girls and female adolescents (Saewyc, 2017). This is the case, for instance, with families that tend to expect their sons rather than daughters to study for a STEM career (Hammond and Rubiano-Matulevich, 2020).

One great challenge which started before COVID-19 and affects the vulnerability of girls and female adolescents when it comes to keeping up their commitment to distance

learning mediated by digital technologies is the influence and support of adults, especially when the teacher's face-to-face support is limited. A study by Zhang and Livingstone (2019) concluded that the higher the schooling of the parents or carers, the greater the management of digital resources by the children, since they become more likely to use a wider range of them and, consequently, they gain more control over their ICT skills. This hypothesis is in line with findings in Bangladesh (World Bank, 2020) and Nigeria (Azubuike and Quadri, 2021), where a positive relationship was found between the education level of parents and the quality of their support for distance learning and education during the COVID-19 pandemic.

3.5.1 The role of mothers in ICT-mediated distance education

It is important to highlight the role of mothers as educators in the home, since they are more actively involved in educating their children than the fathers (World Bank, 2020). For example, in Argentina, in approximately 7 out of 10 families, it is the mothers that have supported their children with their homework during the pandemic. In lower-income households, the figure rises to almost 8 out of 10 families (UNICEF, 2020). In this context, the gaps in digital inclusion usually experienced by mothers with lower levels of schooling can affect their children's ICT-mediated distance education, which tends to deteriorate if, additionally, the mothers do not have enough time to support them in the new education scenario due to an overload of paid work and domestic and care work that they have had to cope with throughout the pandemic.

Global studies have shown that the mother's education also determines the possibility of intergenerational mobility (Corak, 2006; 2013). Children whose mothers have a low level of schooling tend to experience lower levels of cognitive functionality, socioemotional functionality, and academic achievement (McLoyd, 1998; King, Smith, & Glover, 2011).

Having said that, it should be noted that before COVID-19, only 56% of women in Latin America had completed secondary education (ISCED 3[22]). This is the context of the potential effects of mothers as educators in households with children learning in transmedia environments. In Latin America, 1 in 3 households are headed by women. 57% of them are single-parent households with lower socioeconomic levels – compared to two-parent households – where the mothers who are heads of the family not only have lower levels of schooling but also experience less digital inclusion (CAF, 2019), which could affect children's distance learning mediated by digital technologies.

Female-headed households tend to have more limited access to robust infrastructure for the active and educational use of ICTs, as is the case with internet access. As shown in Graph 3, although the gaps in some countries in the region have been turned around in favour of women, the gender gap in internet access remained at 12.3 pp for the year 2020. However, in some countries in the region such as Peru, Guatemala, and El Salvador, the gaps are as much as 29 pp, 22.2 pp, and 21.7 pp, respectively. The persistence of these gaps is a barrier to what is understood as a precondition for ICT-mediated education, and this affects single-parent households headed by women in particular.

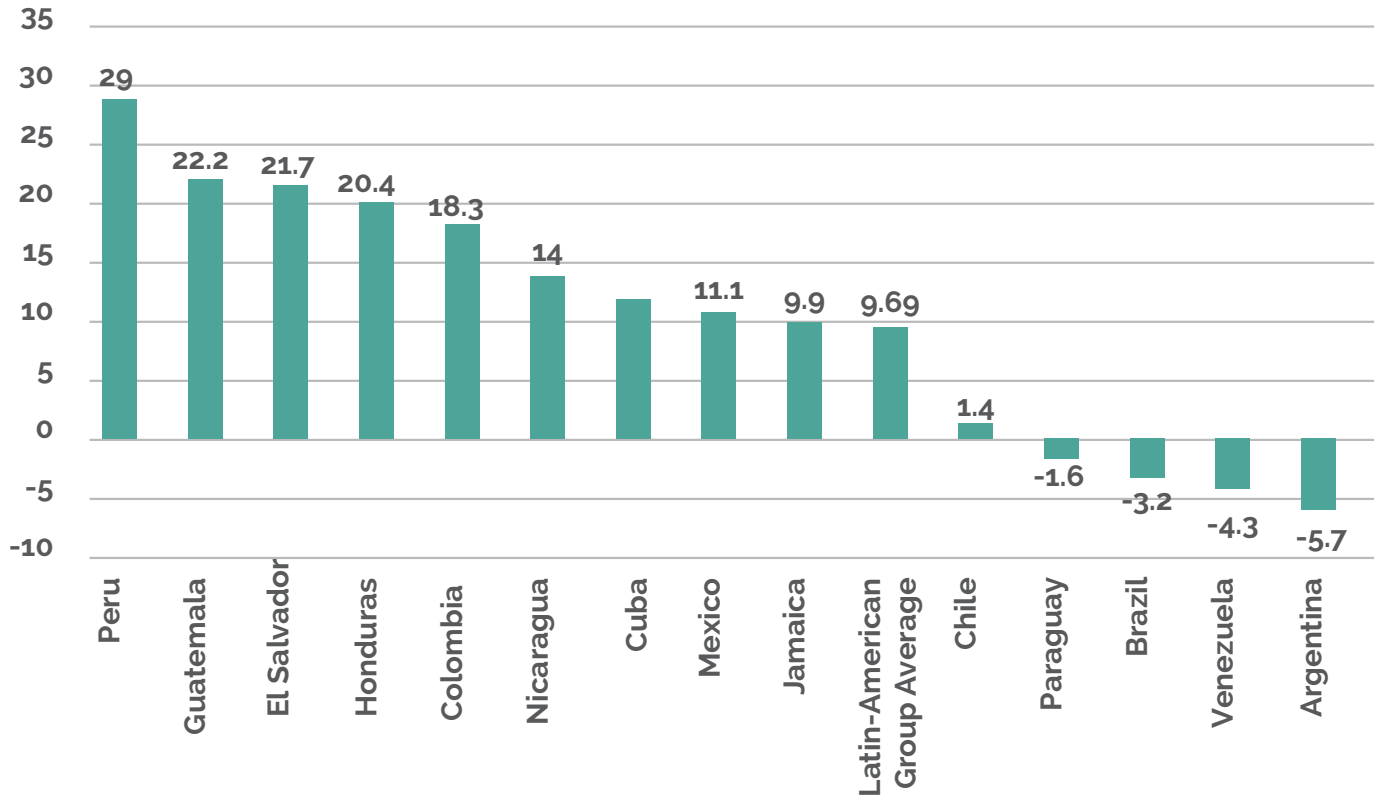
For households headed by the mother alone, the barrier to internet access may partially be due to the opportunity cost of using it. As shown in Graph 4, time use surveys in Latin America show that, on average, women spend 28 hours a week on unpaid domestic work, while men spend 12. Women are therefore more likely to spend longer hours on unpaid household chores than on strategically using and browsing the internet.

The example of the GSMA case study shows that basic training in digital literacy for the use of mobile devices can improve levels of self-confidence regarding ICTs. This approach can lay the foundations for educational use, especially

22 The International Standard Classification of Education is the classification system implemented by UNESCO to organize and compare figures on education systems in various parts of the world. Under this system, the ISCED 3 classification is equivalent to the final stage of secondary education.

for mothers, so that they will have more tools that will allow them to provide as much support as possible for ICT-mediated education from home. This case also presents the intervention of a private company interested in improving digital inclusion and access to ICT resources in populations with specific characteristics.

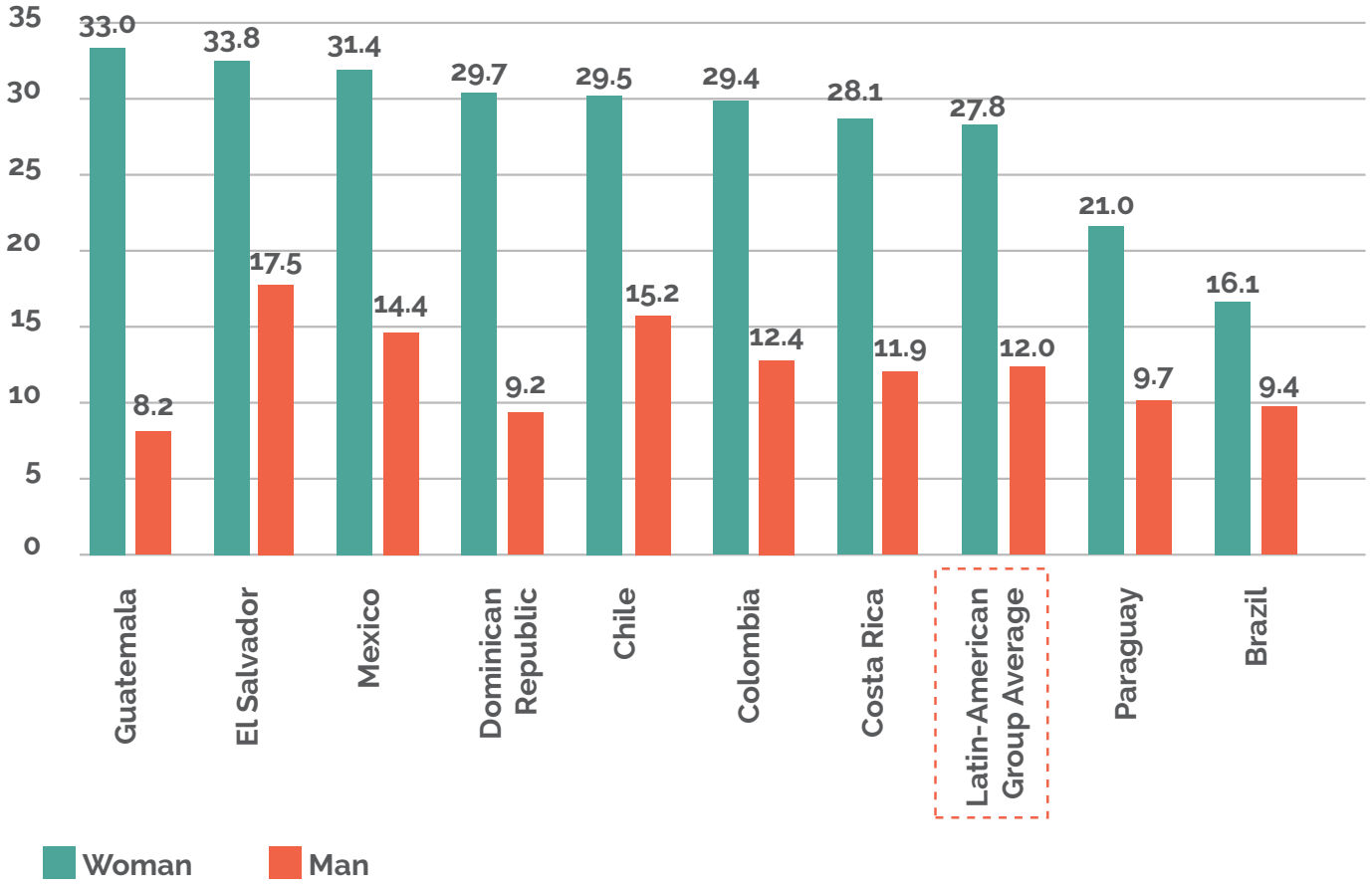
Graph 3 - National individual gender gap in internet access (pp)



Source: Inclusive Internet Index, 2020

Source: Flickr

Graph 4- Time used in unpaid household chores (weekly hours)



Source: CEPALSTAT

Table 8. Case study: Families or households

Case studies		
Country	**Name**	**Initiative**
Global **Guatemala** 	**Mobile Internet Skills Training Toolkit (MISTT)**	The GSMA toolkit addresses the low levels of digital literacy with a visual, dynamic and easy-to-use curriculum to demonstrate the functionality and value of the internet and mobile devices. For instance, in Guatemala, it was used to increase the number of internet users through the Conectadas project. The programme focuses on entrepreneurship, education and personal development, and is designed for women between the ages of 15 and 40 interested in improving their ICT skills and the usability of mobile devices. The assessment of the project found improvements in the levels of self-confidence regarding the use of ICTs among women (GSMA, nd)

Recommendations

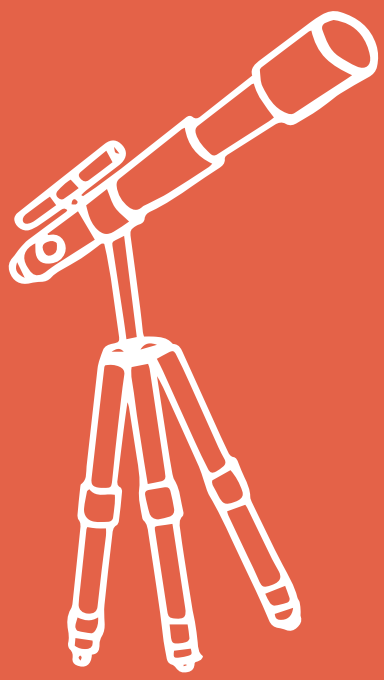
The evidence and the case study show that parents, especially mothers, must have a basic level of digital literacy to provide adequate support and the monitoring required by their children in the new education scenario, in which ICTs are essential. This would be possible through training such as that provided by GSMA with MISTT, which also promotes the purchase of mobile devices at reasonable prices so that women can use them more intensively (GSMA, 2020).

These kinds of initiatives should highlight the positive effects of ICT skills and their strategic uses in personal achievements, such as employability, or achievements for household members, such as the education of girls and adolescent females. These kinds of schemes should also be implemented with a greater focus on rural settings (Ziegler, 2021). This could be complemented with interactive training aimed at parents which will invite them to question the social norms that affect girls during their upbringing, especially those related to the perception of their abilities and preferences, and how they might affect their future.

Part IV

4

TOOLKIT FOR MAINSTREAMING THE GENDER PERSPECTIVE INTO ICT-MEDIATED DISTANCE EDUCATION INTERVENTIONS



"During COVID times, ICTs are mediators not only of learning but of all social interactions. It is important to understand all the spectra of knowledge."

María Florencia Ripani, Director, Ceibal Foundation

In conclusion, it is safe to say that, for one thing, access to ICT resources and their educational use were already limited in the region, with the exception of some specialized programmes such as *"Ceibal en Casa"* in Uruguay, *"Aprendo en Línea"* in Chile, and *Plan Digital TESO* in Colombia, among others. Furthermore, before the health and economic crisis caused by COVID-19, significant gender gaps were already noticeable in digital inclusion and ICT-mediated use and learning among both teachers and students. The Adaptability Indices for ICT-Mediated Distance Learning developed in this report show that before the COVID-19 outbreak, overall access to ICTs in the Home was better in the region in terms of educational use as a result of a process of ICT democratization in some regions of Latin America. When applying gender parity to the three indices, it was observed that the widespread use of ICTs showed greater gender equity with respect to access to ICTs in the home and the educational use of ICT.

In the new education scenario resulting from COVID-19, parents – and more specifically mothers – had to take on the role of teacher or tutor. This brought about new effects on the already precarious situations of some mothers, especially in their use of time, leading to higher levels of stress, anxiety, informality and work downtime (Martínez-Restrepo, et., al 2020, Ramírez et., al 2020). In this context, the COVID-19 crisis compounded the situation of women in the private sphere and in the labour market, posing new challenges for education systems in Latin America in the context of the pandemic.

According to María Florencia Ripani, Director of Uruguay's Ceibal Foundation, having resilient and flexible education systems is key to responding to a world where more and more flexibility in learning is needed. This was a trend that was on the rise before COVID-19 and sped up after the lockdowns and school closures in March 2020. It is not yet clear how much longer schools will continue teaching remotely or using alternating systems. Schools, especially in the higher years, may need to think about a "new normal" in which much of the learning occurs through ICTs and, in some cases, remotely.

Ripani believes that the flexibility and resilience of education systems depend on their ability to mainstream distance learning among the most vulnerable populations. This includes girls, low-socioeconomic status households, people with disabilities and their intersectionality, and those living in the most rural areas.

In keeping with the above, education systems must focus on students if they want to be resilient, according to Vicky Colbert, Director and Founder of *Fundación Escuela Nueva* – a pedagogical model that has revolutionized rural education in Colombia. In this regard, the mainstreaming of ICT resources must be a means for the construction of knowledge between students and teaching staff. Although Escuela Nueva had already created its virtual campus *"Renueva"* just before the pandemic, the organization too had to adapt creatively to address the needs of teachers in rural areas. From this perspective, *"Renueva"* became a community of practice for teachers where they can share innovations, difficulties and learning. They also developed a pedagogical model so that the children could continue their learning at home. To do this, Colbert added, they have made sure they provide specific guidance to parents, especially mothers, who, according to the dynamics observed in their experience in rural areas, are the ones who usually monitor their children's education. At the same time, the conditions of the pandemic led the organization to prioritize educational content that would ensure the learning of the basics depending on each student's school year. Colbert states that the priority of education systems during and after COVID-19 must be the students and their learning process and make interventions with this perspective in mind.

Source: Flickr

After an exhaustive review of the literature and statistics on the role of ICTs in education[23], no comparable data sources were identified in the region at the EI, teacher or student level that would help to understand how these stakeholders have been affected by the recent COVID-19 crisis. Meanwhile, evidence from household surveys at the national level has indeed shown the effects on women's labour market and use of time (Martínez-Restrepo, et al, 2020), but with no comparison of the regional effects so far.

The review of best practices before and after COVID-19 shows that few initiatives have taken into account a gender perspective, and/or do not report the results of their interventions in a disaggregated manner. It must be pointed out that a programme or intervention does not have to include a gender perspective to produce positive effects on women's lives (Evans and Yuan, 2019). However, it must necessarily include the variables and breakdowns that will make it possible to measure the effects differentiated by gender.

In countries such as Sierra Leone and Tanzania, where the risk of adolescent girls dropping out of school is expected to increase along with the crisis, actions with a gender perspective have been taken, such as the provision of cash transfers. At the same time, specific programmes have been defined to keep girls and female adolescents enrolled. Despite these initiatives, the differential impact of ICT-mediated education on girls and female adolescents has not been considered in the measurements (UNESCO, 2020). In order to provide specific actionable recommendations, this section of the report proposes a toolkit that includes policy recommendations according to the kinds of gender perspective, and ends with a roadmap that will allow policymakers in Latin America to design and assess interventions that will help close divides in the access to and use of ICTs among girls and female adolescents.

4.1 A toolkit for mainstreaming the gender perspective into ICT-mediated distance education interventions

Considering the pre-COVID 19 gaps, which have been extensively described in this report, it is essential that the measurements - including those conducted independently by the EIs – and distance education initiatives guided by the Ministries and Secretariats of Education mainstream the gender perspective. It is also important to bear in mind that implementing programmes focused on girls, adolescent females and women only is no guarantee that sustainable transformations will occur over time that will promote gender equality and the empowerment of women. In this context, CoreWoman proposes using the following table to identify the kind of gender perspective that policy makers can mainstream

23 Some of the main sources include: UNESCO, OECD-PISA, CETIC.br or IICA-IDB.

Table 9. Kind of gender approach

Kind of approach	Definition
Neutral	Takes no account of the differences between men and women, boys, girls or adolescents in the design or implementation of programmes. Although the term "neutral" may imply a sense of equity, "neutral" interventions are hardly ever equitable, since even if it is not the intention or aim, some groups tend to benefit more than others, which is why this approach is not recommended. However, it is the most frequent approach in the design and implementation of ICT-mediated education programmes, among others.
Sensitive	This approach is based on the recognition of the specific or differential needs and barriers experienced by teachers, children or adolescents in order to contribute to actual, effective equality; in this case, in terms of ICT-mediated access, use and learning. This recognition also applies to household members and/or carers, so that their needs and barriers are recognized and addressed in order to enhance distance education for children and adolescents.
Transformative	This approach goes beyond the recognition of individual differences between men and women, as it aims to transform the power dynamics and structures that reinforce gender inequalities. A transformative approach goes beyond identifying the "symptoms" of gender inequality and addresses specific actions for challenging the social norms, attitudes, behaviours and social systems that perpetuate inequality.

into ICT-mediated distance education interventions, which can be defined on the basis of 1) the objectives of the intervention, and 2) the actual capacities of the implementing entities (Secretariats, Ministries, Foundations, Regional or International Organizations).

The gender-transformative approach aims to move towards "transforming the power dynamics and structures that serve to reinforce gendered inequalities" (Hillenbrand et al, 2015 p.5). it also addresses the attitudes, behaviours and social norms that affect girls, adolescent females and women. It is important to bear in mind that programmes that seek to improve the well-being of girls, female adolescents and young people are not enough per se to achieve this purpose, since it is not simply about reducing entry barriers or closing gaps. Instead, transformative change involves considering different domains of empowerment: agency, power relations and structures (Hillenbrand et al, 2015), as well as access to and control over strategic resources. An approach based on this perspective is what makes it possible to deal with the roots of gender problems.

Programmes that adopt the transformative approach must take account of the fact that no two contexts are the same, and what is transformative in one setting may not be in another. That is why it is important to bear in mind the characteristics of the social norms of countries and regions, their ethnic groups, and their rural communities, among others.

In its latest report on the state of education during the pandemic, which lays stress on the findings of the Special Survey[24], the OECD came up with a number of recommendations on providing quality distance and ICT-mediated education that would include vulnerable populations. However, the report fails to take a close enough look at the problems and solutions presented from a gender-sensitive or gender-transformative approach. Table 9 includes some of the OECD recommendations and addresses them from the gender approaches put forward in Table 9.

Loly Gaitán, Project Officer of the International Telecommunications Union (ITU) and EQUALS Global Partnerships, states that in order to ensure the adoption of a gender-transformative approach and its sustainability, government interventions should not be implemented individually by some organizations leveraging these issues. In other words, the guidelines and public policies of Ministries and Secretariats, especially Education and ICT Ministries

24 The Special Survey reflects the state of education one year into the Covid-19 Pandemic. It was developed in conjunction with the OECD, UNESCO, UNICEF and the World Bank.

Table 10. Policy recommendations addressed from a gender-sensitive or gender-transformative approach

Recommended policies and actions	Approach	Initiatives with a gender perspective that address the main gaps that need to be closed
- Partnerships with telecommunications companies to improve Internet access - Subsidies for EIs to access better connectivity and ICT resources	Sensitive	Access to ICTs should not be limited to access to the internet, computers or tablets. It must also incorporate devices and applications that meet the differentiated needs of urban and rural households, and from different socioeconomic backgrounds. The use of resources such as TOMi – a device that facilitates the educational use of ICTs by teachers and even by students with no internet access, while contemplating the use of interactive games for learning – could be taken into account by the makers of digital education policy. In addition to the above, access to ICTs must incorporate measurement instruments that will provide a deeper insight into the gender-related differences in the use of digital resources for the purpose of understanding from the outset the situations that could be interfering with the strategic use of ICTs among girls and female adolescents, and encouraging and maintaining their interest so that they will incorporate these skills into their life projects or choose STEM careers. Connect a School, Connect a Community, Nicaragua A pilot implemented by the International Telecommunications Union (ITU), the Nicaraguan Institute of Telecommunications and Postal Services (TELCOR) and INTEL to connect rural schools. The programme involves: - Delivery of computers to EIs and free internet access through a partnership with Claro-Enitel - Review of the country's policies and regulations in order to remove barriers to access to ICT resources by, among others, lowering taxes, setting better rates for EIs for internet access, establishing partnerships with internet service providers to bring broadband to rural areas free of charge for a certain time. The programme focuses on women and on providing them with the necessary information to ensure their connectivity.
- ICT training and support in monitoring education for families from low socioeconomic backgrounds		In addition to taking action to ensure access to devices and other digital resources, it is necessary to take into account the key role of mothers, in view of the fact that 1 out of 3 households in Latin America is headed by a woman. 57% of these female-led households are single-parent households whose socioeconomic status is lower than that of two-parent households. The mothers who are heads of the family not only have lower levels of schooling, but also experience less digital inclusion (CAF, 2019). In this context, it is essential to design basic ICT training programmes that will also take into account the increase in unpaid domestic work. Ideário Hub, Mozambique Three times a year, Ideário offers free courses in digital literacy for urban and rural women from low socioeconomic backgrounds. This training takes into account the domestic responsibilities of women and their use of time. For instance, before the pandemic, they were allowed to take responsibility for minors and were provided with a care support network when they had to take time to pick up their children at school.
- Project-based actions aimed at addressing gender gaps in ICT-mediated learning among students		Actions aimed at addressing learning gaps among students should not only focus on fundamental competences or exclusively on students in transition between primary and secondary education or between secondary and higher education. There should actually be a focus on development and closing gaps in digital and 21st century skills throughout the education cycle, as well as a gender perspective applied to them at all levels of education. Additionally, the creation of programmes introducing ICTs to primary and secondary students, which should include different levels of ICT proficiency, should create content that will appeal to girls and provide them with a safe environment to develop and practise their skills. Block By Block. Hanoi, Vietnam An example of the importance of project-based learning, this initiative gives girls and female adolescents from schools in Hanoi the opportunity to develop solutions to urban problems in their city through the virtual game Minecraft, which allows them to imagine a safer and more functional urban environment for the needs of girls, female adolescents and women. The assessment of the programme showed higher levels of self-confidence in the use of ICTs among the female students who participated in the programme and evidence that it provided urban solutions to the most sensitive problems in their city.

Recommended policies and actions	Approach	Initiatives with a gender perspective that address the main gaps that need to be closed
- Development of content with female role models, especially in STEM areas	Transformative	Access to role models is necessary for changing representations based on gender stereotypes. The development of content that promotes female role models in STEM can be the result of partnerships. For instance, there is a range of content on women in STEM that can be translated from English into Spanish, while promoting publishing projects of this kind in Latin America and strengthening mentoring initiatives among girls and female students on STEM courses. Million Women Mentors, United States Set to achieve global growth and with a focus on highlighting and promoting the access of adolescents to STEM courses, this organization seeks to draw attention to STEM organizations led by women that could become role models for female adolescents and younger women. In the United States, the programme draws attention to the status of women in STEM disciplines in the more than 40 states where it operates.
- Actions aimed at addressing learning gaps between students by upgrading socio-emotional skills		The different levels of development of social-emotional skills are also affected by learning gaps. In the context of the COVID-19 crisis, it is important that girls and adolescents gain enough autonomy for self-directed learning and upgrading their 21st century skills, which are essential for the labour market and, in particular, for the jobs of the future. At the same time, however, girls and female adolescents also need to work on their self-confidence and assertive communication for professional life. In this regard, digital skills training programmes must train soft skills so that women will not only upgrade their 21st century skills but will also develop the disruptive technological skills that will allow them to attain greater leadership in their fields of responsibility, in addition to their technical skills. AHK Argentina, Desafio 4.0, funded by EQUALS Digital Skills Fund The programme focuses on supporting digital, analytical and leadership skills among adolescents, especially women, so that they can build a life project around the digital economy. The programme offers tools for the development of 21st century skills and is based on Project-Based Learning so that the participants can provide innovative solutions that solve real-world problems.
- Training the teaching staff for distance and digital education		As regards ICT and 21st century skills training programmes for teachers, they should include information on the identification of individual biases among teachers and their potential impacts on gender gaps in ICT-mediated learning and STEM disciplines. Gender4Stem, Europe The Platform features a teaching assistant that provides teachers with customized specific tools for using the gender perspective in their classes, so that gender biases will not influence the preferences and self-confidence of girls and female adolescents.

and Secretariats, are the ones that would have the greatest impact on ICT-mediated education for girls and on the development of the skills they need for joining the labour context of the jobs of the future. The interventions, whether they are national, regional, or international, should therefore include not only the stakeholders of the education systems of the region but also allies in different contexts, such as grassroots civil organizations, foundations, and private companies. The same recommendation is made by the OECD (2021) in its report "The State of Education: One Year into the COVID-19 Pandemic", which emphasizes the significance of creating environments for the exchange of knowledge and best practices, which can be led by governments.

Gaitán also suggests that all interventions in ICT-mediated education should be measured, although this is not common practice among the authorities. In this regard, it should be noted that it is not enough to integrate a men-women disaggregated analysis. It is crucial that the relevant Ministries and Secretariats gather information through questions that will make it possible to measure the gaps between male and female teachers in terms of inclusion

and digital skills, the potential gaps in ICT strategies for distance education use, as well as the gaps in the use of time between male and female teachers, and between fathers and mothers. In the case of the student body, the measurements should also include the differences in access to and use of devices in the home in order to understand ICT interactions between the different members of the same nuclear family (for instance, device allocations between brothers and sisters). Only by understanding the size of these gaps and monitoring their evolution over time in quantitative terms will it be possible to understand how COVID-19 and school closures have contributed to the potential decrease or increase in gender gaps among teachers and students.

Finally, this report provides a roadmap that helps conceptualize a Theory of Change for the design and assessment of interventions at the analysis levels that have been set forth in this document: Educational Institutions, Teachers, Students, and Households. This instrument is based on the gaps already explained in Part III for each of these levels, in such a way that they can be quantified and addressed from a gender perspective.

Source: Flickr

Table 11. Roadmap for the design and assessment of educational interventions on ICT access and use that will articulate the gender perspective among EIs, teachers, students, and households

Defining the problem or gaps	Considering gender-related barriers	Proposing interventions and kind of approach	Including measurements with a gender perspective: Some guiding questions
EDUCATIONAL INSTITUTIONS Gaps between EIs in rural and urban areas and between male and female teachers.	Less self-efficacy and schedule availability among female teachers for activities that will encourage active use of ICTs.	Collecting data on ICT access and use among teachers and students. Defining indicators that will help disaggregate data by gender. Using the data to guide decision-making and the design of educational interventions considering the needs of girls, female adolescents and women.	Do EIs identify potential gender gaps in their teaching staff as regards the mainstreaming of ICTs into educational use? Are there tools in EIs for observing the following differences between boys and girls? - Active/passive use of ICTs - Changes in the use of 21 century skills - Effects of social norms on distance learning
TEACHERS Gaps in digital inclusion and digital skills between male and female teachers. Educational use of ICTs is more passive among female teachers. Less schedule availability among female teachers compared to their male colleagues.	Limited access to the internet and ICT devices, especially in rural areas Overload as a result of unpaid domestic work and greater use of time on care-related tasks that tend to affect female teachers more Mental health problems during the pandemic are commoner among female teachers than among their male colleagues.	Upgrading digital skills and ICT-mediated teaching practices among teachers, identifying the areas in which women require greater support. Providing: - Instruments to identify and remove gender stereotypes among teachers. - Training in removing gender bias among students. Designing activities and practices that will promote active use of ICTs with no stereotypes. Making tools available for the mental health of the teaching staff. Providing alternatives that will facilitate care work.	What technological and/or digital resources do teachers have in their homes? How long do they use them per week? How self-confident are male and female teachers in the use of ICTs? What digital skills do female and male teachers have? Which ones should they upgrade? How is the use of time distributed at home among male and female teachers?

Defining the problem or gaps	Considering gender-related barriers	Proposing interventions and kind of approach	Including measurements with a gender perspective: Some guiding questions
STUDENTS Although no gender differences were observed before COVID-19 in access to digital resources at school or at home, the pandemic may have altered these dynamics. Differences between boys and girls in the use of ICTs for learning.	Limited access to ICT resources among students from public/private, rural/urban EIs. Unstable connection in certain areas. Poor ICT skills for learning. Little support from tutors and carers. Limited participation in learning-based projects.	Carrying out student surveys to identify the experiences of female and male students during the pandemic. Quantifying and analyzing the effects of social norms and stereotypes on distance and digital education. Prioritizing the representation of girls and female adolescents in the illustrations of digital content to remove gender stereotypes. Designing safe spaces in which girls and female adolescents will feel confident enough to develop and hone their ICT skills. Involving girls in the active and strategic use of ICTs, for instance, through learning-based projects.	What technological/digital resources are available to boys and girls and adolescents in their homes? Are they shared with other members of the household? How long on average do girls and boys use ICTs in distance education? How self-confident in the use of ICTs are boys and girls and adolescents? What digital skills do boys and girls and adolescents have? What kind of (non-academic) activities do boys and girls engage in at home to hone their ICT skills? How is the use of time at home distributed among male and female teachers?
HOUSEHOLDS The importance of parents in distance education has increased, but there are gaps in terms of their: - Levels of digital inclusion - Digital skills - Educational level and socioeconomic status - Quality of support - Time devoted On average, mothers have taken responsibility for supporting their children in ICT-mediated distance learning.	Limited digital inclusion (access to technological devices and the internet) among low-income families and those in rural areas. Shortage of time affects mothers more than fathers.	Integrating families into ICT-mediated educational processes and not overloading mothers. Devising campaigns to highlight the importance of the development of girls in all areas. Identifying differential needs in fathers and mothers to promote ICT-mediated learning at home (Questionnaires can be administered by EIs and shared with families through different channels)	How many ICT devices with and without internet access are available in the home? If there is more than one boy, girl or adolescent, who makes the most use of ICT devices in the home? What digital skills do the families have? Who is responsible for providing support for learning at home? What are the prevailing social norms in the household on ICT use between girls and boys?

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