

Techno-Educational Conditions in Mexico Before and During the Pandemic: Moving Towards the Necessary Consolidation of a Digital Education Agenda

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This article provides a contextualization of the conditions prior to the pandemic in the Mexican educational system, in particular the programs and educational technologies implemented by the authorities to provide continuity of learning. With this, the actions and mechanisms of students and teachers in the use of information, communication, knowledge and digital learning technologies for the use of multimedia and interactive content are identified. From there, the strategies to provide schools and students with computers, laptops and tablets and Internet connectivity are considered. The results of the research provide a glimpse of those actions that are part of the necessary consolidation of a Digital Education Agenda.

Keywords: Mexico, Digital Education Agenda, National Education System, Emergency Remote Education, learn at home, tv and online

INTRODUCTION

The SARS-CoV-2 Pandemic (COVID-19) brought to the center the questioning of the installed capacities of the educational systems to face the consequences generated by the social distancing measures, which led to the closing of schools at all educational levels and the implementation of actions to provide continuity of learning measures, these actions were mostly focused on the use and exploitation of Information and Communication Technologies (ICT) as a central component to mediate the teaching-learning processes during the pandemic.

From this perspective, the Mexican Educational System (SEN or MES) is made up of students, teachers, and parents, all of them understand the integration and articulation in legal frameworks, budgets, models, plans, and programs, as well as infrastructure. All these components were concentrated on the techno-educational bases and conditions of the MES to face the greatest challenge left by the pandemic in education: measures for the continuity of learning, in the context of social distancing restrictions.

The measures for the continuity of learning initiated and embraced by the educational authority questioned the reevaluation of the use and exploitation of technology in the technological components of infrastructure, the digital competence of teachers (Marín, 2015), the coverage and equity of telecommunications and internet services, as well as the political models and management programs that were developed for the processes of technological mediation of learning.

It is estimated that in the world, during the month of May 2020, at the most critical moment of the pandemic, around **1,134,916,281** students had their studies interrupted, in **117** countries that carried out national school closures, which represented almost 72% of the total number of students enrolled (UNESCO, 2021). This led education systems to take actions to guarantee the academic continuity of learning processes at all levels of education, thus initiating the implementation of actions that implied the organization of “Emergency Remote Education (ERE)” projects (Ibáñez, 2020).

In Mexico, in 2020, the “Learn at Home” strategy was established as an initiative to integrate educational intervention actions for the continuity of learning through the use of technological and computer media, mainly through a combination of printed materials, television, radio, and technological platforms. But Mexico did not start from zero in terms of existing capabilities and experience in the educational use of ICTs; more than fifty years date back to the institutional background in this area. As part of the development of policies in this field, the 2019 educational reform modified the General Education Law, which determined the recognition of technology in educational processes, legally incorporating the establishment of an Educational Digital Agenda as an integrating and planning instrument for public policies on the use of information, communication, knowledge and digital learning technologies (TICCAD) in the National Educational System (SEN) (SEP, 2020)

This chapter will document the dimensions, characteristics, and results of the Learn at Home strategy, highlighting the institutional techno-educational conditions in terms of history, conformation, and management in the use and exploitation of technology in education that led as a result to the systematization of actions for the continuity of learning, taking into consideration the institutional strengths and their contexts to evaluate the frameworks of action that will be decisive for the establishment and strengthening of a Digital Education Agenda, according to the established legal mandates.

With this, the main questions that characterize this chapter seek to contribute components and approaches that strengthen the analysis and the installed experience on the techno-educational conditions in the National Education System to go deeper into the following questions: What have been the main infrastructure actions to incorporate technology in the educational processes; how was the “Learn at Home” strategy systematized in the face of the challenges of the social distancing measures; what were the first results of this strategy; and finally, how to move towards the consolidation of a Digital Education Agenda?

To address the dimensions, characteristics, and results of the measures and actions established in the Learn at Home strategy, four elements of analysis will be developed in this chapter, taking as sources of information the different studies, reports, and official and academic documents to determine the impacts and management paths compared to the institutional frameworks set up to guide and conduct the educational technology management processes. The components will be developed and analyzed in the following sections:

1. History of infrastructure and management capacity in the use and exploitation of technologies to attend Emergency Remote Education (ERE).
2. The capacity and scope in the establishment of the Learn at Home strategy 1- 11- 111.
3. The scope and results of the Learn at Home strategy for the National Education System.
4. Conclusions: The institutional dimensions of the Learn at Home strategy towards the strengthening of the Digital Education Agenda.

Mexico showed the capacity to be responsive in integrating a strategy that would showcase its management capacity in educational technology: it integrated programs, strengthened the network of public and private media to provide television coverage of the programs broadcast, and developed content, platforms, and radio programs, among others. All these experiences should not go unnoticed by society in general and mainly for our educational system, it is necessary to systematize and retake the articulating role to analyze the elements of the Learn at Home strategy to develop policies, resources, plans, integrated in a Digital Educational Agenda.

HISTORY OF THE INFRASTRUCTURE AND MANAGEMENT CAPACITY IN THE USE AND EXPLOITATION OF TECHNOLOGIES TO PROVIDE EMERGENCY REMOTE EDUCATION (ERE)

In Mexico, programs and projects have been developed that have sought to incorporate Information and Communication Technologies in the teaching and learning processes. The history of educational technology and informatics has been extensive, and projects, contents, and infrastructure have been developed to support the different educational levels.

Undoubtedly, one of the most emblematic projects in which Mexico is recognized is the Telesecundaria model, created in 1968 by Bachiller Álvaro Gálvez y Fuentes, a model that over the years was strengthened with the development of satellite infrastructure. Today, this model still has 1.3 million students, and more than 72 thousand teachers distributed in 18 thousand schools (SEP, 2020). This emblematic project has its strengths in the management and development capacity of its educational programs, as well as in its Edusat Network infrastructure. The obsolescence and lack of technological investment by federal and state authorities show the current weaknesses, mainly with the transmissions of the Edusat Network and the hosting capacity of the schools (televisions and encoders), the strength of the model is in its contents (educational materials and television programs) and in its community approach.

The use and incorporation of computers in educational processes is not something new in Mexico, its origins date back more than 30 years with the “Red Escolar” project, through the program “Computación Electrónica en la Educación Básica” (COEEBA), and since then a variety of educational programs have been adopted focused on the introduction of computers in education, both in basic and higher education, and even in some cases, as an effort to promote the digital literacy of the population in general.

These experiences in the use of ICTs date back to the following programs:

- **“Red Escolar”**: In the early nineties, the SEP and ILCE jointly developed the School Network program as a model based on the use of Educational Computing and the support of Television, mainly through Internet connection and the Edusat Network. Its purpose was to provide Basic Education Schools with a flexible technological model (media classrooms) as a tool to strengthen the teaching-learning processes of teachers and students. “Red Escolar” designed a usage model based on the equipment of four to nine computers, a server, a printer, educational television reception equipment, a collection of reference CDs, and a telephone line to connect to the Internet, considering that the average number of students per group is forty. The students in a group attend the media room one or two hours a week depending on the number of groups in a school. The model promoted the use of electronic mail, participation in discussion forums, and the exchange of information to disseminate support materials, news of cultural activities, and other didactic materials. The pretext was the computer; the focus was on the development of research skills, confrontation of sources, writing, argumentation, and discourse in general, as well as the possibility of sharing experiences and points of view with other students and/or teachers. Since the important experience was the generation of materials and collections, it did not necessarily require technology, even a few computers could make a significant change.
- **Enciclomedia**: From 2004 to 2012, the project was known as Enciclomedia. This project made it possible to bring the computer to the regular classroom or to give students and their teachers access to classrooms, laboratories, or libraries equipped with this resource. It consisted of providing public elementary schools in different states of the country with classrooms equipped with a computer, a projector, an electronic blackboard, a power supply, a computer table, and a printer. The teachers in charge of the groups (the target population was fifth and sixth grade students) taught classes using these resources.

The digital contents (aligned to the curriculum and textbooks in force) were preloaded on the computer’s hard disk, so there was no need to connect to the network if this was not possible. The teacher was the one who operated the equipment, which was used for the preparation and presentation of lessons or to induce the completion of exercises and activities.

The official evaluations of the program were carried out by assessing student performance in subjects such as Mathematics, Spanish, Natural Sciences, and Geography, with samples of students and comparing the results between groups and schools that had or did not have access to Enciclomedia.

- **Digital Skills for All Program (HDT):** HDT began to be implemented in 2008 in high schools and was considered a continuity of Enciclomedia. Its objective was to provide elements of information management to accompany the educational process, inside and outside the school, to support students' learning, to broaden their competencies for life, and the development fundamental skills demanded by the knowledge society. It included three levels of educational portals: one at the federal, one at the state, and one at the local level, each with pedagogical resources aligned to the official curriculum.

HDT focused on fifth and sixth-grade students, and its equipment proposal consisted of installing telematic classrooms. In primary education, these classrooms operated in a 1 to 30 ratio, and in secondary education under the 1 to 1 approach.

The proposed equipment was a laptop or PC per student and one for the teacher, a projector, an electronic blackboard, learning objects for the educational level and access to connectivity. The HDT platform and implementation strategy were based on the fact that the users (teachers and school administrators) have basic computer skills, which would allow them to take advantage of the use of the resources and promote the development of digital skills.

- **Mi compu MX:** Starting in 2013, a strategy was proposed to provide laptops in Mexican public elementary schools under the model of the 1 to 1 approach. In compliance with the instruction of the Government of the Republic and Strategy 3.1.4 of the National Development Plan, which states: "Promote the incorporation of new information and communication technologies in the teaching-learning process". The objective of the educational policy was aimed at improving children's study conditions, updating teaching methods, strengthening teachers, revaluing public schools, and reducing the digital and social gaps between families and communities that are part of the country. Part of the lines of action of this strategy was to expand digital skills among students through pedagogical practices; create digital content aligned with curricular plans and promote the evaluation of these plans to incorporate the use of ICTs and incorporate them into teacher training as a tool for use and teaching. Unlike other initiatives where a loan scheme was contemplated, in this case, the computer was owned by the student and his or her family, similar to when free textbooks are granted. free textbooks. Upon receiving the laptop, the children and their families assumed responsibility for safeguarding the integrity of the equipment, which has a useful life of up to five years and can be used with or without Internet access. The device was delivered with preloaded educational materials, information leaflets, and user guides. The devices contained two types of content: multimedia resources and computer programs (free software was chosen). Multimedia educational materials were offered in different formats and languages, resources from SEP's digital materials collection, and governmental institutions. To support the implementation of the project, a PRIMARIA TIC web portal was designed.
- **Digital Inclusion and Literacy Program (PIAD):** This program sought to strengthen the educational system through the delivery of personal devices, and to give continuity to the MI COMPU.MX program, promotes the reduction of the digital divide and the use of ICT in the teaching-learning process, fostering interaction among the educational community, and strengthening the learning of students in public schools, to reduce educational backwardness. The devices delivered were owned by the students, which allowed the device to be for their personal use and that of their families. In addition, on October 31, 2014, the Decree of Creation of a decentralized body of the SEP for the design, implementation, and monitoring of the PIAD for the next subsequent school cycles was published in the Official Gazette of the Federation.

- @prende-Digital Inclusion Program (PID) 2016- 2017: As part of the continuity of PIAD, the Aula @prende 2.0 emerged as a project that sought to equip 1,000 schools through a project that sought to equip a thousand schools through contracted services, but only reached 65 classrooms in six states of the Republic due to complications with suppliers (SEP, 2020)

Other projects undertaken by the federal government to establish an educational offer through the use of technological resources for the different modalities of the National Education System were as follows:

1. Community Telebachillerato: This educational service emerged in the period 2013- 2014 as a pilot program to support coverage at the high school level, this modality was developed through the creation of television programs and printed materials, taking advantage of the infrastructure of the Telesecundarias, this modality is focused on communities with a population of less than 2,500 inhabitants. Currently, 143 thousand students are served in 3,304 educational centers throughout the country (SEP, 2021).
2. National Online Baccalaureate Service “Prepa en Línea”: Through an e-learning platform, the model is student-centered, based on competencies with a modular structure. For the 2020-2021 school year, 184 thousand participants attended 3 calls (SEP, 2021).
3. Open and Distance University of Mexico (UNADM): This project was born as part of the Open and Distance Higher Education Program (ESAD) in February 2009 and by 2012 it was consolidated by decree as UNADM (SEP, 2020). For the 2020- 2021 school year, 101,901 students were attended: 4,051 university technical college students, 96,033 undergraduate and engineering students, and 1,817 graduate students. graduate programs. The academic offer is composed of 23 undergraduate programs, 19 university technical programs and three graduate programs (SEP, 2021).

TABLE 1
EVOLUTION OF ICT MODELS AND EQUIPMENT – EDUCATION

Program	Encyclomedia	HDPT	Laptop for 5th and 6th grade students	PIAD	PID @prende
Target	Display textbook content in multimedia and interactive format.	To equip telematics classrooms as learning spaces for the development of life skills	Promote the use of computer tools to, reduce the digital divide.	Provide tablets with preloaded content linked to the plans of study	Provide students with tablets, and equip media classrooms to develop digital, creative, and critical skills.
Coverage	National	National	3 states	6 states	15 states
Scope	Students in 5th and 6th grade	Students in 4th, 5th and 6th grades of primary school and 1st, 2nd, and 3rd grades of secondary school.	5th and 6th grade students.	Students in 5th grade of primary school.	5th and 6th grade students A device

Infrastructure	One device for every 30 students.	Primary: one device / 30 students. Secondary: one device/ per student.	One device for every 30 students, in and out of the classroom.	Media room, one device for each student.	for each student, inside and outside the classroom. Media room
ICT Access	Teacher-centered approach.	Limited, in high school it encourages information.	Digital inclusion for families and students.	Promotes knowledge production.	Digital inclusion, family and students.
Device	Classroom equipment.	Classroom/computer.	Laptop	Tablets	Tablets / Classrooms 2.0
Monitoring	Help desk	Help Desk	Help Desk	Online and face-to-face	Help Desk
Direct Beneficiary	Docente is the means by which students interact with each other..	Teacher is the medium through which students interact	The student is the user of the information and is guided by the teacher.	The student is the center of knowledge production, the teacher is a guide.	Students and teachers The student uses the information directly, the teacher supervises.

Source: Based on information from Auditoría Superior de la Federación (2016- 2018) and SEP White Papers (2012-2018).

As can be seen, the experience in the different ICT-education equipment projects had different characteristics, objectives and scopes within the national education system, their approaches sought to equip through electronic devices and with Internet support (See Table 1), the investments for these projects were considerable in terms of resources allocated to the purchase and acquisition, only the Enciclomedia, PIAD and PID programs estimated a total expenditure of more than 30 billion pesos. Currently, the government does not have a computer and internet equipment program for schools in the educational system (See Table 1).

**TABLE 2
RESOURCES USED FOR ICT EQUIPMENT PROGRAMS 2008- 2018**

(Spending, classrooms and devices)			
	Enciclomedia¹ (2008- 2012)	PIAD² (2013- 2015)	PID- Aprende 2.0³ (2016- 2018)
Total program expenditures	24,009,694,500	5,840,474,400	301,082,884
Number of classrooms/devices delivered	147,096	1,938,313	25,757,164
Total 2008- 2018 exercised			30,151,251,784
1. Enciclomedia Program: ASF with information from SHCP. Public Account 2008- 2012. For only data from the Enciclomedia Program (2008-2012) were used for the calculation.			
2. Digital Inclusion and Literacy Program (2013-2015). ASF with information from the SHCP. Public Account 2008- 2012. Data from Laptops for 5th and 6th grade of primary school.			
3. Digital Inclusion Program- Learn 2.0 (2016-2018). SEP- White Paper Programa de Inclusión y Alfabetización Digital (PIAD), later called Programa de Inclusión Digital (PID).			

Source: Own elaboration.

THE CAPACITY AND SCOPE IN THE ESTABLISHMENT OF THE STRATEGY LEARN AT HOME I - II - III

In Mexico, since March 23, 2020, as a social distancing measure, it was decided to close schools for the entire Mexican Educational System (SEP, 2020) to prevent the spread of contagions. This was one of the most significant measures in the history of education in Mexico, since the right to education was affected by the closure of 261,101 public and private educational institutions, which provide educational services to 35.5 million students with the support of more than 2 million teachers (SEP, 2021). See Table 2.

**TABLE 3
TOTAL NUMBER OF STUDENTS IN THE SCHOOL SYSTEM AFFECTED
BY SCHOOL CLOSINGS**

Type, level and support	Students			Teachers	Schools
	Total	Women	Men		
Public	31,037,835	15,583,865	15,453,970	1,614,392	215,938
Private	4,550,754	2,385,700	2,165,054	448,151	45,163
Educationbasic	24,597,234	12,137,706	12,459,528	1,209,998	228,852
Public	22,203,400	10,951,723	11,251,677	1,036,645	197,843
Private	2,393,834	1,185,983	1,207,851	173,353	31,009
High school	4,985,005	2,562,983	2,422,022	408,267	20,943
Public	4,210,737	2,152,463	2,058,274	307,570	14,284
Private	774,268	410,520	363,748	100,697	6,659
Higher education	4,030,616	2,085,219	1,945,397	401,367	5,794

Public	2,881,605	1,435,048	1,446,557	246,049	2,349
Private	1,149,011	650,171	498,840	155,318	3,445
Training on-the-job	1,975,734	1,183,657	792,077	42,911	5,512
Public	1,742,093	1,044,631	697,462	24,128	1,462
Private	233,641	139,026	94,615	18,783	4,050
Total education system	35,588,589	17,969,565	17,619,024	2,062,543	261,101

Source: SEP (2020). Main Figures of the National Education System 2020- 2021

Faced with the problem of coverage and attention due to the magnitude of the national education system, the Ministry of Public Education, through its installed capacities, undertook the “Learn at Home” strategy as a project of academic continuity of learning for the elementary and high school levels, the project considered different phases as it was adapted to the contexts, contents and dissemination windows.

Learn at Home I

Learn at Home I began with the name Learn at Home on Television and Online (March 23 to April 17) developed during the first school break decreed. This initial coordination was carried out by the General Directorate of Educational Television (DGTVE), Channel Eleven Girls and Boys and the Public Broadcasting System of the Mexican State (SPR), the Latin American Institute of Educational Communication (ILCE) and the Network of Educational and Cultural Radio and Television Broadcasters of Mexico and the Public Broadcasting System (SPR).

In this first phase of the strategy, high school programs were broadcast on the DGTVE’s Ingenio TV signal and programs for the elementary level were transmitted on Channel Eleven Girls and Boys. Likewise, the following platforms were made available to students with Internet connection possibilities:

- <http://educacionbasica.sep.gob.mx>
- www.telesecundaria.sep.gob.mx
- <https://www2.aefcm.gob.mx/aprende-en-casa/index.html>
- www.librosdetexto.sep.gob.mx
- www.aprende.edu.mx

In addition, the SEP made available a teacher training offer through a catalog of Digital Competencies for Teachers of the National Education System on the following website:

- <https://formacionycapacitaciondigitales.televiseducativa.gob.mx/>

After the school break and the Easter 2020 holiday period, on April 20 the strategy adopted the name “Learn at Home”, which combined the coordinated efforts of different SEP Undersecretariats and Directorates to integrate five components of the strategy, considering contents for the basic and upper secondary school levels:

1. **Printed materials (free textbooks):** The SEP distributed during 2020 about 189 million books through the National Commission of Free Textbooks (Conaliteg). The books were made available in digital format in the portal <https://www.conaliteg.sep.gob.mx/>. Additionally, Conaliteg developed a mobile application to consult the books on Smartphones.
2. **Educational Television:** Television was one of the most significant elements in the Learn at Home strategy. During this stage, the production of programs was consolidated in coordination between the SEP and Canal Once Niñas y Niños, as well as the dissemination of content through a production model for the generation of 1,232 programs aligned with the study plans and programs and the Free Textbooks for preschool, elementary, middle and high school levels. The production was organized as follows: Preschool 8 subjects; Primary 10 subjects; Secondary 12 subjects; and, Higher Secondary Education 6 areas of knowledge.

3. **Educational radio:** In order to provide an additional coverage alternative to the strategy in those places where television has no coverage, actions were undertaken to use radio stations, coordinated by the Mexican Radio Institute (IMER), for which 516 radio programs were generated in 22 indigenous languages.
4. **Educational materials and telephone support:** In addition to the delivery and distribution of free textbooks, workbooks of the National Council for the Promotion of Education (CONAFE) were distributed in 31 states. In addition, 167,000 workbooks were distributed to high school students without Internet access as part of the Jóvenes en Casa (Youth at Home) program. In addition to this strategy, the “Educatel” telephone service was set up for academic, pedagogical and psychological counseling.
5. **Digital educational platforms:** Content was updated and the following platforms were created:
 - www.aprendeencasa.sep.gob.mx.
 - www.aprendeencasa.mx
 - www.televisioneducativa.gob.mx
 - www.aprende.edu.mx
 - www.jovenesencasa.sep.gob.mx
 - www.tripulantes.sep.gob.mx
 - www.nuevaescuelamexicana.sep.gob.mx
 - www.prepaenlinea.sep.gob.mx
 - www.unadmexico.mx

During this period, actions in teacher training stood out, mainly focused on digital competencies, most of these actions were carried out in the virtual modality, through isolated programs of short duration in collaboration with strategic public and private partners such as Google and Microsoft.

At the end of the school year (June 5, 2020), SEP initiated an educational program for the summer school break, called “Fun Summer”, which started began broadcasting on the public television channels that broadcast Aprende en Casa (Learn at Home). The programming consisted of cultural and recreational content for the vacation period (SEP, 2020).

At the higher education level, the National Association of Universities and Institutions of Higher Education (ANUIES) carried out the following actions:

1. First national workshop for the Digital Education Agenda: The social role of Universities in the Digital Transformation (Valls, 2020).
2. COVID-19 Action Guidelines for Higher Education Institutions (ANUIES, 2020).
3. Collaborative Agenda. For the digital transformation of education (ANUIES, 2020).
4. Models of continuity of educational services in the context of an emergency and its stages and crises.
5. Teacher training through the website: <https://espaciODOcente.mx/>

In connection with the first national workshop for the Digital Education Agenda, more than 60 institutions of higher education were organized in 3 working groups with the following activities and objectives:

- **Discussion Table 1: Teacher training and updating in digital skills, knowledge and competences:**
 - Strengthen teaching programs for the development of digital skills.
 - Create collaborative academic offerings among HEIs: diploma courses and MOOCs in the field of technology-mediated use.
 - Consolidate professional certification programs for experts in educational technology.
- **Discussion Table 2: Digital educational resources for access to open knowledge:**
 - Develop a program to strengthen the quality of digital educational resources.

- Generate a program for the certification of distance education experts.
 - Create a program for the universal and accessible design of digital educational resources.
- **Discussion Table 3: Research, innovation and new professions in the digital environment**
- Consolidate a system of indicators in Educational Technology, linked to lifelong learning.
 - Create alliances with CONACYT and companies for applied research programs.
 - Develop a bank of best practices.
 - Create open knowledge repositories.

Similarly, ANUIES in coordination with SEP, published the document “Guidelines for action COVID-19 for higher education institutions” in which they determined the alignment of agreements of the National Council of Educational Authorities (CONAEDU), in coordination with the Ministry of Health regarding COVID-19 on the recommended measures for each higher education subsystem.

The “Collaborative Agenda. For the digital transformation of education” was established as a guiding document for the establishment of a framework for the alignment of policies and programs between higher education institutions, research centers, government agencies, and associations around the development of actions for the digital transformation of education. The agenda determined eight lines of action (ANUIES, 2020):

- Basic educational model for digital transformation
- Regulations
- Educational innovation
- Connectivity, security, and technological infrastructure
- Educational technologies, information resources, and digital services
- Educational Quality
- Academic cooperation, internationalization, and linkages
- Training, coverage, and inclusive digital culture.

Likewise, the work “Modelos de continuidad de servicios educativos ante un contexto de emergencia y sus etapas y crisis” (ANUIES, 2020) systematized the contexts of pandemic emergency in school management, considering elements such as communication, community, autonomy, legality, knowledge, competence, innovation, and health.

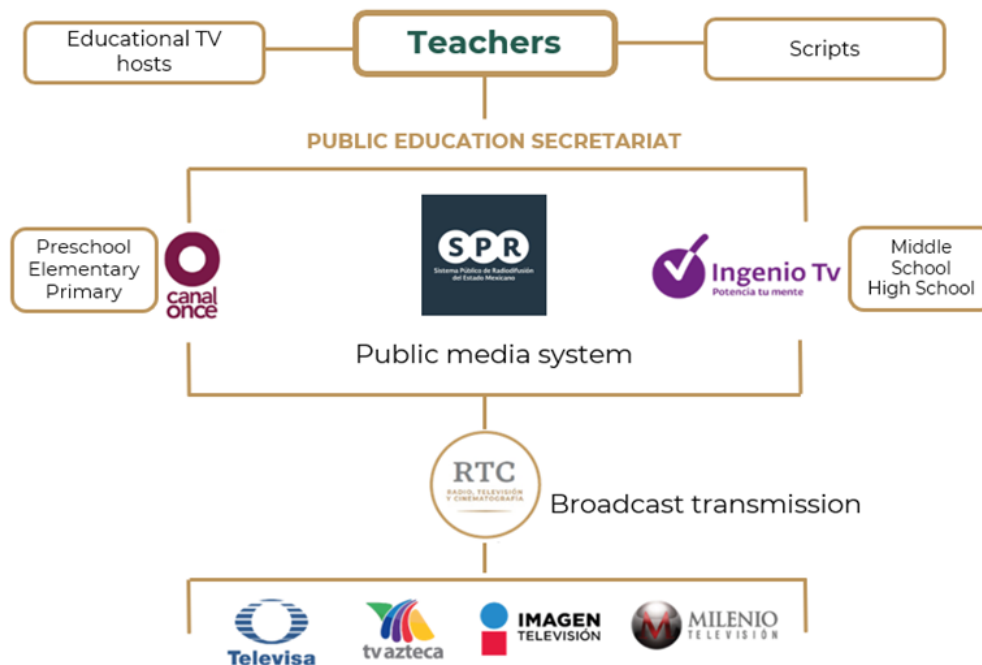
Learn at Home II and III

On August 24, 2020, the “Learn at Home II” program began, which took up again the components of “Learn at Home I”. In this stage, a reinforcement of the pedagogical elements of the strategy was sought, considering the following elements (DOF, 12/28/2020):

- Prioritize the formative role of assessment.
- Inquire from a variety of sources to obtain information about learning and employ complementary strategies.
- Assess progress based on the starting points of each learner.
- Consider the specific conditions in which each learner develops in the health contingency period.
- Assign grades only in cases where the teacher has sufficient information.
- Use assessment to improve learning.

Another element of relevance in this stage is focused on the increase in television signal coverage through the signing of an agreement between the federal executive, the SEP, and the main private television networks to rebroadcast the contents of the Learn at Home II program, thus increasing the potential audience, together with the collaboration of the Public Media Network in the states. See Figure 1.

FIGURE 1
DISTRIBUTION SCHEME OF THE LEARN-AT-HOME SIGNAL II






Source: DGTVE (2020).

Another characteristic of this phase was the incorporation of the subjects of Healthy Life and Civic and Ethical Education for the primary grades; for the upper secondary level, television programming was developed in six areas of knowledge (SEP, 2020):

1. Healthy Living
2. Education and digital knowledge
3. Social, Civic, and Ethical Responsibility
4. Mathematical Thinking
5. Communication
6. Historical Awareness

The components of the program Aprende en Casa III (Learn at Home III) were placed in the eventual return to face-to-face activities, for which teacher training actions were carried out in coordination with the Ministry of Health. The courses were implemented from the portal of the Mexican Social Security Institute on basic health measures for the eventual return to face-to-face activities. In this stage of the program, a mixed education system was considered with a combination of face-to-face and distance classes, following the traffic light schemes for the reopening of schools. It is worth mentioning that, in this phase, educational activity is decreed as essential for the resumption of face-to-face activities in an orderly and responsible manner (DOF, 2021). See Figure 2.

FIGURE 2
EVOLUTION AND CHARACTERIZATION OF THE LEARN AT HOME STRATEGY

Learn at Home I March-June 2020	Learn at Home II August-December 2020	Learn at Home III January-June 2021
 <p>-Use of existing, donated, and adapted materials selected by SEP.</p> <p>-Inclusion of the Radiophonic strategy for indigenous communities.</p> <p>-Inclusion of CONAFE and EDUCATEL.</p>	 <p>-The Strategy is articulated in two components: distance education offers and pedagogical action for teachers.</p> <p>-Coverage was expanded with private television and radio stations.</p> <p>-Radio programs were expanded to 22 indigenous languages and workbooks were distributed.</p>	 <p>-Combines face-to-face and distance classes for green light states.</p> <p>-Continues with the same educational components of Learn at Home II.</p>

Source: Based on (CONEVAL, 2020).

THE SCOPE AND RESULTS OF THE LEARN AT HOME STRATEGY FOR THE NATIONAL EDUCATION SYSTEM

Considering the results of the Learn at Home strategy from an institutional perspective entails analyzing the coverage and quality of the actions carried out by the national education system to maintain and provide continuity of learning. In terms of coverage, one of the main questions is determined by educational equity, since the digital divide, the lack of accessibility to telecommunications, and the contrasting socio-economic conditions were determining factors for the strategy to have the expected results.

Unquestionably, the government acted quickly to close the schools and establish forceful measures of social distancing and thus guaranteeing the health of around 37 million people who actively participate in the Mexican Educational System, without a doubt the institutional and response capacity was significant, although showed elements of lack of equity and quality in the contents, mainly in the evaluation schemes of learning through technological mediation processes.

In terms of quality, the challenge will be the evaluations aimed at terminal learning outcomes in each educational cycle and level, since the lack of mechanisms for the evaluation and monitoring of students speaks of loss or weakness in the acquisition of knowledge, due to the result of emergency remote teaching. UNESCO (2021) alone revealed that an average of two-thirds of the academic year is lost worldwide due to COVID.

Some of the results in the institutional components of the Learn at Home strategy:

1. **Television:** Learn at Home's television reach was obtained through the overall average television audience for 15 months, which was 8.5 million viewers per week. Peak viewing hours were 9:30 am and 4:30 pm. By gender, women predominated (54%) and by age group, the majority were girls and boys from 4 to 12 years old (52%) (SEP, 2021).

Although the results and scope of coverage were broad, mainly thanks to the alliance of public and private media to join the broadcasting of the programs, according to Nielsen Ibope polls (2021) for educational levels are focused on:

- Primary: represented 43.4% of the audience in children between 6 and 11 years old, which identified that 2.4 million children watched at least 5 minutes of primary content.
 - Secondary: represented 45.6% of the audience in adolescents between 12 and 14 years old, which identified 4.8 million people who on average spent 43 minutes watching the programs.
 - High School: represented 74.74% of the audience in young people between 15 and 17 years old, which meant 2.7 million people who on average spent 9 minutes watching content.
 - In terms of production, according to SEP (2021): 5,170 TV programs were produced and broadcast; 95 bilingual TV programs were made in 18 indigenous languages. An element of inclusion was the incorporation of Mexican Sign Language interpreters in all TV programs that were broadcasted on open television. A total of 91 teachers from 19 states participated in the television production process.
2. **Radio:** A total of 594 programs, 60 physical activation capsules, and 130 musical backgrounds were produced as inputs for the production of the radio versions of the programs. production of the radio versions of the programs. Radio transmissions were made through 18 stations in 15 states of the country and 31 indigenous languages. In this area, there was no follow-up or studies of the impact or coverage of the radio programs.
 3. **Internet:** In this area, the SEP mainly documented the number of visits to the main portal for the consultation of online content, among which the following are noteworthy:
 - www.aprendeencasa.sep.gob.mx with more than 533 million visits from 13.5 million users generating 117 million sessions.
 4. **School dropout:** According to the information analyzed and INEGI data (2020), the dropout population is around 5.2 million students who could not enroll in the 2020-2021 school year due to causes related to COVID-19, mainly in the primary and secondary levels, the latter being the most affected. For its part, the SEP (2021), refers to the following dropout indicators:

**TABLE 4
DROPOUTS 2020-201 (PRELIMINARY NUMBERS)**

Educational level	Total enrollment	Percentage of school dropouts rate
Primary	13,862,321	0.4%
Secondary	6,407,056	4.2%

Source: General Directorate of SEP, with preliminary data.

In this dropout item, both INEGI (2020) and Fundación SM (2020) documented the main causes of dropout because of COVID-19, identifying that loss of contact with their teacher (or) was the main cause (28%).

5. **Vulnerability and family environments:** The Comprehensive System for Children and Adolescents (SIPINNA) reported problems in family environments, mainly due to violence, teenage pregnancy, homicides, and injuries (SIPINNA, 2021).

CONCLUSIONS

The Institutional Dimensions of the Learn at Home Strategy About the Strengthening of the Digital Education Agenda

The 2019 Education Reform concentrated in Article 3 of the Constitution of the United Mexican States, determined in a transcendental way in the legal mandate of the establishment of the Digital Education Agenda:

“The Ministry will establish an Educational Digital Agenda, which will direct the models, plans, programs, initiatives, actions and pedagogical and didactic projects, which will allow the use of information technologies, communication, knowledge, and digital learning.” (SEP, Ley General de Educación, 2019.)

This agenda considers five guiding axes (SEP, 2020), through which the components and dimensions of the Aprende en Casa strategy will be analyzed, identifying institutional management and impacts, as well as areas for improvement and action to strengthen the actions of the Digital Education Agenda:

1. **Teacher training, updating, and professional certification in digital skills, knowledge, and competencies:** Although significant efforts have been made to provide training to SEN teachers, in alliances with Google and Microsoft, as well as through the establishment of a Digital Competencies Catalog, through the development of short courses, it is still necessary to validate these training processes in the teaching career system to gradually build a permanent training system in the use of digital teaching skills considering the different educational levels and models.
2. **Building a digital culture in the SEN: digital literacy, inclusion, and citizenship:** One of the central components faced by the educational community was the digital skills of both learners and teachers. It is necessary to gradually incorporate the use of ICTCAD in formal processes (plans and programs) to gradually determine the didactic elements that would provide digital skills, in areas such as usability, security, and competencies.
3. **Production, dissemination, access, and social use of digital educational resources for teaching and learning:** Most of the educational resources produced in the Learn at Home strategy were focused on television and radio. It is necessary to rethink the management of production, as well as the use of devices such as the internet, radio, and podcast. It is also necessary to strengthen the guidelines in the production of Digital Educational Resources to promote a degree of professionalization and validation of the resources as components of the teaching-learning processes.
4. **Connectivity, modernization, and expansion of the TICCAD infrastructure:** Undoubtedly, connectivity and internet access are elements that should be incorporated as a government society in the coming years. In 2019 alone, only 43% of elementary schools had computers and internet and 70.3% of high schools had them (INEE, 2019). These experiences of COVID-19 and Learn at Home can be significant to reevaluate the technological convergence in the use of radio, television, and the internet, adapting content and infrastructure to the social contexts of schools. This implies the development of new elements focused on multiplatform and mainly, reconsidering radio and telephone as important means of coverage and communication. It is important to highlight the digital gaps that exist in Mexico, considering that the urban population has an average of 78.3% Internet access, while in rural areas it is barely 50% in the coverage areas.
5. **Educational digital research, development, innovation, and creativity:** Throughout the contingency period, many public and private institutions and organizations carried out actions to systematize information on the effects of Covid-19 on education. This research will be fundamental for decision-making in the improvement and rethinking of the SEN teaching-learning processes. The role of universities and research centers will be important for the

Digital Education Agenda to integrate components of R&D (Innovation, Research, and Development), located in a social intervention model to support the formation of the Digital Society. It is worth mentioning that on April 20, 2021, the General Law of Higher Education was published, which determined the legal components for universities to integrate and participate in the Digital Education Agenda (SEP, 2021).

With the above, the experience with the Learn at Home strategy and the development of a Digital Agenda in the education sector made clear the weaknesses and strengths of the National Education System in terms of techno-educational conditions in terms of their management and use, As well as identifying the accessibility components in social inequalities at all levels and educational modalities, it is necessary and fundamental that as a society we build long-term public policies to generate installed capacities, all in a systematized component and with the public and private participation of educational actors, supporting the legal elements provided by the Digital Education Agenda.

The history and development of the elements involved in the techno-educational conditions in Mexico were a fundamental component in providing a media-based strategy to provide coverage and continuity of learning to one of the largest educational systems in Latin America.

From this perspective, considering the components of Learn at Home were elements that determined the history of educational technology in Mexico. Although there were experiences that were based on infrastructure, content, and techno-pedagogical models, their experiences gradually generated the installed capacity to be able to promote a strategy of this magnitude.

Experiences such as Telesecundaria- Telebachillerato and other models that linked technology (mainly television) as a learning mediation process, gave the guideline to be able to locate the challenges and advances that society has in the commitment to digital education.

Other models such as Prepa en Línea and SEP's Universidad Abierta y a Distancia de México (Mexico's Open and Distance University), gave a view to the development of an infrastructure more in line with the new platforms and contexts in the face of the pandemic.

The challenges of connectivity and the digital divide for the education system in this pandemic, in the face of the abysmal features between sectors and urban areas, make clear the challenges of incorporating technology that will be components to face the post-pandemic challenges for the assessment of learning and the impacts that will be documented for the generations that will be facing the "new realities" of the return to face, hybrid, and online education.

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