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Aprende en Casa (Learning at Home)

An Opportunity for Hybrid/Virtual Public Education Policies

The Competitive Intelligence Unit

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ABSTRACT

Since the first officially reported COVID-19 case in Mexico, many emergency programs and strategies were launched and implemented to try to guarantee the continuity in the provision of education services.

At this point, it is important to evaluate considering lessons learned for the path forward. This is of crucial importance for a country like Mexico, where a large part of the population is in the school age. Here, the program implemented to continue the provision of public education services for elementary and higher-level public schools (preschool, primary, secondary, and higher middle education levels) was *Aprende en Casa* (Learning at Home).

Data from INEGI and CONEVAL suggest that *Aprende en Casa* program could reach a considerable number of students (elementary and high-level students) through different platforms (TV, radio, and online), nevertheless it registered an important rate of dropouts because of COVID-related reasons.

This paper begins with a review of the technology-based education policies in Mexico. It then explains the *Aprende en Casa* program implemented by the Ministry of Public Education (SEP by its acronym in Spanish).[1],[2]

Afterward, it develops a general evaluation of the program and the lessons learned, along with a review of international experiences and some recommendations by the United Nations Educational, Scientific and Cultural Organization (UNESCO). Finally, public policy recommendations are presented based on the conclusions of the document.

The starting point of this paper is that the *Aprende en Casa* program accounts for many advantages but also many areas of opportunity. We explore these areas and conclude with the following recommendations:

- Mexico has a long history of ICT-related policies for education. This experience should be considered for developing hybrid/virtual education policies based on *Aprende en Casa* Program.
- A comprehensive evaluation of the *Aprende en Casa* program is necessary mainly for two reasons:
    - to understand the effectiveness of the program; and
    - to recommend improvements for hybrid/virtual education policy.

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[1] SEP function is to create conditions that ensure access for all Mexicans to quality education, at the level and modality required and where it is demanded.

[2] Gobierno de México (2021). Secretaría de Educación Pública. Available at: https://bit.ly/2X1r89o

- A hybrid/virtual education policy can be implemented as
  - a complementary strategy where there are actual education services coverage, and as
  - an alternative to provide education services where there is no education services coverage through connectivity services and ICT devices access.
- Despite digital tools enabling two-way communication (unlike broadcast systems), the lack of access and coverage of internet services remain an important reason for students not accessing online content.
  - Authorities responsible for *Aprende en Casa* need to work and coordinate with public agencies developing and implementing connectivity programs, which are receiving more public funding according to the 2022 federal budget.
  - For *Aprende en Casa* to become a permanent program, it is important to promote the use of digital platforms. Relying on TV platforms is not the best response considering the limited impact of programs such as Telesecundaria.
- Despite the widespread access to smartphones and the intensive use of those devices for education purposes during the pandemic crises, *Aprende en Casa* did not manage to take full advantage of mobile tools.
  - A comprehensive policy to enable high-capacity smartphones/tablets for students is required, according to information from the ECOVID-ED, provided by INEGI.[3] Some policies could be:
    - Tax policy aimed at reducing consumers' cost can be established by considering smartphones/tablets exempt of VAT, together with eliminating IEPS to education-oriented services provided through telecommunications networks.[4]
    - Subsidies form government to promote adoption in targeted social groups. Subsidies could be channeled through the scholarship program known as Becas para el Bienestar Benito Juarez servicing students from basic, high school and higher education levels.[5]
    - Low-cost public loans to promote adoption where government plays as joint guarantor. There are institutions that can provide low-cost credits to acquire smartphones such as Banco del Bienestar or Fund for the Promotion and Guarantee for Workers' Consumption (Fondo

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[3] INEGI. *Encuesta para la Medición del Impacto COVID-19 en la Educación (ECOVID-ED) 2020*. (Mexico 2020). Available at: https://bit.ly/3loUY0Z

[4] The Competitive Intelligence Unit (The CIU). *Enhancing Smartphones Adoption in Mexico: Incentives for an Essential Activity.* 2021. Available at*: https://bit.ly/3yDvbs9*

[5] *Id.*

de Fomento y Garantía para el Consumo de los Trabajadores or FONACOT).[6]

- o Promote smartphones/tablets sharing schemes for students in public schools, for them to gain access to these devices to fulfill their education activities in a hybrid/virtual learning environment.
- o *Aprende en Casa* contents require to be adapted to mobile tools considering international experience since these technologies are widespread.
- o It is necessary to create mobile learning policies *as well as to develop* teachers and students' training through mobile platforms and technologies to effectively use ICT devices.
- o Design mobile learning resources such as video games, educational videos, platforms, etc.
- o Create and promote the use of public internet access points suitable for students located in municipal seats or localities with connectivity coverage, and internet access points equipped with devices jointly financed and managed by the local and federal governments.
- o Reverse data billing schemes financed by the Shared Network (Red Compartida) for educational purposes.

- Explore new education curricular or non-curricular contents related to coding for Aprende en Casa. Coding is a fundamental tool with high demand in today's job market.
- *Aprende en Casa* program requires more investment on developing ICT related skills among teachers:
  - o Reported government spending and federal budget information from 2020 to 2022 do not show an improvement on resources for developing skills among teachers.
  - o *Aprende en Casa* estimated cost in 2020 accounted for 1.3% of the total cost of federal education funds. For 2021, Colombian authorities planned a budget to strength learning at home activities that accounted for 0.4% of the entire education budget[7], while US investment in public education for students between kindergarten and 12 grade (k–12) accounted for 2% of the education funding.[8]

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[6] *Id.*

[7]Ministerio de Educación Nacional. Published in "El Tiempo" (2020): *Presupuesto más alto en la historia de la educación.* Available at: https://bit.ly/3eG83Cv

[8] Learning Policy Institute. *COVID-19 and State Education Budgets: The Story behind the numbers (2020). Available at: https://bit.ly/3SnYnup*

- *Aprende en Casa* contents can acquire regional perspective by working with other countries' education authorities:
  - A connectivity policy can benefit from States' perspective by helping federal government targeting priority connectivity municipalities or localities, complementing the Shared Network project, which offers access to the infrastructure and capacity of wholesale telecommunications services.
- Most of LatAm countries analyzed in this paper shared similar problems regarding the implementation of a hybrid/virtual education strategy.
  - LatAm countries can collaborate on stablishing permanent hybrid/virtual education strategies to share lessons learned and pave the way for policies aimed at tackling education coverage problems. These collaborations can be in the framework of different multilateral organizations such as Alianza del Pacífico or the OECD group.

1. INTRODUCTION

1.1. DIGITAL INCLUSION PROGRAMS FOR EDUCATION

This section explores the evolution and changes of technology-based education policy in Mexico from 1997 to 2016. Besides, it explores the stagnation on policy making between 2016 and 2019 and how efforts were focused on providing connectivity service to academic and education spots, as well as workshops in digital inclusion centers before COVID-19 pandemic.

These programs, mostly operated by SEP, are classified into four categories for the purposes of this document: equipped classrooms, a device per student, an integral model, and connectivity provision.

This classification is mostly based in the way students are provided with ICT-related equipment.

Equipped classroom (1997-2012)

During the second half of the 90´s, the Ministry of Education introduced "Scholar Network" ("*Red Escolar*" in Spanish), a program aimed at creating technology-based classrooms equipped with computers, fixed internet access, and educational content.

The program was conceived as a network of students, professors, parents, and other relevant members of the education community, all of them able to communicate through internet. Professors could track the modifications of academic programs while students received relevant content and information according with SEP´s programs[9]. Red Escolar targeted students from basic school programs and teacher-training.

> **Red Escolar results:**
>
> 3,000 schools participated between 2002 and 2004.
>
> 200,000 students participated

After this program, in 2004, a novel approach was adopted, through Enciclomedia program, the Ministry of Education adapted content from student's free textbooks and teachers' textbooks to a digital environment[10]. Students from elementary school (fifth and

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[9] Muñoz-Ízquierdo, Carlos; Rolando, Magaña Rodriguez. "Un acercamiento a la eficacia de los programas del gobierno federal orientados a mejorar la calidad de la educación básica",en *Revista Mexicana de Investigación Educativa,* (México, 2009), Avialable at: http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1405-66662008000400007

[10] Subsecretaría de Educación Básica y Normal, *Enciclomedia: Documento Base*, (México, 2004). Available at: http://www.oei.es/historico/quipu/mexico/documento_enciclomedia.pdf

sixth graders) and professors were beneficiaries of ICT-equipped classrooms and teachers' centers[11]. The program considered training processes for teachers to guarantee the correct appropriation of the Enciclomedia system.

The educational content was distributed in compact discs which was installed in computers' hard discs, requiring no connectivity.

Although the program seemed to be integrally designed because it considered students and teachers' perspective as well as the installation of ICT equipment, the program ended up focusing on the provision of equipment and not in providing follow-up to the training sessions and proper assessment.[12]

> **Enciclomedia results:**
>
> Between 2005 and 2009, 11 million students serviced
>
> 126 thousand ICT-equipped classrooms

The next generation of technology-focused education policy was "Digital Skills for All." This initiative started in 2009 and continued the concept of ICT-equipped classrooms at elementary and high school levels. The program also considered teachers' training and certification on ICT integration. This program provided high school education students with laptops, which constituted an important antecedent to the transition to a "device per student" policies.

Device per student (2013-2015)

The "device per student" approach started with "Mi COMPU.MX" program which brought tablets for students attending 5th and 6th grades between 2013 and 2014. The tablets had pre-charged educational content and special software for students and teachers. This program lacked a training strategy for teachers, as well as technical support.[13]

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[11] The equipment consisted of computers with pre-charged contents, interactive blackboards, digitized free textbooks and projectors.

[12] Consejo Nacional de Evaluación. "Seguimiento a Aspectos Susceptibles de Mejora Derivados de las Evaluaciones Externas", en *Secretaría de Educación Pública,* (México, 2007). Available at: https://www.coneval.org.mx/rw/resource/Mecanismos_2008/SEP/DT_SEP_ENCICLOMEDIA.pdf

[13] Gobierno de la República, "México Digital", *Programa @prende 2.0*, (Enero, 2018). Available at: https://www.gob.mx/mexicodigital/articulos/programa-de-inclusion-digital-prende-2-o

At the same time the National Digital Strategy Coordination performed a pilot program in previously selected public schools in different points of the country. This program known as "Programa Piloto de Inclusión y Alfabetización Digital" (PPIAD) characterized for enabling superior quality connectivity in the intervention groups and a proper assessment.

The initiative derived in the creation of a new area within SEP, explicitly dedicated to the introduction of a technology-based education policy: @prende Coordination.[14]

> **PPIAD results:**
>
> During the scholar year 2013-2014, 240 thousand tablets were delivered
>
> During the scholar year 2014-2015,

After the pilot program, the @prende initiative was implemented by delivering more tablets to elementary school students, most of them in fifth grade. The program innovation had cross platform content allowing students get more knowledge and appropriation capacity. The initiative had limited coverage since it only served fifteen States out of the thirty-two.

> **@prende.mx results:**
>
> During scholar year 2015-2016, more than 1 million electronic devices were delivered.
>
> 63 thousand teachers were trained.

This initiative faced two main problems that prevented its full success. First, delivering tablets in some non-connected schools caused a limited appropriation of the device's benefits. On the other hand, there was no selection criteria to determine the participating States.

Towards an integral model (2016-2018)

By 2016, SEP announced @prende 2.0[15], a comprehensive strategy which integrated the previous program. The strategy included teachers' training, digital content, equipment, connectivity, monitoring, and assessment.

@prende 2.0 was designed to take advantage of devices already delivered during the deployment of past programs, therefore it focused on delivering content in digital

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[14] *Ibid.*

[15] *Ibid.*

platforms and training teachers. The installation of technology-enabled classrooms was planned, all of them connected.

The program identified connectivity services for public schools as one of the key enablers to achieve the device's optimal use. The Coordination and the Ministry of Communications and Transport (SCT by its acronym in Spanish) through the *México Conectado* program made joint efforts to provide these services.

> **@prende.mx 2.0 results:**
>
> 2,600 digital resources available for students.
>
> In September ,2017 the bidding process for digital services related

Three connectivity models were proposed by the Coordination because of a range of pilot test performed with the SCT and industry participants: connectivity only for the teacher's device, connectivity for ten devices simultaneously, and connectivity for thirty devices simultaneously. These models considered different content appropriation levels and skills to develop. Although the initiative was comprehensive and tried to adapt experience from previous programs, the execution was limited due to budget limitations.

Scenario just before pandemics (2019-2020)

Efforts to include ICT-based education policies were focused on providing connectivity through *Internet para Todos* program (a continuation of *México Conectado* program).

During the first half of 2019, a bidding process took place to provide the service to 1,275 public spots, education centers among them.[16] As well, by the end of the first half of 2019 year, SCT reshaped the model of the thirty-two digital inclusion center which seeks promoting information technology-based training for people of different ages. The SCT certificates facilitatorswho are responsible for transferring knowledge in the digital inclusion centers.[17]

On the other hand, the @prende Coordination focused on training teachers, providing cybersecurity workshops, and expanding the use of the online platform Mexico X.[18]

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[16] Compranet's File 1933694 – High-Capacity Internet Services.

[17] Secretaria de Comunicaciones y Transportes (SCT). *Centros de Inclusión Digital Inician Nuevo Modelo de Desarrollo y Formación de Habilidades* (May, 2019). Available at: https://bit.ly/2tOkYuU

[18] Coordinación General @prende.mx. *Alcances de la Coordinación General de @prende.mx durante el 2019* (December, 2019). Available at: https://bit.ly/2RwYjMH

1.2. THE EDUCATION VACCINE: *APRENDE EN CASA*

Currently, Mexico faces an important opportunity for implementing a long-term ICT-based education policy. Previous experience shows that government agencies such as SEP, the @prende coordination, and those responsible universal connectivity policies are powerful enablers to boost an innovative education strategy that increases qualified human capital and boosts productivity and social development in a context of world stagnation.

This mentioned policy requires public investment, coordination between SCT and SEP to take advantage of previous experience, coordination with ICT industry and focus on next-generation skills, such as coding, creativeness, collective intelligence, and horizontal learning.

Aprende en Casa is the education sector program implemented in response to the health emergency and the suspension of in-person lessons in March 2020 caused by Covid-19. It is a broadcast (free-to-air TV service) and online-based education strategy aimed at providing continuity to basic and higher middle public education levels. This program provides access to educational content through broadcast TV and an online platform.[19]

The program had modifications depending on the school year, the operational requirements, and the pandemic evolution. The implementation of the program can be classified into three stages: 1) *Aprende en Casa*, which ran from March 23rd, 2020, to June 5th, 2020, to conclude the 2019-2020 school year; 2) *Aprende en Casa* II for the 2020-2021 school year; and 3) *Aprende en Casa* III for the 2021-2022 school year. In this paper we will focus on *Aprende en Casa* II since a more comprehensive analysis can be carried out because it ran a complete school year.

One of the most important courses of actions of *Aprende en Casa* is the use of open TV services to promote education programs developed by SEP and produced with the help fof the state-owned TV channel, Canal Once.

By the second stage of the program, the education content supply reached forty free-to-air TV channels (from public and private networks), 36 channels from the Sistema Estatal de Red de Radiodifusoras y Televisoras Educativas y Culturales de México, as well as 48 pay TV channels. This number of available channels broadcasting simultaneously enabled one program per school course.

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[19] The Competitive Intelligence Unit, ITAM. "Pocket Classroom: Desarrollo de Videojuegos Móviles para la Educación" (México, 2020), available at: https://bit.ly/3GZwILA

Other course of action, which worked as a complement to TV content, was the online resources. In the face of the contingency, SEP developed *Aprende en Casa* web page containing the TV program content, access to free textbooks (Libros de Texto Gratuito) among other learning resources making them available for students at elementary and high school levels.

Nueva Escuela Mexicana is the name of other webpage servicing students, teachers, and parents to strengthen the teaching learning process, particularly in the feedback process. The portal enables students to download TV content so it can be consumed offline.

In addition, for students who do not have access to broadcast TV or pay TV channels, and internet, the contents are also available via broadcast radio, in 20 indigenous languages at elementary, and high school levels.[20] Moreover, The National Council for Education Development (CONAFE by its acronym in Spanish) delivered physical educational materials to more than 300,000 students in the country by 2020, these materials are presented in a booklet, aimed at students living in zones with no connectivity access.[21]

The objective of *Aprende en Casa* was to facilitate studying at home and to create habits to strengthen hybrid/virtual education in the future.[22] The strategy was designed with the priority of safeguarding the health and lives of children and teachers but considering that the right to education should not be suspended or cancelled.[23]

The strategy has a long-term perspective, since it is likely to be preserved even after the pandemic; this type of education system should not be discontinued but rather remain. Meanwhile, *Aprende en Casa* III showed a hybrid methodology, that is, in-person lessons, there will also be an online modality.

When the program was implemented, one of the objectives was to prevent or minimize school dropout, however, 59% of the population from 3 to 29 years old enrolled in the 2019-2020 school year that dropped out, they did so due to COVID-related issues, this accounts for 435,000 out of 33.6 million students across the country.[24] One of the main

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[20] Becas México, *Aprende en Casa* II (México, 2020). Available at: https://bit.ly/3CiKwoD

[21] Gobierno de México, Consejo Nacional del Fomento Educativo, "Entrega CONAFE materiales educativos a más de 300 mil alumnos del país" (México, 2020). Available at: https://www.gob.mx/conafe/es/articulos/entrega-conafe-materiales-educativos-a-mas-de-300-mil-alumnos-del-pais?idiom=es

[22] Gobierno de México, Secretaría de Educación Pública, "Fortalece SEP programa *Aprende en Casa* mediante sitio web especializado en educación básica" (México, 2020). Available at: https://bit.ly/3jGYp1Y

[23] Ramírez Raymundo, et al. (2020) "Orientaciones para apoyar el estudio en casa de niñas, niños y adolescentes". Secretaría de Educación Pública. Available at: https://bit.ly/3c1uq0g

[24] Instituto Nacional de Estadística y Geografía. *Encuesta para la Medición del Impacto COVID-19 en la Educación (ECOVID-ED) 2020*. Available at: https://bit.ly/3loUYoZ

reasons students decided not to continue is that they considered virtual classes do not work for them.

1.2.1. CURRICULUM

The curricular subjects are the same as those on the in-person programs, Mathematics, Spanish or Mother Language, English, Arts, etc., however, some subjects have been added to the curriculum. In basic education, during the 2020-2021 school year, for the first time, the Civic and Ethical Formation (FCyE) curriculum was applied for the first two grades of primary school; in middle school and high school, in order to comprehensively develop young people in the socio-cognitive and socio-emotional areas, the Common Curricular Framework was redesigned in this type of education; also, the Music Education and School Orchestras Program was developed, which promotes the comprehensive training of students, through the development of artistic expression.[25]

In addition to the *Aprende en Casa*[26] platform, the Online Training Platform of the *Dirección General de Centros de Formación para el Trabajo* (DGCFT) is available, which offers didactic support materials for the teaching-learning processes in the online modality, such as audiovisual resources, infographics, manuals, presentations, and interactive exercises.[27]

Extracurricular activities are available in the Training Centers for Work that are configured in the virtual platform CEDDICA, whose purpose is to share materials of various specialties for free download, for instructors to use them as teaching materials and share developed materials. Also, to strengthen the habit of reading in middle school and high school, the section *Mi Club de Lectura* (My Reading Club) was set up on the *Jóvenes en Casa* website.

Furthermore, the Educational Attention Program for the Migrant School Population aims at enabling migrant population access to basic education in migrant education centers.

There are no curricular or extracurricular activities related to coding, a fundamental tool that has a high demand in today's job market. We consider, it is a suitable time to include it to the core curriculum.

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[25] Poder Ejecutivo Federal, Informe de Gobierno 2020-2021. Available at: https://bit.ly/3HiD74W

[26] From this point *Aprende en Casa* will refer to the three programs: *Aprende en Casa*, *Aprende en Casa* II and *Aprende en Casa* III.

[27] Poder Ejecutivo Federal, Informe de Gobierno 2020-2021. Available at: https://bit.ly/3HiD74W

1.2.2. STRENGTHS AND OPPORTUNITIES

As any public program, *Aprende en Casa* has strengths but also areas of opportunity that can be improved and meet its objective. These strengths and weaknesses are reviewed in this section.

The strengths include the variety of resources and platforms where the program was implemented. Some of the areas of opportunity are closer collaboration between local governments and education federal authorities (SEP and involved government agencies), targeting areas where there is no connectivity and creating sustainable options for them, improving content quality, and taking advantage of the household's use of ICTs.

A closer collaboration between States and SEP is necessary to enrich *Aprende en Casa*. The lack of interaction between these government levels (since it is a federal program), deprive *Aprende en Casa* content from regional focus, although there are some state specific curricular programs, like "*La entidad donde vivo*" (The State Where I live), however this is monitored by the SEP agencies and not by local governments. This situation also reduces the chances to coordinate the deployment of connectivity infrastructure (together with carriers) where it is required.

As stated, before, having different platforms to execute the program and reproduce the content supports the achievement of the program goals. This decision was made considering the lack of connectivity in Mexico and that it was not feasible that a single media could achieve the goal of everyone having access to education content. This strategy received awards due to its wide variety of platforms, for example the award given by CONEVAL for "Good Practices in the Use of Monitoring and Evaluation Results in the 2020 Public Policy Cycle".[28]

The program uses traditional and digital channels, through broadcast TV programs and Internet platforms, a variety of tools have been created to overcome the limits imposed by school's closure, thus bringing content to most students. .[29]

Even with the different platforms in which the program was developed, there are connectivity gaps that do not allow education to reach all students. According to ENDUTIH 2020, 72% of the population had access to internet, and 60.6% of households have

[28] Rangel Calvo, Israel, "SEP recibe premio del CONEVAL por la implementación del programa *Aprende en Casa*", Televisa News, (México, 2020). Available at: https://bit.ly/2YE8VQ9

[29] The Competitive Intelligence Unit, ITAM. "Pocket Classroom: Desarrollo de Videojuegos Móviles para la Educación" (México, 2020), available at: https://bit.ly/3GZwILA

internet.[30] The survey also estimates that 50.4% of the population aged 6 years and older located in rural areas are internet users.[31]

Television is the most extensive means of communication since 91.6% of households have at least one television, but only 76.6% of households have a digital one.[32] This can lead to a review about the type of program needed based on the availability and use of media.

The strategy did not take advantage of the use of smartphones despite the widespread access to this tool. These devices are used as the main connection mean in Mexico[33] and there is no specific *Aprende en Casa* mobile applications only web pages where content can be played or reproduced. According to ENDUTIH 2020, 96% of internet users access it through a smartphone.[34]

Using smartphones as the main platform can also improve the program impact on teaching and learning processes since creating a platform for the mobile phone or an app can facilitate two-way communication necessary to generate a community and to be able to build learning.

In this regard, there is potential improvement area in terms of content quality. *Aprende en Casa* has an educational element of content transmission rather than learning construction. Learning is achieved through the relationship among educational community: families, teachers, and students.[35] This model requires a great level of self-learning, which is a skill that is not fully developed in most students given the fact that it was not necessary before distant education programs and the age of the students.

The educational gap caused by dropout rates is not only affecting young people regarding education but also regarding health. The interruption of education and the uncertainty regarding the future, has made young people anxious, 1 in every 2 young people possibly suffers from anxiety or depression.[36] There is a necessity of treating the

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[30] Instituto Nacional de Estadística y Geografía. *Encuesta Nacional sobre Disponibilidad y Uso de Tecnologías de la Información en los Hogares (ENDUTIH) 2020*. Available at: https://bit.ly/3iJwOMK

[31] *Ídem.*

[32] *Ídem.*

[33] *Ídem.*

[34] *Ídem.*

[35] González, Valentina, "Experta: '*Aprende en Casa*' no construye aprendizaje y centraliza conocimiento", Comunicación Institucional de la Universidad Iberoamericana (México, 2020). Available at: https://bit.ly/3CfcYAg

[36] Consejo Nacional de Evaluación (2021). El CONEVAL da a conocer el informe de evaluación de la política de desarrollo social 2020 (Comunicado de prensa núm. 01). Available at: https://bit.ly/3wFwkof

health problem that it represents and giving solutions, especially for those who are experiencing an education interruption.

One solution to make education more accessible, regardless of the pandemic crisis, is what this paper is about. Lessons on how to implement hybrid/virtual education programs due to pandemic should help in the implementation of permanent policies that make education services more accessible and effective through alternative platforms such as ICTs.

It should be considered that dropout is not only related to connectivity access problems but also to economic motivations: some students are forced to become part of the labor force because of the economic crisis driven by the pandemic. This phenomenon must also be addressed.

1.2.3. COST

Although the budget allocated to the *Aprende en Casa* program is unknown, there are three budgetary programs whose objectives correspond to the purpose of the *Aprende en Casa* strategy. This information enables an approximation of the public cost of the program.

The "Programa de producción y distribución de libros y materiales educativos" (Production and distribution of books and educational materials program), which in the 2020 Public Account reported an amount of 3.1 billion pesos.[37]

On the other hand, the program "Producción y transmisión de materiales educativos" (Production and transmission of educational materials) reported 899.5 million pesos.[38] Likewise, the "Programa para el Desarrollo Profesional Docente" (Program for the professional development of teachers), with an amount paid of 409.2 million pesos in 2020.[39] In total, the three programs had a cost of 4.5 billion pesos, representing 1.3% of the total cost of federal education programs.

For 2021, Colombian authorities planned a budget to strength learning at home activities that accounted for 0.4% of the entire education budget[40], while US investment in

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[37] Cuenta Pública 2020.

[38]*Ídem.*

[39]*Ídem.*

[40]Ministerio de Educación Nacional. Published in "El Tiempo" (2020): *Presupuesto más alto en la historia de la educación*. Available at: https://bit.ly/3eG83Cv

public education for students between kindergarten and 12 grade (k–12 funds) accounted for 2% of the education funding.[41]

Public Education Expenditure (Estimated Aprende en Casa expenditure), 2020

Program Budget	Costs (Mexican pesos)
Producción y distribución de libros y materiales educativos	$3,141,982,524
Programa para el Desarrollo Profesional Docente	$409,195,226
Producción y transmisión de materiales educativos	$899,454,328
Total	4,450,632,078

Source: Public Account,2020

Beside this, the Public Account for 2021 year and the 2022 Public Budget reported a similar total spending for these programs, which implies a zero growth in real terms, with respect to the Public Account of 2020 reported cost.

It is important to stress that among the three budgetary programs considered for the approximation of the total cost of *Aprende en Casa*, the one aimed at improving teachers' professional skills suffered an important cut between 2020 and 2021. The 2022 budget remained the same as the 2021 reported cost.

Investment in teachers' digital skills must happen in regular bases. ICT tools for education evolve in short periods of time demanding a constant training process for teachers.

Regarding connectivity, the changes in the 2022 budget show a substantial increase in telecommunications spending, specifically in programs such as "CFE Telecomunicaciones" which has increased 61%, in real terms, compared to 2021.[42] Likewise, the @prende.mx

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[41] Learning Policy Institute. *COVID-19 and State Education Budgets: The Story behind the numbers (2020). Available at: https://bit.ly/3SnYnup*

[42] Presupuesto de Egresos de la Federación para el Ejercicio Fiscal 2021 (PEF 2021) y Proyecto del Presupuesto de Egresos de la Federación 2022 (PPEF 2022).

coordination (conducts planning, coordination, execution, and periodic evaluation of the Digital Inclusion Program (PID)[43]). investment increased by 50%[44] suggesting not only a prioritization of universal connectivity policies but connectivity services for education purposes.

1.3. CONCLUSION

Aprende en Casa was designed with the priority of safeguarding the health and lives of children and teachers but considering that the right to education should not be suspended or cancelled.

It was an emergency program, and it has improved with time, nevertheless *Aprende en Casa* must be considered as an opportunity for Mexico to have a comprehensive program of hybrid/virtual education for elementary and high school levels based on the use of ICT and broadcasting technologies. For that to happen there are still areas of opportunity for the provision of quality and universal education.

It is an educational model of content transmission rather than learning construction that can take advantage of the considerable penetration of mobile technologies such as. smartphones.

Technology is now fundamental to the fulfillment of some rights, including education. A digital policy is also an education policy.

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[43] Gobierno de México (2021). AprendeMx. Available at: https://www.gob.mx/aprendemx/que-hacemos

[44] *Ídem.*

2. EVALUATION AND LESSONS

So far, there has not been any official evaluation of *Aprende en Casa*, but those implemented by Consejo Nacional de Evaluación de la Política de Desarrollo Social (CONEVAL by its acronym in Spanish) and non-government organizations (NGOs).

Nevertheless, there have been some surveys conducted by the *Instituto Nacional de Estadística, Geografía e Informática* (INEGI) regarding the use of Information and Communications Technologies (ICT), as well as the evolution of education before and after the crisis caused by the pandemic. By using both surveys, it can be inferred the coverage and effectiveness of the program.

It is worth mentioning that *Aprende en Casa* was a response to the confinement due to the pandemic. Data shows that it was a good response considering the small amount of time and preparation the government had at the beginning of the crisis. Being an emergency strategy, it was created without a well-defined structure. This means it gave priority to the production and delivery of educational resources over activities related to adjustment and strategic planning.

The purpose of this section is to use these surveys regarding the use of technology and the impact of Covid-19 on education to estimate the reach and overall efficiency of the strategy. To do so, data from the INEGI and CONEVAL surveys were used, as well as information regarding Telesecundaria, a model with the aim of imparting secondary education through television broadcasts in rural or hard-to-reach areas that has existed in Mexico for over 50 years.

.1. ICT USE

As mentioned before, the strategy had three elements: 1) television, 2) website and 3) radio. This was designed so most of the student population could have access to the program through at least one of these channels.

According to *Encuesta Nacional sobre Disponibilidad y Uso de Tecnologías de la Información en los Hogares (ENDUTIH) 2020*, 72% of the population had internet access. However, only 60.6% of households had internet. This means that there is a considerable percentage of people that can only access internet outside their households, either in an internet cafe or in other public place, hence affecting the capacity to exercise this human right in the context of a pandemic.

Regarding television, 91.6% of households are equipped with at least one TV set, but only 76.6% have digital television. In addition, almost 4% of the population does not

have access to any type of television signal. Finally, little more than half of households have a radio equipped, although only 35.1% of the Mexican population are radio users.[45]

Although there is available data from ENDUTIH 2021, this section will consider data from 2020 to explore how well prepared was the population to face the first stage of confinement due to pandemic crises.

Percentage of users and households with information and communication technologies
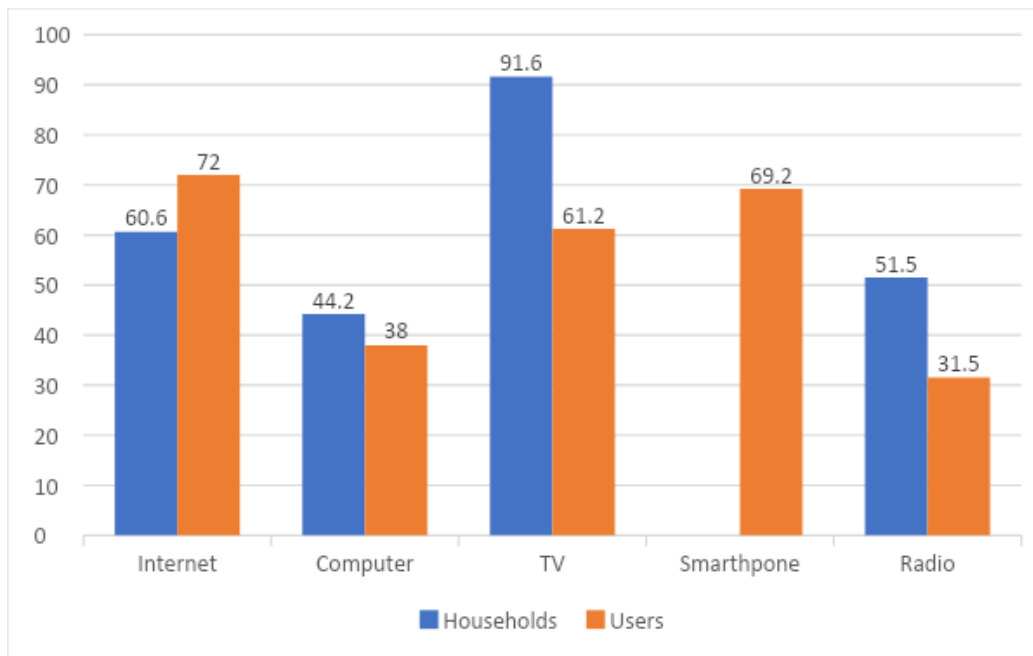
Source: The CIU with data from ENDUTIH 2020.

Even though every Mexican has access to a television signal, according to the *Encuesta para la Medición del Impacto COVID-19 en la Educación (ECOVID-ED) 2020*, conducted by INEGI, only 5.2% of the students used TV as their main device to learn. Most of them used smartphones and computers as their main learning device.[46] This means that most of the students required to count on internet access to study.

According to the ENDUTIH 2020, out of the 72% of internet users, 96% of them used smartphones to access the internet, 33.7% use laptops and 22.2% use a smart TV. However,

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[45] Instituto Nacional de Estadística y Geografía. *Encuesta Nacional sobre Disponibilidad y Uso de Tecnologías de la Información en los Hogares (ENDUTIH) 2020*. Available at: https://bit.ly/3iJwOMK

[46] Instituto Nacional de Estadística y Geografía. *Encuesta para la Medición del Impacto COVID-19 en la Educación (ECOVID-ED) 2020*. Available at: https://bit.ly/3loUYoZ

only 69.2% of the population has a smartphone.[47] In addition, 65.7% of the students use smartphones as their main device, which shows that the smartphone penetration is fundamental to reach higher levels of education.

However, there is a digital divide in smartphone spending. According to The SIU, the richest decile spends on average 4.4% of their income on smartphones, while the poorest decile spends 13.5%, i.e., the share of spending on smartphones in the poorest decile is three times higher than that of households in the richest decile.[48] Despite this, the richest decile spends five times more on smartphones. This situation reveals an intense pressure on the first lower deciles income, since they spend much less resources in absolute terms on a smartphone, but a bigger share of their income than the higher deciles.

.2.   SCHOOL DROPOUT

According to ECOVID-ED conducted by INEGI in December 2020, from the 33.6 million students (61.99% of population aged 3 to 29) enrolled in the 2019-2020 school cycle, 738,400 did not finish the school year, which represents 2.2% of the total number of students. This impact was bigger in private than in public schools. The private system dropout rate was 4.2%, while the public system had 2%.

This can be explained for two correlated reasons: first, the health crises came with an economic crisis, which made impossible for some families to pay for school, and the second reason in which dropouts were explained by a lack of learning.

Also, according to CONEVAL, the dropout rate in elementary schools was of 0.7%. Meanwhile, in middle school, it was of 4.2%. Moreover, in community elementary schools, this rate increased to 5.0% and in technical middle schools, this number was about 5.4%.[49]

The data shows that pandemic affected vulnerable households more than those households with better economic perspective.

From the total number of students who did not finish the school cycle, 58.9% did not do so due to COVID-19 related reasons), 8.9% due to economic reasons, 6.7% because they joined the labor force, and the rest for other reasons.

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[47] Instituto Nacional de Estadística y Geografía. *Encuesta Nacional sobre Disponibilidad y Uso de Tecnologías de la Información en los Hogares (ENDUTIH) 2020*. Available at: https://bit.ly/3iJwOMK

[48] The SIU. *Brecha de gasto de los hogares en smartphones,* 2021. Available at: https://bit.ly/3iEwOOj

[49] Consejo Nacional de Evaluación de la Política de Desarrollo Social. *Caracterización y análisis del diseño de la estrategia Aprende en casa,* 2021. Available at: https://bit.ly/3akoDSB

. In the next scholar cycle, 2020-2021, enrollment accounted for 60.59% of people aged 3-29. From the rest who did not enroll, 24.3% attributed to COVID-19 related reasons.[50]

.3. GOVERNMENT EVALUATION

As it was mentioned before, the CONEVAL conducted a survey to evaluate the strategy *Aprende en Casa*[51]. This government agency asked teachers, students, and parents, through an internet page, questions about accessibility, learning experience and difficulties during their participation in *Aprende en Casa* program.

Since this survey was conducted through internet, there is a bias: the poll does not consider population without internet access or devices such as smartphones and computers.

It is important to highlight that this study provides information about the perception of teachers, students and parents regarding *Aprende en Casa* performance.

Thanks to the ECOVID-ED survey, it is known that only 5.2% of students used TV as their main device for learning. On the other hand, according to teachers' perception (between 60% and 90% depending on the education level) at CONEVAL's study, free textbooks were the most helpful material for basic and secondary levels of education.

Behind textbooks, between 20% and 45% of teachers (depending on the school level) considered TV Contents, *Aprende en Casa* web page, and videos transmitted though *Aprende en Casa* web page as the second most useful material for their teaching purposes.

The last suggests that digital platforms can work as a complementary tool for providing education where infrastructure already exists but can also represent an opportunity to address access issues where it is difficult.

Despite the teachers' perception regarding the digital material at CONEVAL's study, around 77% of the total number of parents of students at elementary and secondary school levels suggested that internet connection was the main challenge for education during confinement. Parents also declared that availability of computers or TVs were important barriers (around 45%).

These results suggest repeatedly that connectivity remains as a challenge.

Some strategies to address this problem were addressed by The Competitive Intelligence Unit (The CIU) at Pocket Classroom: Mobile Video Game Development for

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[50] Instituto Nacional de Estadística y Geografía. *Encuesta para la Medición del Impacto COVID-19 en la Educación (ECOVID-ED) 2020*. Available at: https://bit.ly/3loUYoZ

[51] CONEVAL, Información Estratégica para el regreso a Clases en México2021. Available at: https://bit.ly/3QsG9Y6

Education white paper[52]. Nevertheless, smartphones emerge as a device alternative to computers or TVs due to their widespread adoption.

Another important detail is that many parents do not have the time or the skills to give support to children with scholar tasks. In middle school, almost half of the students didn´t have support from parents to prepare or scholar activities.[53] This was not the case for elementary school, where 93% had some sort of support which came specially from the mother of the student. Most of the cases of students with no support provided were because both parents work during class hours.

Barriers related to the characteristics of homes and students

Access to contents	Households	Students
o Connectivity o Availability of computers o Availability of Smartphones	o Support availability o Household's economy	o Abilities of self-learning o Skills developed before the pandemic

Source: The CIU with data from Inter-American Development Bank.

With all this information, using the three surveys (ENDUTIH and ECOVID-ED from INEGI, and the evaluation from CONEVAL) it can be estimated the impact of the program *Aprende en Casa*. Using the data mentioned before, it is possible to depict the performance of the program.

When referring to *Aprende en Casa*, CONEVAL stated they should improve education materials, and suggests creating complementary actions to reduce the prevailing digital divide in the country.

Aprende en Casa was designed as an emergency strategy created to respond to the quarantine mandate. At first glance, it proves to be a great short-term response. The strategy was based on TV, radio, and online platforms so it can reach the greater number of students. However, when analyzed in detailed, it shows a lack of means to truly reach the whole country, since there is still a big percentage of the population that do not have access to internet or the necessary devices to truly take advantage of program.

TV programming is not enough to successfully replace the in-person lessons. The use of ICT is necessary to decrease this gap, and unfortunately, one third of the population

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[52] The CIU, *Pocket Classroom: Mobile Video Game Development for Education white paper (2021).* Available at: https://bit.ly/3Qs8j5t

[53] Instituto Nacional de Estadística y Geografía. *Encuesta para la Medición del Impacto COVID-19 en la Educación (ECOVID-ED) 2020*. Available at: https://bit.ly/3loUYoZ

is unable to do so. According to de ECOVID-ED, many of students left school because they feel they are not learning.

If we want the program to optimally work and become a public policy to improve education coverage and complement education efforts where there is no coverage (where people do not have ICT access), it is necessary to increase its scope so that it can reach the entire population, and to do so, the government must work on increasing the access of internet and ICT penetration.

.4.   LESSONS

The most used device for scholar activities was, as declared by 65.7% of students, the smartphone. This question was asked to population aged from 3 to 29 who were enrolled in the 2019-2020 cycle. 18.2% said that their main device used was a laptop, 7.2% a computer, 5.3% said it was a TV and 3.6% used a tablet.[54]

Percentage of students enrolled in the 2019-2020 school year according to the main devices used for their school activities
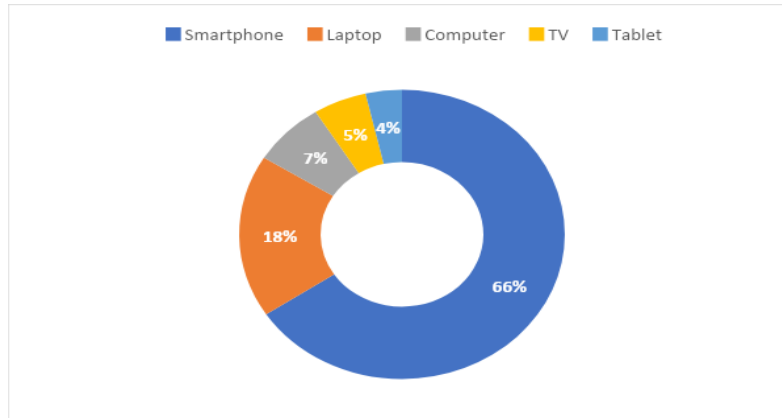
Source: The CIU with data from ECOVID-ED.

It is known that the scope of the program is exceptionally large thanks to TV programming, but according to the students, using only the TV programming is not enough

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[54] Instituto Nacional de Estadística y Geografía. *Encuesta para la Medición del Impacto COVID-19 en la Educación (ECOVID-ED) 2020*. Available at: https://bit.ly/3loUY0Z

for a complete learning experience, since only five out of 100 watch it. The next step is to find better ways to implement the strategy *Aprende en Casa*.

Now that almost everybody has access to it through TV, the government must find ways for TV programming to really engage the children so they can learn. Also, they must find a way to increase access to internet and smartphones, which are the main devices that students use for scholar activities.

And not only that, but it is also necessary to give the teachers enough equipment to teach their classes, as well as to train them to be proficient in the use of platforms that they need to teach online. According to CONEVAL, there is no evidence or mechanisms to measure the results of the teacher training program from the government. Moreover, a substantial number of parents (25%) think teachers do not have the necessary equipment or they do not know how to use it (34%) …[55]

Also, according to a survey conducted by the National Commission for Continuous Improvement of Education (MEJOREDU), about 70% of the participant teachers increased their household, particularly on phone related expenses, as well as on electricity and internet services.[56] Also, most of the parents increased spending on electronic devices and subscriptions to online platforms.

Here is an opportunity to create a national digital strategy focused on two action points: one focusing on internet access to the entire population and the second one on increasing the penetration of ICT devices.

If the students have the necessary equipment, as well as internet access, then *Aprende en Casa* could reach everyone and finally be a program that serves as an effective complement and alternative in-person lessons.

If an improvement is added to the existing learning platforms, such as a wider reach and a better implementation of the existing tools, Mexico could have a solid program for virtual learning. Online classes came to stay, and the only way to adapt is to improve the existing *Aprende en Casa* program.

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[55] Netquest. *Back to School en México*, 2021. Available at: https://bit.ly/2YpLmKl

[56] National Commission for Continuous Improvement of Education. *Share of principals, teachers, and parents who increased spending due to distance learning amidst the COVID-19 lockdown in Mexico in 2020, by category*, 2021. Available at: https://bit.ly/3FrOtT9

.5.   TV LESSONS EXPERIENCE

Since 1968, there has been an education model in Mexico known as Telesecundaria which provides secondary education through television broadcast in hard-to-access areas.

During the current health crisis, this model was highly criticized due to the minimal impact results when compared to other education models. This, coupled to the fact that most rural areas do not have access to electricity, televisions, computers, or other devices, made it impossible for some regions to access this model.to access this educational model.

According to the *Instituto Nacional para la Evaluación de la Educación*, in 2005, almost 90% of the students from Telesecundaria could not perform basic reading tasks, 30 more percentage points than general middle-school students. Also, 94.4% of them were considered to have insufficient math skills.[57]

The strategy *Aprende en Casa* can face comparable results if continuing using the same model. Television broadcasts, concept books and learning guides are not enough to achieve good levels of education.

A successful virtual education model requires online lessons to make the experience more interactive and personal.

.6.   CONCLUSION

According to this research, the strategy *Aprende en Casa* was a great response to the sanitary emergency caused by the pandemic. However, it must improve many aspects such as increase internet access, as well as the penetration of connectivity devices, also it must consider teachers' ICT related training.

Using TV alone as a platform to promote contents is not enough to properly teach. The educational TV broadcasts reach almost every student. However, this platform is not enough to reach a satisfactory level in the education standard, the results of the evaluation of Telesecundaria suggest it.

In addition, the use of platforms and online services can also help to improve the education in Mexico. A major problem falls in the low internet access rate to connect to education platforms, as only 72% of the population has access to internet.

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[57] Instituto Nacional para la Evaluación de la Educación. *Las telesecundarias mexicanas,* 2005. Available at: https://bit.ly/2WS1S5k

The government must act on it to improve internet penetration, as well as to help consumers to gain more easily devices such as smartphones and computers.

The country returned to in-person, nevertheless Aprenden en Casa can remain as a policy tool to improve the educational system in Mexico. According to the Program for International Student Assessment (PISA) 2018, Mexico is still below average in performance in reading, mathematics, and science.[58]

The opportunity of using different platforms and adopting the strategy to complement the current educational system can contribute to solve this educational challenge that Mexico has always had.

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[58]Organization for Economic Co-operation and Development. *Program for International Student Assessment (PISA) results from PISA 2018*. Available at: https://bit.ly/3apryt6

3. A LITERATURE REVIEW ON INTERNATIONAL PRACTICES

3.1. INTERNATIONAL EDUCATIONAL EXPERIENCE DURING COVID-19

According to the United Nations International Children's Emergency Fund (UNICEF) Covid-19 has cost the loss of 1.8 trillion hours of in-person learning affecting nearly 77 million children worldwide, specially the most vulnerable. For many the alternative scenarios to school are child labor, child marriage or teen pregnancy leading to a definite dropout of their studies.[59]

The sudden lockdown in many countries has inspired several research on its impact on education. For example, Prabakaran and Saravanakumar directed a study in India that found that an interactive e-Content enhances the students' achievement in Mathematics than the conventional method of teaching. The incorporation of videos, animations, 2D or 3D pictures, simulated games etc. proved to stimulate students' enthusiasm on learning.[60]

While there are evident benefits from the use of digital tools in learning there are also challenges for e-learning expansion and superior performance.

Brooks et al. prove that large quarantine period were associated with poorer mental health including post-traumatic stress symptoms, avoidance behavior, frustration and boredom, all important barriers to the remote teaching process.[61] In addition it must be considered that not all students nor teachers have an appropriate space and installations at home to take/give lessons.

There are documented effects related to the use of digital learning tools and better educational results.

For example, PISA 2018 Results informs that the use of ICT and digital tools to provide education were correlated with higher reading scores in the test. Having an effective online learning support platform available was associated with an increase of 0.39 points in the mean reading score (even after considering the effect of economic, social, and cultural differences among the participant countries).[62]

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[59] UNICEF, #ReopenSchools, UNICEF, 2021. Available at: https://uni.cf/3AH1KnZ

[60] B. Prabakaran and AR. Saravanakumar, Effectiveness of Interactive E-Content Module in Enhancing Students' Achievement in Mathematics, International Journal of Control and Automation 13 (2), 2020. Available at: https://bit.ly/3AGAIo7

[61] Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G.J., 2020. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. The Lancet. Available at: https://bit.ly/3ERxDgc

[62] OECD, PISA 2018 Results (Volume V): Effective Policies, Successful Schools, OECD, 2020.p.123. Available at: https://bit.ly/3ElnJD3

Nevertheless, the use of these tools is not universal because it depends not only on connectivity and material capacities, but it depends on school's policies.

From PISA participant countries, the most common school practices to improve education using digital devices were having regular discussions between principals and teachers about the use of digital devices for pedagogical purposes (63% of students attended schools that practice this); having written school statements about the use of digital devices (62% of students); and having a specific program to prepare students for responsible Internet behavior (60% of students). While the least common practices were having a specific program to promote collaboration amongst teachers on the use of digital devices (36% of students); having a scheduled time for teachers to meet to share, evaluate or develop instructional materials and approaches that use digital devices (44% of students); and having a written statement specifically about the use of digital devices for pedagogical purposes at school (46% of students).[63]

Schools' management of E-learning systems and tools was found by Ammar Y. Alqahtani and Albraa A. Rajkhan to be one of the most significant factors influencing E-learning success during Covid-19 pandemic along with technology knowledge, support form management, and students' awareness of utilizing E-learning systems.[64]

An online survey conducted by NewSchools Venture Fund in 2019 to teachers, principals, district administrators and students at K-12 schools in the US tried to understand the barriers and advantages of adopting digital learning tools. Their main findings can be seen in figure bellow

Perspectives on Digital Learning Tools in the US in K-12 Education Level

Reasons teachers do not use digital learning tools		Reasons students use digital learning tools		Effectiveness of digital learning tools	
Do not have enough training to use them	56%	Help learn things on their own	78%	Researching or searching of information	90%
Think non-digital tools are more effective	49%	Let them learn at their own pace	74%	Creating projects, reports, or presentations	84%

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[63] Ibid. pp.121-122.

[64] Ammar Y. Alqahtani and Albraa A. Rajkhan, E-Learning Critical Success Factors during the COVID-19 Pandemic: A Comprehensive Analysis of E-Learning Managerial Perspectives, Education Sciences 10(9), 2020. Available at: https://bit.ly/2W6imq7

They are expensive	47%	Make school more interesting	74%	Providing practice lessons and exercises	83%
Do not know which to use	46%	They are fun	73%	Personalizing content to meet individual students' needs	76%
There are too few devices for students	38%	Help them remember what they learnt at class	65%	Assessing student learning	71%

Source: The CIU with data from NewSchools Venture Fund (2019).

It stands out that the principal barrier declared by 56% by teachers was that they do not have enough training to use digital learning tools such as websites, apps, online tutorials, online games and videos or programs used to teach and support schoolwork.[65]

In the case of students, they agreed in average that the principal reasons to use digital learning tools are those related to the capacity to learn things on their own (78%) and at their own pace (74%) making school more interesting (74%).[66] Finally as a proxy measure of effectiveness of digital learning tools teachers declared that these were effective for common reasons as research or searching (90%) but also for novel reasons such as personalizing content to meet students' needs (76%) and assessing student learning (71%).[67]

Research undertaken by of Hameed, S. et al. show that in a blended system of education that mixes both in-person and online learning tools allow student to have access to lectures anytime and this translates to better recalling skills of the information it presents.[68] The benefits of E-learning does not only impacts favorably to students, due to

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[65] NewSchools Venture Fund, Leading reasons that K-12 teachers in the United States choose not to use digital learning tools in 2019, STATISTA, 2019. Available at: https://bit.ly/3EFi0bG

[66] NewSchools Venture Fund, Leading reasons that K-12 students in the United States use digital learning tools in 2019, by level, STATISTA, 2019. Available at: https://bit.ly/3CF3rmF

[67] NewSchools Venture Fund, Effectiveness of digital learning tools at K-12 public schools by activity U.S. 2019, STATISTA, 2019. Available at: https://bit.ly/3CGzSB3

[68] Hameed, S.; Badii, A.; Cullen, A.J. Effective e-learning integration with traditional learning in a blended learning environment. In Proceedings of the European and Mediterranean Conference on Information Systems, Al Bustan Rotana, Dubai, UAE, 25–26 May 2008; pp. 25–26. Available at: https://bit.ly/2XUtRSv

its flexibility also become an ally to instructors that have other personal responsibilities like taking care of their families and getting to a better life-work balance. [69]

It is also relevant then to analyze how the region of Latin America is prepared or not to adopt E-Learning and its benefits.

3.2. LATAM EDUCATIONAL EXPERIENCE DURING COVID-19

During the COVID-19 pandemic countries of Latin America and the Caribbean applied diverse tools in mobile devices to educate remotely. As showed in figure below from a sample of 29 countries in the region the most used channel of education was Online learning (used by 26 countries), Offline learning (24) – not to be confused with online learning whose main characteristic is that is shared via internet while offline does not require this technology- and Broadcast of educational programs via TV or radio (23).[70]

Latin America: most used virtual learning tools 2020, by type
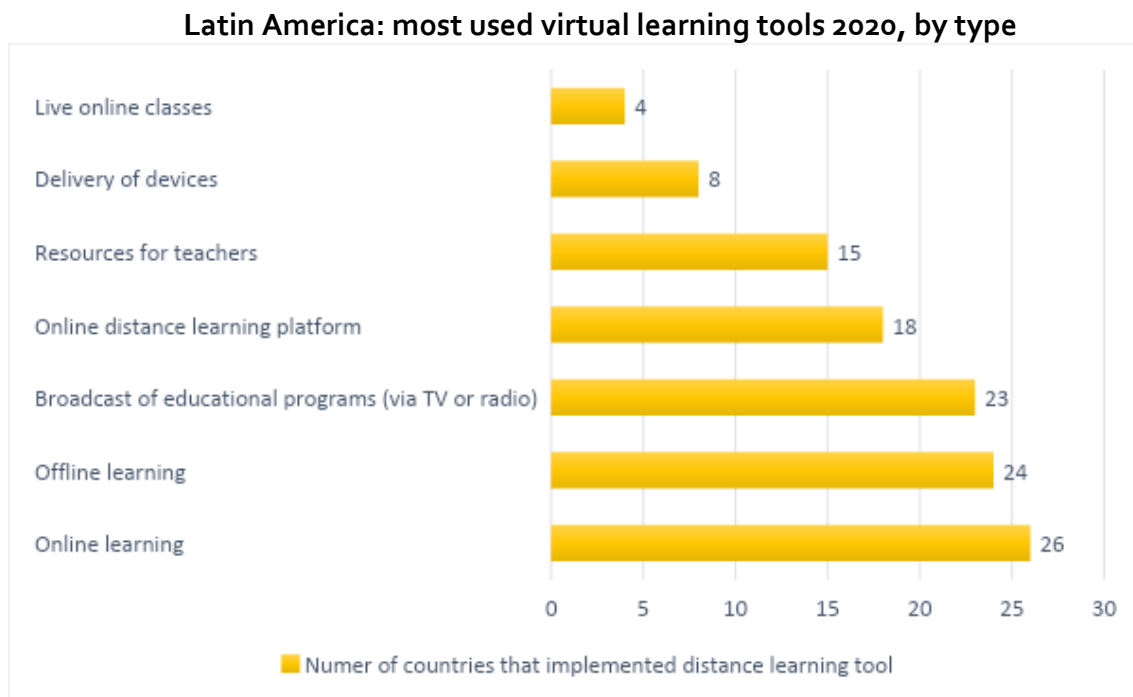
Source: The CIU with data from the Economic Commission for Latin America and the Caribbean (2020).

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[69] Basak, S.K.; Wotto, M.; Bélanger, P. A framework on the critical success factors of e-learning implementation in higher education: A review of the literature. Int. J. Educ. Pedagog. Sci. 2016, 10, 2409–2414.

[70] Economic Commission for Latin America and the Caribbean, Latin America: most used distance learning tools 2020, by type, STATISTA, 2020. Available at: https://bit.ly/3nzDBMi

In addition, a survey conducted by UNESCO reveals that in Latin America and the Caribbean the online learning platforms used amidst the COVID-19 pandemic were in same proportion open and commercial, suggesting the complementarity of services provided from one and another kind of platforms.[71]

3.3. EDUCATION POLICIES AND PROGRAMS DURING COVID-19 IN LATAM

The following is a summary of some of the measures taken by Latin American countries at the basic and secondary education levels, as well as a brief analysis on how technologically prepared countries were able to conduct online classes diligently.

To understand to what extent were the countries prepared to offer and deliver digital solutions for educational continuity during the emergency, Álvarez Marinelli proposes a comparison of the level of development of Educational Information and Management Systems (SIGED) will be presented. SIGEDs encompass all the management processes necessary for the operation of the education system, the level of development of SIGEDs shows how prepared the education systems were to offer digital solutions for educational continuity during the emergency.[72]

Argentina

The measures taken in Argentina for educational continuity consisted of generating digital content, physical material for social networks, radio, and television. This process was implemented by the National Ministry of Education of Argentina through its own web page; television content was promoted through the program *'Seguimos Educando'*, which articulates TV and radio content, a series of booklets and digital materials to facilitate and promote access to educational content and cultural goods until the normal functioning of classes is resumed.[73]

Argentina was one of the few Latin American countries that did consider, as a strategy to implement virtual learning activities, the provision of technological devices and

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[71] UNESCO, Online learning platforms used amidst the COVID-19 pandemic in Latin America and the Caribbean in 2020, by type, STATISTA, 2020. Available at: https://bit.ly/3EkcXNo

[72] Álvarez Marinelli, Horacio, et. al., Education in times of Coronavirus: Latin America and the Caribbean's education systems in the face of COVID-19, Inter-American Development Bank, 2020. Available at: https://bit.ly/3DRroHH

[73] Educar Portal. *Plataforma Seguimos Educando,* 2021. Available at: https://bit.ly/3pki8Ip

proposals to offer credits from the *Banco de la Nación Argentina* at a subsidized rate so that teachers could buy computers.[74]

Argentina's SIGEDs show that it was sufficiently prepared in terms of having digital resource packages and a central repository of digital content but very poorly prepared in virtual tutoring and with relevant connectivity failures in schools.[75] In 2018 the percentages of 15-year-old students who had access to internet connection at home, to a computer at home and educational software at home was 83%, 72% and 33% respectively.[76]

Brazil

In the case of Brazil, the measures taken for educational continuity consisted of generating learning platforms and digital content for radio and television. The Government leaned on the work of the *'Centro de Medios Educativos de Amazonas'*, which was founded in 2007 to provide televised lessons to 300,000 students in remote areas.[77] Since the coronavirus pandemic hit, the programs have expanded to several Brazilian States where educators adapt them to different cultures and teaching styles, more than 4.5 million children have watched them.[78] Notably, the state of Amazonas offers a smartphone app to complement televised schooling and allowing students to ask questions of their teachers in real time.[79]

Brazil's SIGEDs show that it was unprepared for the emergency, mostly in lack of virtual tutoring but also lacked good connectivity and digital content.[80]

The percentages of 15-year-old students who had access to internet connection at home, to a computer at home, and to educational software at home in 2018 was 91 percent, 59 percent, and 30 percent, respectively.[81]

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[74]ECLAC-UNESCO, Education in the Time of Covid 19, ECLAC-UNESCO, 2020. Available at: https://bit.ly/3FVautT

[75] Álvarez Marinelli, Horacio, et. al., Education in times of Coronavirus: Latin America and the Caribbean's education systems in the face of COVID-19, Inter-American Development Bank, 2020. Available at: https://bit.ly/3DRroHH

[76]ECLAC-UNESCO, Education in the Time of Covid 19, ECLAC-UNESCO, 2020, 6. Available at: https://bit.ly/3FVautT

[77] Mueller, Benjamin, "La educación por televisión vive un auge por la pandemia del coronavirus", New York Times (2020). Available at: https://nyti.ms/3jenMry

[78] *Ídem.*

[79] *Ídem*.

[80] Álvarez Marinelli, Horacio, et. al., Education in times of Coronavirus: Latin America and the Caribbean's education systems in the face of COVID-19, Inter-American Development Bank, 2020, 10. Available at: https://bit.ly/3DRroHH

[81]ECLAC-UNESCO, Education in the Time of Covid 19, ECLAC-UNESCO, 2020, 6. Available at: https://bit.ly/3FVautT

Chile

In Chile, the education portal 'EducarChile' was used, as a product of a collaboration agreement between Fundación Chile and the Chilean Ministry of Education.[82] The *'Aprendo en Línea'* platform, which contains digital materials for self-learning at home, was also introduced along with the 'Aptus' platform which has educational software and training in order to improve the quality of education in Chilean schools.[83] In general, in the Chilean case the measures taken for educational continuity consisted of generating digital content, physical and social network material shared through radio and television.

In Chile, a self-application survey shows that 63% of teachers consider that they are working more or much more than before, and more than half of them consider that they have fewer resources than before the pandemic to conduct their pedagogical work in a proper way and to reconcile their domestic and pedagogical work[84]. This is especially serious among female teachers, whose answers reach a difference of 10 percentage points compared to those of male teachers.[85]

Another survey, addressed to teachers, reveals that pedagogical activities during the pandemic are mainly based on sending activities (81%) and homework (75%) for students' autonomous work; however, only 9% of teachers consider that most of their students have the habits to study autonomously and only a quarter of them believe that their students have the necessary skills to use virtual work applications.[86]

That is, there is a similar problem to the one in Mexico in terms of content, although there are sufficient resources (transmissions and videos) they are focused on transmitting information and not on generating a community and understanding. In other words, there is not a problem of quantity but of quality.

A good practice in Chile is that it provided resources for mental health support through resources on socioemotional support developed by the Ministry of Education (MINIEDUC). An example of these resources is a guide for self-care and socioemotional well-being.[87]

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[82]EducarChile, Fundación Chile and Ministerio de Educación de Chile (2021). Available at: https://bit.ly/3ph6Iox

[83] Aptus website (2021). Available at: https://bit.ly/3vqGCk4

[84] ECLAC-UNESCO, Education in the Time of Covid 19, ECLAC-UNESCO, 2020, 10-14. Available at: https://bit.ly/3FVautT

[85]Ídem.

[86] Ídem.

[87] Ídem.

Chile's SIGEDs show that it was slightly better prepared in terms of school connectivity, otherwise remarkably similar to Argentina.[88] In Chile the percentage of 15-year-old students who had access to internet connection at home was approximately 88%, 82% those who had access to a computer at home and 43% those who had access to educational software at home.[89]

Colombia

The main platform for remote schooling in Colombia is Aprende Program's Aprender Digital educational portal, which has more than 80,000 digital educational resources, organized by grade level. It stands out because, differently from the rest of the region in Colombia there is not a national curriculum but a series of guidelines for each grade level.[90]

In Colombia, through the *Padrino Plan*, there has been promotion of capacity building and the exchange of pedagogical experiences among educational institutions in the use and appropriation of ICTs while giving training processes as a support for teachers.[91]

Colombia had very similar characteristics to Argentina in terms of how prepared they were to face the crisis according to the SIGED.[92] In Colombia, the percentage of 15-year-old students who had access to an Internet connection at home was approximately 67%, 62% those who had access to a computer at home and 29% those who had access to educational software at home.[93]

Annex A presents other relevant LatAm counties experiences.

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[88]Álvarez Marinelli, Horacio, et. al., Education in times of Coronavirus: Latin America and the Caribbean's education systems in the face of COVID-19, Inter-American Development Bank, 2020, 10. Available at: https://bit.ly/3DRroHH

[89]ECLAC-UNESCO, Education in the Time of Covid 19, ECLAC-UNESCO, 2020, 6. Available at: https://bit.ly/3FVautT

[90]País, Ana, "Coronavirus: 4 países de América Latina que lograron aplicar estrategias exitosas de educación a distancia ante la pandemia", BBC News, 2020. Available at: https://bbc.in/3DYJGqS

[91]ECLAC-UNESCO, Education in the Time of Covid 19, ECLAC-UNESCO, 2020, 12. Available at: https://bit.ly/3FVautT

[92]Álvarez Marinelli, Horacio, et. al., Education in times of Coronavirus: Latin America and the Caribbean's education systems in the face of COVID-19, Inter-American Development Bank, 2020, 10. Available at: https://bit.ly/3DRroHH

[93]ECLAC-UNESCO, Education in the Time of Covid 19, ECLAC-UNESCO, 2020, 6. Available at: https://bit.ly/3FVautT

CONSIDERATIONS FROM LATAM EXPERIENCE

Like Mexico, the solutions adopted by the countries are focused on the dissemination and delivery of educational content and not on maintaining bonds and creating learning through the community.[94] In most of the response plans, Internet-based programs and platforms were created to reproduce pre-recorded class content for rebroadcasting over the Internet.

Nevertheless, a common feature is that in all countries there are problems of connectivity and internet access, so the most vulnerable communities were the ones that had more problems in the continuation of education.

Most Latin American countries continued with previously established programs, reinforcing them, and adapting them to the necessary conditions, but there is still a lot of work to do. The content itself is not sufficient to maintain quality online education. Like mentioned before, the problem that involves the fact that education is not only about transmitting information but also about creating communities through interaction, persists.

The case of Uruguay stands out, where the previous program was more developed, so they did not have to make so many changes to move to online education immediately. This reflects how technology development plans are useful not only for the present but also for the future. Technology is increasingly part of everyday life and development; it is pertinent to invest in technological infrastructure to be able to better face the challenges that arise.

3.4. TECHNOLOGY ADOPTION AS A CONDITION FOR E- LEARNING IN LATAM

For e-Learning to spread and enhance remote learning in Latin America it is necessary to look on internet access and penetration of the mobile devices that allows users to receive online learning. These last are presented in figure bellow. Where it is easy to confirm that at least for five of the greatest economies in LATAM, the penetration of these kind of devices is heterogeneous. For example, Argentina has great presentation of

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[94]Álvarez Marinelli, Horacio, et. al., Education in times of Coronavirus: Latin America and the Caribbean's education systems in the face of COVID-19, Inter-American Development Bank, 2020, 6. Available at: https://bit.ly/3DRroHH

computers and smartphones but is no so great in tablet's penetration while in Colombia the least adopted device is the computer.[95]

Despite the lack of uniformity in penetration of computers, smartphones, and tablets it is true that for all countries presented at least one device reaches more than a half of total households. And as these tools can be all used in E-Learning it is reasonable to think that there is a fantastic opportunity for its expansion in the region.

Penetration of computer, smartphone, and tablet in households of selected countries of LATAM

Penetration by device / Country	Argentina	Brazil	Chile	Colombia	Mexico
Computer	70%	40%	64%	38%	37.4%
Smartphone	77%	73%	81%	65%	106%
Tablet	25%	23%	50%	49%	14.4%%

Source: The CIU with data from Statista (2021), ENDUTIH 2021, AIMX, and The CIU.

To complete the understanding of needs to spread e-Learning, UNESCO also informs that in the region teachers trained to use online platforms by teaching level were 68% in Primary, and 75% in Lower secondary and Upper secondary.[96] This information shows how there is an important proportion of professors, from 25% to 32%, that cannot use the most widely virtual learning tool in the region. This is an important barrier to reach more students and also, guarantee virtual.

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[95] STATISTA, Online education in Latin America – statistics & facts, STATISTA, 2021. Available at: https://bit.ly/3BeEnm9

[96] UNESCO, Teachers trained to use online platforms amidst the COVID-19 pandemic in Latin America and the Caribbean in 2020, by teaching level, STATISTA, 2020. Available at: https://bit.ly/3EkwqO7

Figure bellow shows the share of students with teachers with technical and pedagogical skills to teach with digital devices as a dimension of the challenge to provide online education.

This challenge is different among countries, having some like Mexico more advanced capacities than for example, Argentina.[97]

Share of students with teachers with technical and pedagogical skills to teach with digital devices
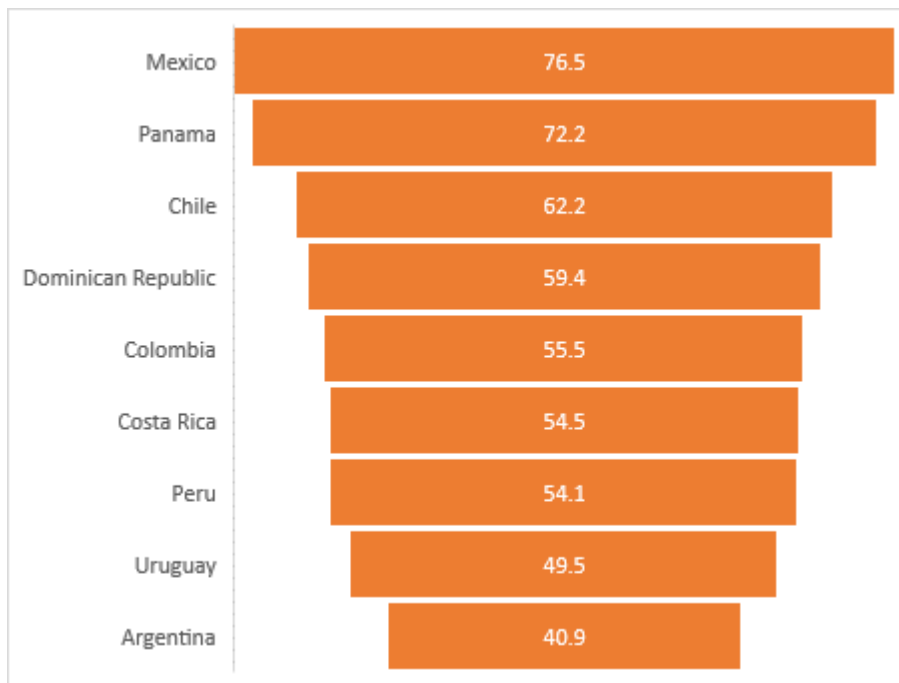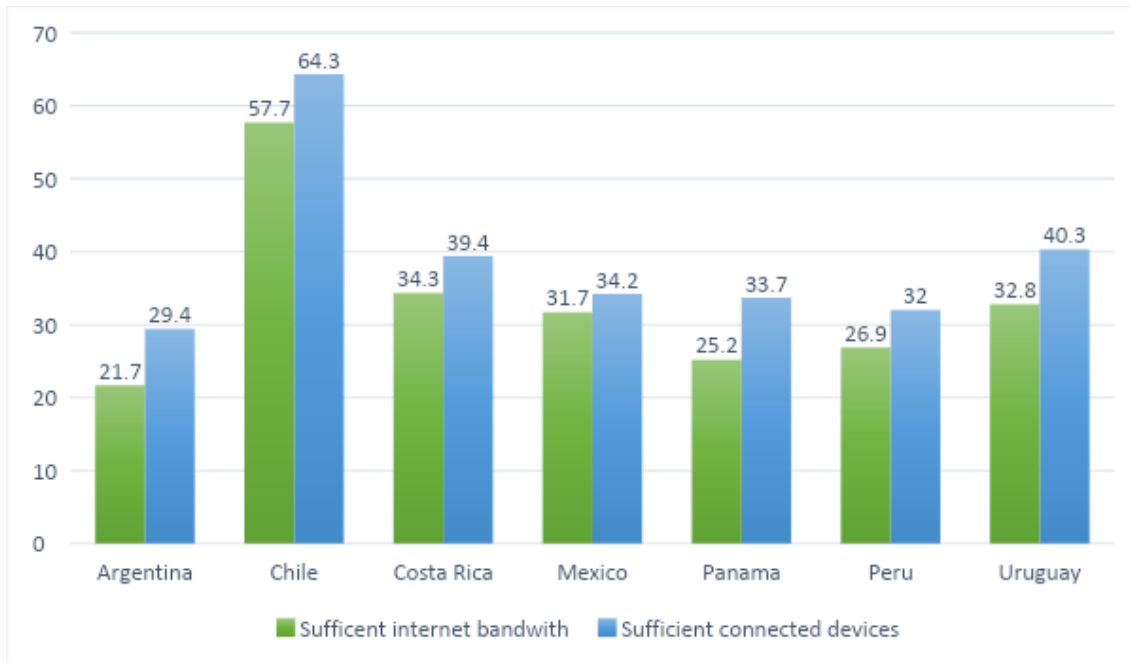

Source: The CIU with data from OECD (2020).

While there can be an interesting percentage of technically and pedagogically trained teachers when observing Latin American schools, in the following figure there is a clear challenge to provide internet access to school.[98]

In Mexico for example, just one third of its schools are equipped to benefit of digital online tools for education and all its benefits.

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[97] OECD, Share of students in schools with teachers having the necessary technical and pedagogical skills to integrate digital devices in instruction in selected countries in Latin America in 2018, STATISTA, 2020. Available at: https://bit.ly/3CfoGYL

[98] OECD, PISA 2018 Results (Volume V): Effective Policies, Successful Schools, OECD, 2020.p.266-267. Available at: https://bit.ly/3ElnJD3

Share of students in schools with sufficient internet bandwidth and connected devices in selected countries of LATA

Source: The CIU with data from OECD (2020).

e-Learning demands for educational content to be designed specifically for the devices in which it be consumed like smartphones or tablets. That is why it is important to seek for those solutions already working successfully as educational platforms in the world.

3.5. VIRTUAL LEARNING SOLUTIONS FOR MOBILE DEVICES

Due to the global phenomena of virtual learning expanding worldwide during the lockdown, the United Nations Educational, Scientific and Cultural Organization (UNESCO) gathered a list of tools for teachers and schools to create, share, and educate digitally. Recognizing the challenges of connectivity and equipment in countries such like Mexico, here are presented some of UNESCO's solutions for mobile devices, mostly but not exclusively for smartphones, which could improve *Aprende en Casa*'s strategy.

Solutions for mobile devices with connectivity access

In this category there are solutions that propose the use of short videos in a social network-like platform to educate on diverse subjects offering the chance to complete

courses video by video. These platforms affirms that its content and delivery are 20% more effective than traditional e-learning.[99]

Other most well-known solutions are the MOOC platforms. Coursera, EdX, Udemy and Canvas are examples of it. In Mexico, the National Autonomous University of Mexico (UNAM for its name in Spanish) has its own MOOC platform with 4,317,180 enrollments so far.[100] The benefits of this kind of platforms are that allows self-paced kind of learning in multiple subjects offered from leading educational institutions. It also permits teachers to design online courses and provide lessons adapting to its necessities. These platforms allow students to advance in learning based on their capabilities and efforts. The fragile point of these is that most are not cost-free, and courses take a considerate time to be completed making constant connectivity a fundamental requirement.

Another proposal for remote learning focuses on educating and empowering the youth to navigate safely and create healthy, supportive, and inclusive online communities. Some of the biggest social networks are working in this kind of solutions being quite relevant due to its worldwide penetration.[101] A collaboration with one of these social networks to offer specific modules for *Aprende en Casa* with games, educational materials could reach more students and improve Mexican government's efforts in providing remote education.

One of the most valuable skills in the nearest future is learning to code. Code.org and Code It are platforms that provide free online resources, activities, and lessons to learn how to code, specifically designed for kids.[102] A benefit of these platforms is that they focus on developing the skills to think and build code rather than learning a specific coding language, creating resilience, and promoting creativity in children.[103] In addition, Code Week is an effort designed by and for the European Union available in all its official languages, demonstrating how governments value this kind of education and how cooperate to offer it remotely.[104]

Solutions for mobile devices without connectivity access

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[99] Rumie, *About Us*, Rumie, 2021. Available at: https://bit.ly/3zr98Da

[100] CUAIEED, moocUNAM, UNAM, 2021. Available at: https://bit.ly/2XO115L

[101] Get Digital, Facebook Get Digital, Facebook, 2021. Available at: https://bit.ly/2WkfUwa

[102] Code.org, About us, Code.org, 2021. Available at: https://bit.ly/2WnUGND

[103] Code it!, About Code it!, Code it!, 2021. Available at: https://bit.ly/3jcNM6U

[104] CodeWeek, About us, European Union, 2021. Available at: https://bit.ly/3y9cF7S

UNESCO also presents a set of solutions for smartphones without connectivity access, this would allow to use learning platforms on all kind of devices including legacy phones.

An example of this is a platform, like Kolibri and Ustad, which includes a library of open educational resources and a toolkit to support implementation of diverse learning environments and is specifically designed to reach those students and educators living in underserved where access to Internet is costly or impossible.[105]

How it works? First a device is "seeded" with the program via an internet download. Once the platform had been fully installed in the device it can be shared with other devices over an offline network. This allows reaching the last mile's students just by transporting a device with the seed and share it offline with others.[106]

Other solutions include the broadcasting of educative content in TV and radio broadcasting like *Aprende en Casa* but not only this, some use chatbots in instant messaging apps to reach people that have access to it, and for those with legacy phones a phone line to an answering machine is available.[107]

UNESCO presented in 2013 a policy guideline for mobile learning- learning that involves the use of mobile technology such as smartphones and tablets- to facilitate the adoption of these strategies to enable quality learning anytime and anywhere.108

Some of their recommendations are presented here below due to their applicability and pertinence to the Mexican case.

Create or update policies related to mobile learning

In Mexico, the education policy does consider remote learning strategies such as tele-education. Nevertheless, there is not yet a comprehensive program that includes the use of mobile technology such as smartphones or tablets both in presential and remote learning systems.

It then may be recommended to update the education policy to avoid blanket prohibitions of mobile devices, to recognize the educational potentials of mobile technology and provide guidance on how technology policies and investment programs can work in conjunction with educational initiatives.

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[105] Ustad Mobile, *Teach.Learn. Share.Online or Offline.*, Ustad Mobile, 2020. Available at: https://bit.ly/3zfbfKz

[106] Learning Equality, *Kolibri: An Adaptable Product Ecosystem for Offline-first Teaching and Learning*, Learning Equality, 2021. Available at: https://bit.ly/2WfWsB4

[107] Ubongo, 2020 Learning Report, Ubongo, 2021. Available at: https://bit.ly/3myoClk

[108] UNESCO, Policy Guidelines for Mobile Learning: Open Access, UNESCO,2013. Available at: https://bit.ly/3zSaR42

Training teachers to advance learning through mobile technologies

For teachers to successfully adapt their courses to mobile learning it is essential that they receive proper technical capacitation.

Not only teachers can benefit of mobile technologies for delivering lessons, but it could also be a tool to receive themselves training to keep up with latest pedagogical trends. UNESCO has found that this way of assisting educators is highly cost-effective, especially for those working in remote and deprived areas.[109]

Creating and optimizing educational content for use on mobile devices

Although a great amount of educational content is available online this does not guarantee that it is accessible from mobile devices making it impossible for both students and teachers to take full advantage of the specific capabilities of these devices (like unique multimedia, interactions, and location recognition).

That is why tailoring educational content for mobile devices like smartphones is important. To do so it is necessary to create incentives for developers to work in these solutions and encourage the development of platforms and software that can be perfectioned in time with self-declared needs from the educational community such as added content and in local languages- important for communities with Indigenous languages-. In this sense, the Ministry of Education in its technology department should stablish the standards for a mobile hardware and software that aims to create E-Learning platforms and content.[110]

Some of these regulations must consider that all content must be accessible even for kinds and young scholars with disabilities while ensuring gender equality access at the same time.

Developing strategies to provide equal access for all

When planning a comprehensive remote learning strategy-based on mobile devices and internet access it is fundamental to weave it with the digital development policy in the country.

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[109] Ibid. UNESCO, 2013.p.32.

[110] Ibid. UNESCO. P.33.

"Most mobile learning opportunities depend on reliable connectivity to the internet and other communication and data networks. As access to information becomes increasingly tied to economic and social development, governments should work with relevant industries to build and augment the technological infrastructure that powers mobile learning." [111]

UNESCO enlists three widely practiced models in the world for ensuring people have the hardware needed for mobile learning:

1) governments or other institutions provide devices directly to learners.

2) learners supply their own devices, commonly referred to as 'bring your own

device' or BYOD; or

3) governments and institutions share provisioning responsibilities with learners.[112]

In the specific case for Mexico, The CIU has proposed a series of incentives- like subsidies and credits to consumption- to promote both mobile devices acquisition and access to mobile data and broadband services that could be specially tailored for educational purposes and to benefit the poorest households.[113]

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[111] Ibid. UENSCO.p.35.

[112] Ibid. UNESCO.p.36.

[113] Available at: https://bit.ly/36LugHQ

4. CONCLUSIONS AND STRATEGIC RECOMMENDATIONS

After reviewing and analyzing the evaluation information available for *Aprende en Casa* program, some general comments and recommendations are:

- Mexico has a long history of ICT-related policies for education. This experience should be considered for developing hybrid/virtual education policies based on *Aprende en Casa* Program.
- A comprehensive evaluation of the *Aprende en Casa* program is necessary mainly for two reasons:
    - to understand the effectiveness of the program; and
    - to recommend improvements for hybrid/virtual education policy.
- A hybrid/virtual education policy can be implemented as
    - a complementary strategy where there are actual education services coverage, and as
    - an alternative to provide education services where there is no education services coverage through connectivity services and ICT devices access.
- Despite digital tools enabling two-way communication (unlike broadcast systems), the lack of access and coverage of internet services remain an important reason for students not accessing online content.
    - Authorities responsible for *Aprende en Casa* need to work and coordinate with public agencies developing and implementing connectivity programs, which are receiving more public funding according to the 2022 federal budget.
    - For *Aprende en Casa* to become a permanent program, it is important to promote the use of digital platforms. Relying on TV platforms is not the best response considering the limited impact of programs such as Telesecundaria.
- Despite the widespread access to smartphones and the intensive use of those devices for education purposes during the pandemic crises, *Aprende en Casa* did not manage to take full advantage of mobile tools.
    - A comprehensive policy to enable high-capacity smartphones/tablets for students is required, according to information from the ECOVID-ED, provided by INEGI.[114] Some policies could be:
        - Tax policy aimed at reducing consumers' cost can be established by considering smartphones/tablets exempt of VAT, together with

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[114] INEGI. *Encuesta para la Medición del Impacto COVID-19 en la Educación (ECOVID-ED) 2020*. (Mexico 2020). Available at: https://bit.ly/3loUYoZ

eliminating IEPS to education-oriented services provided through telecommunications networks.[115]

- ▪ Subsidies form government to promote adoption in targeted social groups. Subsidies could be channeled through the scholarship program known as Becas para el Bienestar Benito Juarez servicing students from basic, high school and higher education levels.[116]
- ▪ Low-cost public loans to promote adoption where government plays as joint guarantor. There are institutions that can provide low-cost credits to acquire smartphones such as Banco del Bienestar or Fund for the Promotion and Guarantee for Workers' Consumption (Fondo de Fomento y Garantía para el Consumo de los Trabajadores or FONACOT).[117]

- o Promote smartphones/tablets sharing schemes for students in public schools, for them to gain access to these devices to fulfill their education activities in a hybrid/virtual learning environment.
- o *Aprende en Casa* contents require to be adapted to mobile tools considering international experience since these technologies are widespread.
- o It is necessary to create mobile learning policies *as well as to develop* teachers and students' training through mobile platforms and technologies to effectively use ICT devices.
- o Design mobile learning resources such as video games, educational videos, platforms, etc.
- o Create and promote the use of public internet access points suitable for students located in municipal seats or localities with connectivity coverage, and internet access points equipped with devices jointly financed and managed by the local and federal governments.
- o Reverse data billing schemes financed by the Shared Network (Red Compartida) for educational purposes.

- • Explore new education curricular or non-curricular contents related to coding for Aprende en Casa. Coding is a fundamental tool with high demand in today's job market.
- • *Aprende en Casa* program requires more investment on developing ICT related skills among teachers:

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[115] The Competitive Intelligence Unit (The CIU). *Enhancing Smartphones Adoption in Mexico: Incentives for an Essential Activity.* 2021. Available at*: https://bit.ly/3yDvbs9*
[116] *Id.*
[117] *Id.*

- o Reported government spending and federal budget information from 2020 to 2022 do not show an improvement on resources for developing skills among teachers.
  - o *Aprende en Casa* estimated cost in 2020 accounted for 1.3% of the total cost of federal education funds. For 2021, Colombian authorities planned a budget to strength learning at home activities that accounted for 0.4% of the entire education budget[118], while US investment in public education for students between kindergarten and 12 grade (k–12) accounted for 2% of the education funding.[119]
- *Aprende en Casa* contents can acquire regional perspective by working with other countries' education authorities:
  - o A connectivity policy can benefit from States' perspective by helping federal government targeting priority connectivity municipalities or localities, complementing the Shared Network project, which offers access to the infrastructure and capacity of wholesale telecommunications services.
- Most of LatAm countries analyzed in this paper shared similar problems regarding the implementation of a hybrid/virtual education strategy.
  - o LatAm countries can collaborate on stablishing permanent hybrid/virtual education strategies to share lessons learned and pave the way for policies aimed at tackling education coverage problems. These collaborations can be in the framework of different multilateral organizations such as Alianza del Pacífico or the OECD group.

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[118]Ministerio de Educación Nacional. Published in "El Tiempo" (2020): *Presupuesto más alto en la historia de la educación*. Available at: https://bit.ly/3eG83Cv

[119] Learning Policy Institute. *COVID-19 and State Education Budgets: The Story behind the numbers (2020). Available at: https://bit.ly/3SnYnup*

5. ANNEX A. OTHER LATAM COUNTRIES EXPERIENCE

Costa Rica

In Costa Rica, the measures taken for educational continuity consisted of generating digital content, physical and social network material and through radio and television through the "*Aprende en Casa*" strategy. The strategy provided orientations, specific guides, and support resources to the national educational community.[120]

The Ministry of Public Education generated specific and contextualized actions for virtual learning, addressing various scenarios, among them: students with Internet access and a device at home, students with a device and reduced or limited Internet access, students with technological devices and no connectivity, and students with neither technological devices nor connectivity.[121]

It was also one of the few countries in Latin America that used live learning as a modality.[122] That is, lessons transmitted live in real time, face-to-face. Typically, Latin American countries preferred the use of asynchronous learning, that is, lessons that are pre-recorded and broadcast on different platforms; The reason can be because broadcast learning has more possibilities of reaching a bigger number of people.

Costa Rica's SIGEDs show that it was not prepared for the crisis, with significant problems of Digital Platforms and Virtual Tutoring and lack of connectivity in schools, although it had a good central repository of digital content.[123] This may explain the different approaches to the strategy. In Costa Rica, the percentage of 15-year-old students who had access to internet connection at home was approximately 83%, 73% those who had access to a computer at home and 39% those who had access to educational software at home.[124]

Dominican Republic

The Ministry of Education of the Dominican Republic made available tools, resources, and contents to support learning during the temporary suspension period due to the COVID-19 pandemic. The resources consist of 'Educando', an education portal with resources and

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[120] Katherine Diaz, Ministerio de Educación Pública (MEP), Gobierno de Costa Rica (2021). Available at: https://bit.ly/3BYxiXd

[121] *Ídem.*

[122] ECLAC-UNESCO, Education in the Time of Covid 19, ECLAC-UNESCO, 2020, 3. Available at: https://bit.ly/3FVautT

[123] Álvarez Marinelli, Horacio, et. al., Education in times of Coronavirus: Latin America and the Caribbean's education systems in the face of COVID-19, Inter-American Development Bank, 2020, 10. Available at: https://bit.ly/3DRroHH

[124] ECLAC-UNESCO, Education in the Time of Covid 19, ECLAC-UNESCO, 2020, 6. Available at: https://bit.ly/3FVautT

curricular content; 'EduPlan', a pedagogical support planning system with curricular sequences, digital resource sheets and didactic proposals, designed to allow teachers to program activities, plan classes and evaluation instruments; and 'IQ.EDU.DO, a proposal to support students in the learning process and prepare them for the National Tests.[125]

The SIGEDs of the Dominican Republic show important problems in all digital conditions, they were not prepared for the continuity of online schooling.[126] In the Dominican Republic, the percentage of 15-year-old students who had access to an Internet connection at home is approximately 78%, 44% the ones who had access to a computer at home and 27% the ones who had access to educational software at home.[127]

Panama

To address education during the pandemic, Panama opted to offer live classes - something uncommon in public education in Latin America - and the government enabled a virtual platform for teachers and students to retake the lessons called: 'Educa Panama'. Nevertheless, the problem with this strategy was the lack of access to Internet.[128]

Panama's SIGEDs reflect, as the Dominican Republic, serious problems in all digital conditions.[129] The percentage of 15-year-old students who had access to internet connection at home in 2018 in Panama was approximately 68%, 60% those who had access to a computer at home and 29% those who had access to educational software at home.[130]

Peru

Instead of using resources they already had, - there were resources from the 60's of radio lessons but they were abandoned due to economic and political crises - the country decided to first use resources from Argentina and Mexico and then create its own televised educational system from scratch.[131] The platform that the Ministry of Education of Peru

[125] Ministerio de Educación de República Dominicana, *Espacio Virtual de Soporte para Educación No-presencial*, 2021. Available at: https://bit.ly/3B7V7e1

[126] Álvarez Marinelli, Horacio, et. al., Education in times of Coronavirus: Latin America and the Caribbean's education systems in the face of COVID-19, Inter-American Development Bank, 2020, 10. Available at: https://bit.ly/3DRroHH

[127] ECLAC-UNESCO, Education in the Time of Covid 19, ECLAC-UNESCO, 2020, 6. Available at: https://bit.ly/3FVautT

[128] Forbes Staff, "La pandemia lleva al límite a la educación pública de Panamá", Forbes Centroamerica, 2020. Available at: https://bit.ly/3aQhCJF

[129] Álvarez Marinelli, Horacio, et. al., Education in times of Coronavirus: Latin America and the Caribbean's education systems in the face of COVID-19, Inter-American Development Bank, 2020, 10. Available at: https://bit.ly/3DRroHH

[130] ECLAC-UNESCO, Education in the Time of Covid 19, ECLAC-UNESCO, 2020, 6. Available at: https://bit.ly/3FVautT

[131] Benjamin Mueller, "La educación por televisión vive un auge por la pandemia del coronavirus", New York Times, 2020. Available at: https://nyti.ms/3jenMry

made available to students is called Aprendo en Casa and contains content for the different grades for students, teachers and family members.[132]

Peru's SIGEDs show that it was more prepared than other Latin American countries, however, with connectivity problems persisting.[133] The percentage of 15-year-old students who had access to internet connection at home in 2018 was approximately 57%, 53% those who had access to computers at home and 28% those who had access to educational software at home.[134]

Uruguay

Uruguay had the advantage of having the technological infrastructure developed in the Ceibal Plan from 2006, which allowed it to respond more immediately to the pandemic, although with the difficulty of reaching remote populations with limited Internet connectivity. The Ceibal Plan was a government initiative that consisted first, in providing a laptop to each student in public schools[135]. Afterwards, the CREA virtual learning platform was created, which has interaction between students and teachers, with a virtual classroom that can be used by each teacher. This platform was used during the pandemic[136].

It is the only country that had good digital base conditions of the SIGED.[137]The percentage of 15-year-old students who had access to internet connection at home in 2018 was approximately 87%, 82% those who had access to a computer at home and 41% those who had access to educational software at home.[138]

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[132] Aprendo en Casa Website. Available at: https://bit.ly/3jhocKL

[133]Álvarez Marinelli, Horacio, et. al., Education in times of Coronavirus: Latin America and the Caribbean's education systems in the face of COVID-19, Inter-American Development Bank, 2020, 10. Available at: https://bit.ly/3DRroHH

[134]ECLAC-UNESCO, Education in the Time of Covid 19, ECLAC-UNESCO, 2020, 6. Available at: https://bit.ly/3FVautT

[135]País, Ana, "Coronavirus: 4 países de América Latina que lograron aplicar estrategias exitosas de educación a distancia ante la pandemia", BBC News, 2020. Available at: https://bbc.in/3DYJGqS

[136] Plan Ceibal, CREA website. Available at: https://bit.ly/3C1aAh1

[137]Álvarez Marinelli, Horacio, et. al., Education in times of Coronavirus: Latin America and the Caribbean's education systems in the face of COVID-19, Inter-American Development Bank, 2020, 10. Available at: https://bit.ly/3DRroHH

[138]ECLAC-UNESCO, Education in the Time of Covid 19, ECLAC-UNESCO, 2020, 6. Available at: https://bit.ly/3FVautT

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