September 2022

Building Better Education Systems in the Wake of the Pandemic

Ceibal

Content

Context

Uruguay.

Uruguay educational system.

Ceibal in the educational system.

Pandemic national education contingency plan

Ceibal at home

Infrastructure

Contents

Monitoring

Conclusions

Context

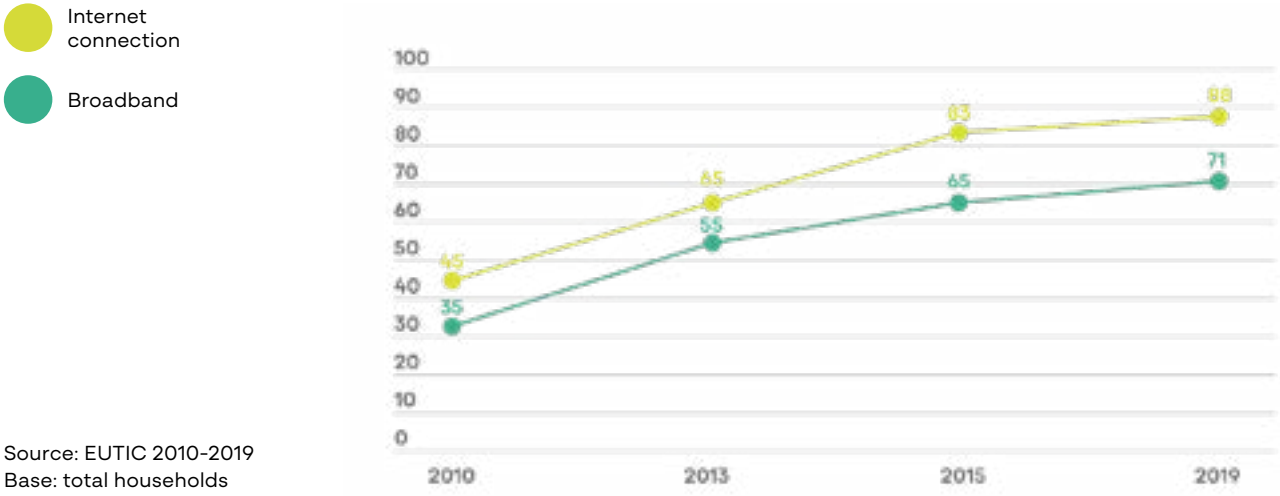
Uruguay

Uruguay (República Oriental del Uruguay) is located in the southern extreme of Latin America between Argentina and Brazil and on the Rio de la Plata and the Atlantic Ocean. Historically, livestock farming has been its main industry, but in recent years a number of novel industries have become more and more relevant; among them, the software industry. With a population of 3,500,000 people, it has the highest literacy rate in Latin America (UNPD, 2005). Politically, Uruguay has the strongest democratic system in the region -it ranks #15 in the democracy index 2020 report (The Economist Intelligence Unit, 2021), and is among the top five Latin American countries in terms of GPD (The World Bank, 2022).

Connectivity

Nine out of ten people have internet access in 2019, and its use increases significantly: 79% of the population connect daily.

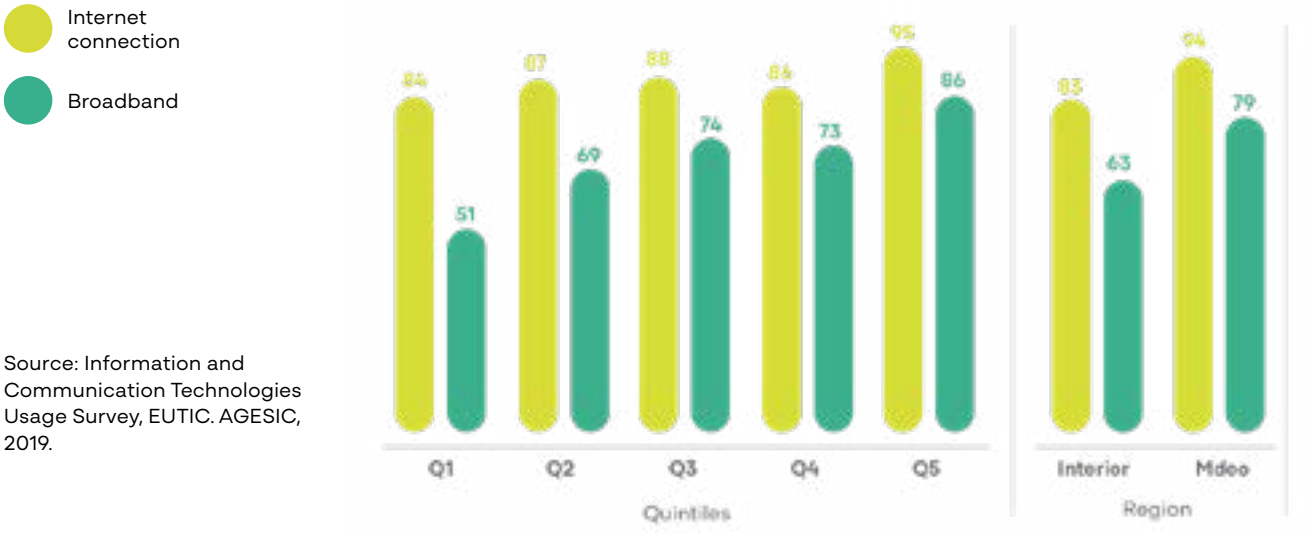
Figure 1 | Households internet connection and fixed broadband



Source: EUTIC 2010-2019
Base: total households

Internet access is widespread among households in the highest income quintile: 95% of these households have internet connection, and 86% have fixed broadband (Figure 2). Among lower income households, 84% have internet connection and 51% have fixed broadband.

Figure 2 | Internet connection according to income quintiles and region



Source: Information and Communication Technologies Usage Survey, EUTIC. AGESIC, 2019.

Percentage of people across the country.

Figure 3 | Access to PC, 2007:

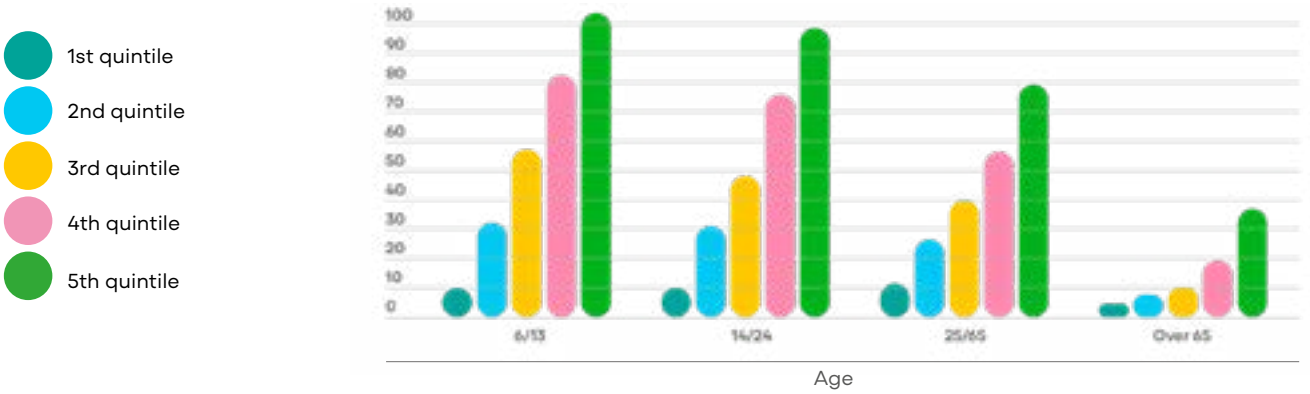
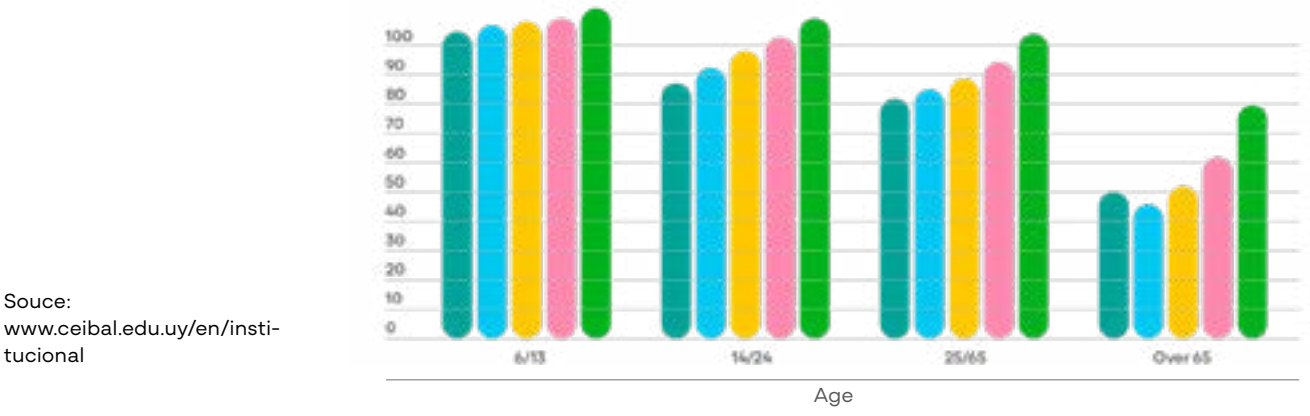


Figure 4 | Access to PC, 2016:



Souce: www.ceibal.edu.uy/en/insti-tucional

a. Uruguayan education system[1]

With 3.5 million people, school-aged children (4-17 y.o.) represent approximately 20% of the population. The Uruguayan education system includes fourteen years of compulsory education, and boasts the highest literacy rate in Latin America at 98% (Edelman & Fernández, 2010).

The Uruguayan education system is unique in that there are three primary institutional actors: the Ministry of Education and Culture (MEC), the National Public Education Administration (ANEP), and the University of the Republic (UDELAR). Unlike OECD-member countries, it is the autonomous ANEP, not the MEC, which holds the most power over public education, responsible for the establishment of Uruguay's education policies, administration, and teacher training (Hinostroza et al., 2011).

ANEP consists of the Central Governing Council (CODICEN) and 3 Directors (primary, secondary and vocational education) and 1 Council for governing the teacher education programs that cover different areas of the education system. However, their roles are not clearly defined. For example, while CODICEN coordinates the councils and is hierarchically superior, the councils act almost entirely autonomously, showing no coordination between them or with CODICEN. (Santiago et al., 2016).

b. Ceibal

The need to solve this issue may have contributed to President Tabaré Vázquez's decision to introduce the Ceibal reform through Executive Presidential Decree 144/007. Born out of the political will to merge technology and education, Ceibal responded to the "need to advance toward an information and knowledge society" (Mateo-Berganza Diaz & Lee, 2020 in Delso Segovia, et. al. 2022).

The Equity program for Access to Digital Information (PEAID) was launched in December 2006, based on the MIT non-profit organization, One Laptop Per Child (OLPC), which provided digital devices to address critical education gaps. Ceibal was subsequently created in 2007 to provide a laptop to every student and teacher in public primary education (Plan Ceibal & ANEP, 2011 in Delso Segovia, et. al. 2022).

Ceibal's theory of action is to promote "the integration of technology into education in order to improve learning and promote processes of innovation, inclusion and personal growth" (Plan Ceibal, 2020 in Delso Segovia, et. al. 2022).

While creating Ceibal via an executive order was arguably wise at the time, enabling a fairly swift implementation of OLPC, prioritizing speed, meant sacrificing "closer coordination with educators and education authorities" which may have "helped to better integrate education technology into teaching and learning." (Delso Segovia, et. al., 2022)

[1] Extracted from Delso Segovia, et. al., 2022

Ceibal is Uruguay's digital technology center for education innovation at the service of public education policies. Ceibal promotes the integration of technology to improve learning and foster processes of innovation, inclusion and personal growth.

Ceibal believes that technology improves education since it creates innovative pedagogical experiences and educational activities that could not otherwise be carried out, such as distance learning, customization through platforms, distribution of digital books, or the development of blended educational strategies.

From its inception, Ceibal aimed to universalize public education students and teachers' access to computers and the internet. After meeting its goals for Primary Education students, its scope was extended to Lower Secondary Education (Secondary Education and UTU) and those private schools interested in joining the proposal. As of the Budget Act of 2020, computers were also delivered in Upper Secondary Education.

Within the framework of the Ministry of Education and Culture (MEC) principles and goals set out in the National Education Policy Plan 2020-2025, in conjunction with the National Public Education Administration (ANEP), and aligned with its Education Development Plan 2020-2024, Plan Ceibal aims to provide students with the skills required for an information society, through innovative technologies and methodologies applied in various areas of knowledge (STEM, Language, Foreign Languages, etc.). Through the Deep Learning paradigm, education is comprehensively promoted, coordinating knowledge, up-to-date information, life skills and competencies such as creativity, collaboration and perseverance.

Since its creation in 2007, Plan Ceibal has gone through four stages: The first three were identified by Michael Fullan in "Ceibal: los próximos pasos" (2013), and the fourth began in 2020:

1. 2007-2009.

Delivery of devices to students and teachers; schools were connected to the internet.

2. 2010-2012.

Deployment of platforms and teacher support.
Emphasis shifted to encouraging the use of computers. A new position was created, the Ceibal Support Teacher (MAC), and multiple platforms set up for teacher work management, online assessment and education.

1. Digital Library
2. Adaptive Mathematics Platform (PAM)
3. CREA Platform
4. Online Evaluation System

3. 2013-2019.

Technologies as accelerators for new pedagogies.

The objective is to transform teaching practices through the integration of computers into the learning process. As of 2014, the technological deployment and software programs were maintained, but the use of technology as an accelerator for customized learning processes was increased. Plan Ceibal implements a series of initiatives that put into practice the latest concepts and

proposals of contemporary educational knowledge (e.g., the Global Learning Network, the Computational Thinking program and the Digital Citizenship Education initiative). These initiatives' objectives, content and design make them examples of "new pedagogies".

4. 2020-2025.

Systemic approach, teacher orientation and blended teaching. In 2020, Plan Ceibal began to transition a fourth phase adjusting its proposals to the needs of the teaching personnel through the design of user experiences, increased communication with the education communities, and coordination opportunities with ANEP. In turn, blended education modes are developed and the technological infrastructure required is set up. The aim is to strengthen inter-agency processes within the education system, e.g., the creation of the Inter-Agency Data Board composed of Plan Ceibal, ANEP, MEC and INEED. The aim is to promote international exchanges on the integration of education technologies.

Pedagogical framework

In order to fulfill its mission Ceibal focuses on three areas of action that promote pedagogical innovation and integration of education technologies:

Pedagogical practices and learning environments.

Our motto is "learning by doing." We place each student at the center of the learning process, which is supported by technology. We foster collaborative workspaces where we promote the culture of making (maker culture) and project-based learning since we believe that this approach develops key competencies for the world we live in. The experiences proposed cater for the students' different interests, and make teachers the catalysts for learning.

The use of virtual platforms and digital resources enables learning environments outside the classroom, extending pedagogical time and transforming other spaces outside school into learning spaces. This technological deployment makes it possible to test innovative models such as videoconferencing teaching where the triad remote-teacher, classroom teacher, technology facilitates learning in areas as diverse as English, Computational Thinking, or Science and Art.

In this framework, pedagogy-oriented technology takes on the role of "digital trigger" enabling, customizing and accelerating learning in places where it would not be possible otherwise. This ubiquitous learning also enables greater family involvement; families are learning catalysts, being also a fundamental pillar of blended education and remote teaching global models that have expanded their scope in the past years. (Strategic Plan. Ceibal, 2021)

Ceibal delivered an XO computer with free digital access to Biblioteca Digital Ceibal to every primary-school student and teacher. Notably, there was a significant increase in access to technology in Uruguay between 2007 and 2017. Over ten years, PC access in all age groups and income quintiles increased. An outstanding increase was observed within the youngest group, aged 6 to 13, which saw over 90% improvement across all income quintiles (Plan Ceibal, 2020 in Delso Segovia, et. al. 2022).

By 2021, over 2.5 million devices have been delivered, thus securing access for students and teachers in secondary education (Ceibal, 2021). By providing 3,023 education centers with connectivity and equipping 1,500 with video conferencing platforms, Ceibal has also ensured that "every educational center in the country is now connected to the internet" (Mateo-Berganza Diaz & Lee, 2020 in Delso Segovia, et. al. 2022).

Guaranteeing universal access to computers and digital textbooks highlights Ceibal's commitment to inclusion in its theory of action. This evidence also underscores Ceibal's direct effect on students in narrowing the digital divide and "promoting equal access to information and communication tools for all our people" (President Vázquez, 2009). Ceibal's intended impact to narrow the social divide between urban/rural students and those from different socioeconomic backgrounds through the universal provision of technological education is reflected in the aforementioned improved access (Trucano, 2009).

This complements one of the MEC primary objectives to "guarantee the use of ICT as an instrument for the democratization of knowledge" signaling early alignment between Ceibal and prominent local government entities (Ministerio de Educación y Cultura, 2021). The tight intertwinement between Plan Ceibal and Uruguay's most influential education decision-makers is not coincidental, given its status as a privately run but publicly funded organization.

Additionally, representatives from the MEC and ANEP form half of the Ceibal board of directors. This results in undeniable political influence, while also allowing some degree of autonomy.

Ceibal also offers a robust learning management system, CREA, which proved particularly influential during the COVID-19 pandemic.
In October 2021, 376,836 students and teachers entered CREA; of those, 347,585 were students (92%) and 29,251 teachers (8%).

The CREA platform hosts a vast collection of tools, over 1,500 educational resources, and a guidance section on "how to support pedagogical continuity from home, targeting parents and students' families" (Florencia Ripani, 2020, in Delso Segovia, et. al. 2022).

There is clear alignment in encouraging innovation, as named in its theory of action, by providing more tools and resources, as well as a commitment to personal growth by including resources targeted at supporting student learning in partnership with their families. Ceibal has since expanded its activities far beyond OLPC, its remit now encompassing branches for teacher training, English language instruction, and coding and robotics initiatives.

The use of technology to achieve social and educational goals promotes a national digital culture, equipping students, teachers, and families with "new digital skills [...] beyond basic reading, writing, and arithmetic" (Molinari de Rennie & Canale, 2019, p.7). These goals – of equity, knowledge, and inclusion – are at the core of the Plan Ceibal reform, and in direct alignment with the United Nations Educational, Scientific and Cultural Organization's (UNESCO) goal "to close the digital divide in education, and to consider digital literacy, for students as well as for teachers, one of the essential literacies of the 21st century" (The International Commission on the Futures of Education, 2021, in Delso Segovia, et. al. 2022). This alignment signifies unity in a global context.

Strategic areas

Ceibal provides every student and teacher at primary and basic secondary public education with a personal computer, internet access in schools, a comprehensive set of educational resources, as well as pedagogical services and programs. (Delso Segoviab, et. al. 2022)

Ceibal works in six strategic areas providing services to the Education System:

Basic Infrastructure. Connectivity and Devices

Ceibal provides broadband connectivity to 94.4% of public schools, and other types of internet connection to the remaining 5.6%, thus covering 100% of schools. This network provides broadband connection to 99,8% of school children in the Public School System.

Also, Ceibal provides high quality video conference equipment to 52% of schools, chosen with specific criteria for education settings, creating the widest videoconference network in Latin America.

In terms of devices, laptops and tablets are purchased in international open bids and following specific criteria designed for devices in education settings. In 2022 154,800 new devices were delivered to students and teachers following the distribution criteria mentioned previously in this article.

A strategy for repairing devices is crucial for the success of technology projects with young children. Ceibal decided to assume the cost of repairing devices by creating a repair center network all over the country. Each province has a repair center and by a collaboration agreement with the National Post Office, students send their devices by mail for repair and get it back free of charge. Through this network Ceibal provides support to 592,027 devices at the moment this report was prepared.

In addition to that basic infrastructure Ceibal also distributes other technologies for Education:

Digital Ramps:
Hardware and software solutions for learners with low vision, motor difficulties, etc. , these are offered to eligible students all over the country.

Maker Technology:
Following the "learning by doing" premise, Ceibal offers a wide variety of gadgets and tools to implement pedagogical projects, among them, programming boards, robotics kits, drones, sensors, 3D printers and educational video games.

Ceibal provides an ecosystem of platforms to support learning in different areas:

CREA: Learning Management System (LMS) that connects teachers with their students and students with their peers.
Conferences: Videoconference Tool that allows users to make video calls in CREA, providing the chance of connecting synchronically, as a complement of the asynchronous work already happening on the platform.
Little Bridge: Gamified English learning platform that includes an online automatic assessment system.
Biblioteca País: An intuitive, easy to use digital library with over 9,000 titles to download or read online. Textbooks for elementary and middle school are available for Uruguayan families free of charge.
Language Platform: Language Learning Platform that enhances language learning from a communicative perspective.
Matific: Gamified platform that aims to improve Math teaching and learning processes. It has an adaptive component that enables students to have a customized experience depending on their strengths and areas in need of improvement. It provides teachers with tools to design and assign tasks and challenges to their students.
ALEKS: New online Math adaptive platform.

Ceibal designs innovative, student-centered programs to create learning environments where competencies unfold, enabling students to make their own decisions, to co-design their learning path and to solve problems through technology. A brief summary of each project is included below:

Computational Thinking

This project is based on an innovative design created by Ceibal en Inglés (a language teaching program described later) that combines remote video conference teaching, follow up activities in an LMS, and collaborative work between the classroom teacher and the remote teacher.

Students solve problems using the logic of programming and the cycle of computational thinking: identify a problem, decompose it into smaller parts, recognize patterns, abstract it and create algorithms to create an innovative solution. They learn logical thinking, how to represent information in different formats, and problem solving skills.

Ceilab

Maker spaces designed at schools to work on technology-based collaborative projects, following the premise of "learning by doing". Ceilabs include most of the technology described and provide opportunities

for teacher development, collaborative work, creativity, critical thinking, communication and other 21st century skills, designing solutions to problems using technology.

Robotics, Coding and programming Olympic Games

Elementary and High School groups from all over the country work during the school year on a topic designing their own robotics and coding projects. The completion of this process is celebrated in an annual gathering, a big project showcase where students share their ideas with the audience and best projects are awarded.

Jóvenes a Programar (Programming Youth)

Spin off project that has the goal of training young people to get into the IT sector industry. It is a public-private partnership with local and international organizations (CUTI, BID Lab, INEFOP and the main tech industries based in Uruguay.

Artists and Scientists in the Classroom

Videoconference supported projects where local artists and scientists connect with students nationwide to show their work and share their knowledge in interactive conferences. As a complement of these conferences, activities and extra materials for teachers are uploaded to CREA to create a learning experience beyond the videoconference lesson.

Diseñando el cambio (Design for Change)

Project that applies the design thinking process (based on four stages: feeling, imagining, doing and sharing) to solve local problems and the need for changes in education centers. It is aimed both at teachers and students. This program is part of the international network "Design for Change".

This program focuses on developing the necessary digital skills to be a competent digital citizen, promoting a critical, responsible and creative use of technology. It is part of a national strategy of digital citizenship, designed with other strategic partners, such as AGESIC (National Digital Government Agency) and also a part of Ceibal strategy on Digital and Global Citizenship and Wellbeing.

Red Global de Aprendizaje (Global Learning Network)

This program focuses on Innovative pedagogical practices to competence development. It promotes the work around six basic competences: Communication, Creativity, Citizenship, Critical Thinking, Character and Collaboration, and it is the framework in which Ceibal lays all education programs. Red Global de Aprendizajes is part of the International Network "New Pedagogies for Deep Learning" led by Michale Fullan.

Ceibal en inglés (Ceibal in English)

This English teaching program complements the traditional one in Primary Education, solving the issue of the lack of language teachers in Uruguay.

It was the pioneer project on remote teaching for Primary Education in Uruguay, with an innovative design adopted by other projects such as Ceibal's Computational Thinking program.

It combines remote teaching through a high quality video conference call, follow up activities on the LMS (CREA) and collaborative work between the Remote English Teacher (RT) and the Classroom teacher (CT)

Ceibal has worked in an alliance with the education system to provide teachers a wide variety of initiatives and professional development opportunities. It is a flexible and diverse offer and each teacher chooses the path to follow according to their professional needs and interests.

Ceibal's professional development strategy:

Focused on digital competences, life skills, and innovation
Guided by the national curriculum framework and the international digital competence framework
Offers different tracks that vary in duration and dedication requirements
Offers integrated certifications and validations by the CFE (Teacher Training Council) and external partners
Easy access and usability for teachers
With different topic options/alternatives
With different scopes (massive or tailored made according to needs)
Indifferent formats (online, face to face or hybrid)
Indifferent modalities (synchronous or asynchronous)
Integrating different platforms.

An interesting opportunity for Teacher Development is the creation of content, particularly in a program called Open Educational Resources (in Spanish "Recursos Educativos Abiertos" or REA).

This initiative helps teachers to create and share their own Learning Objects designed to enrich teaching practices in the digital world. All content is created with Creative Commons licensing and shared in a repository specially built by Ceibal for this purpose.

Courses teach how to design these materials, help teachers to reflect on content generation, collaboration, and promote the creation of teacher's networks to exchange ideas and learn together.

Ceibal aims to become a data oriented organization and also to create a data wise culture in educational settings. In this direction, Ceibal generates strategic information towards a user centered management model. The Data Treatment Unit runs two major projects in this line of work to help teachers and administrators to use data for decision making and assessment of educational policies:

Education Centers Monitor

Digital tool available for principals and administrators with the goal of enriching decision making processes by providing data gathered in ANEP and CEIBAL databases in an intuitive and friendly manner.

Data Observatory

This digital tool provides data about the use of education platforms in the public school system. It contains current and historical data and, thanks to a set of filters, allows teachers and administrators to get data on the scope and use of platforms in different areas of the country and different courses, among other indicators.

Pandemic national education contingency plan

The Coronavirus landed in Uruguay in March 2020, just a few days before the new government settled in office. One of the first decisions involved shutting down schools. Complete school shut down would not last very long since by the end of April a gradual "back to school" plan started to take place. The plan started in rural areas (in schools with low numbers of students, approximately 11,000 students in the whole country), it was then extended to small cities and finally, it included the most populated schools in Montevideo (by the end of June, most schools had returned to classes, though not necessarily in a "normal" scenario). (Check Pag. 15). This resulted in most of the 2020 courses being taught online and eventually in a hybrid format.

2021 started with a peak in COVID cases that impacted on the education system. Attendance was not compulsory, so each school managed its hybrid learning system according to their own capabilities. Early in May a similar "back to school" plan was implemented and students returned to school by the end of the year. (Check Pag. 15). Vaccination plans (March 2021) that gave top priority to teachers and other members of the educational community were

crucial to return to in person courses; 70% of said population was vaccinated (first dosis) by the end of April.

The COVID-19 pandemic meant that schools were closed in Latin American countries for much of 2020 (in most countries it took more than 41 weeks). Uruguay is the country in South America with the shortest period without in-person courses.

Plan Ceibal launched the contingency plan "Ceibal en casa" that made available several resources, among them, the mathematics learning platforms, the virtual learning systems, and the Biblioteca País. Besides, communication campaigns were carried out, support was provided to teachers, students and their families, and data costs to access educational contents was reduced.

By the end of 2020, Plan Ceibal and CREA platforms did not consume internet data for mobile devices with contracts with national (ANTEL) and private (Movistar and Claro) internet providers.

[2] In this context, measures were implemented to guarantee daily meals for those children who normally had lunch at school. In-person courses were canceled while a national health emergency was declared, borders with countries declared at risk were partially closed, public shows were suspended, and measures to restrict the movement of people were put in place (UNICEF, 2020).

March 13, 2020

First four cases of COVID-19 detected in Uruguay. The government suspends compulsory attendance to face-to-face classes.

1

March 14, 2020

Classes are suspended in public and private schools at all levels throughout the country for at least two weeks.

2

March 19, 2020

The government extends the suspension of face-to-face classes until the end of Easter Week.

3

April 1, 2020

An adapted food service is implemented for school children during Easter Week; it includes family tickets.

4

April 8, 2020

Rural, single-teacher schools are to start classes on April 22, with the exception of Canelones" where attendance is voluntary.

5

April 22, 2020

Classes start in 546 rural schools. On the first day, only 1,000 students attend classes, with a reduced schedule and no food services.

6

May 25, 2020

Gradual return to face-to-face classes is announced. The exception is Rivera due to a Covid-19 outbreak; attendance remains voluntary

7

June 1, 15 and 29, 2020

Return to classes in three stages: 1) all schools except Montevideo, 2) youngest students, and 3) the most disadvantaged. New sanitary protocol implemented.

8

June 22, 2020

Due to an outbreak in the capital city of Treinta y Tres, classes are suspended.

9

July 20, 2020

Winter holidays; this time for two weeks.

10

August 3, 2020

Extension of face-to-face classes schedule and days of attendance in Primary.

11

October 1, 2020

Food services and full class schedule are authorized.

12

October 13, 2020

Class attendance becomes compulsory again.

13

December 3, 2020

End of school years ceremonies are canceled; two weeks later compulsory class attendance is suspended.

14

March 1, 2021

Beginning of the school year with face-to-face courses and compulsory attendance.

15

March 16, 2021

Face-to-face attendance is suspended in high school and compulsory attendance in elementary school is suspended.

16

March 23, 2021

Face-to-face education is suspended at all levels until the end of Easter Week.

17

March 30, 2021

They extend the suspension of face-to-face classes until the end of April.

18

April 28, 2021

Gradual return to face-to-face classes is announced, starting on Monday, May 3, 2021.

19

May 3, 2021

726 rural single-teacher schools reopen. One week later, the rest of rural schools and pre-schools will reopen.

20

Ceibal Strategy: Ceibal at home

Ceibal en casa (Ceibal at Home) was the contingency plan implemented by the Uruguayan government to mitigate the disruption to education caused by school closures across the country due to the COVID-19 pandemic. It consisted of offering digital platforms and services together with support and guidance for teachers, students, and their families to allow for distance learning for primary and and secondary public schools which cover approximately 85% of the total students in Uruguay. Ceibal en casa offers a versatile Learning Management System (LMS) with communication features, digital learning platforms, and more than 173,000 educational resources, including adaptive solutions and gamification.

Ceibal en casa was launched immediately after school closures were announced because it could draw on the pre-existing systematic deployment of Ceibal's digital resources.

In order to implement Ceibal en casa, Ceibal worked in cooperation with the National Administration of Public Education to transform a program designed to complement and enhance face-to-face classes to a fully digital distance-learning solution. This transformation included technical and pedagogical aspects, ranging from new videoconferencing functionalities to ad hoc teacher training as well as guidance for parents (given that their role as mediators in the teaching and learning process became even more crucial than before).

Although complementary contents to reach students with no connectivity at home were put in place (for example, new educational TV programs), Ceibal en casa relied primarily on digital media. This was possible given the relatively high number of households with internet access in Uruguay.

On average, 88% of households have internet access, but this is true for 93% of households with children aged 14 or younger; over 76% of households have access to a computer, partly thanks to the devices provided by Plan Ceibal (INE & AGESIC, 2020).

According to data analytics and to a national survey conducted among teachers, Ceibal en casa's resources were widely used by most students and teachers during the school closures. [3](Florencia Ripani. M. (2020), Uruguay: Ceibal en Casa (Ceibal at home), Education continuity stories series, OECD Publishing, Paris)

Mobilizing and developing resources Ceibal had a whole ecosystem of contents and platforms, offering more than 173,000 educational resources that were already available prior to the pandemic. This includes a learning management system (CREA), accessible to all public schools across Uruguay, gamification and adaptive math platforms for primary and secondary education, a digital library with more than 7,000 books, a collection of 1,500 open educational resources and school texts for students free of charge. It also featured a number of educational sites, online resources and software installed

in Ceibal computers and tablets, for example robotics and coding accessories among other materials.

The new features introduced by Ceibal en casa were mostly related to enhancing the digital interaction between students and teachers, and the involvement of families as key facilitators in the teaching and learning process.

When face-to-face classes were suspended , videoconferencing capabilities were added to the learning management system in order to leverage synchronous activities and allow group audiovisual interaction between teachers and students. Although Plan Ceibal had already introduced videoconferencing on a massive scale to teach English remotely in schools in 2013. (Ceibal was a precursor in teaching English as a foreign language remotely by videoconferencing to address the shortage of English language teachers in Uruguay. This method facilitated the interaction between students in Uruguayan schools and remote teachers both in Uruguay and overseas.) Ceibal en casa marked the first time that this distance learning method was fully integrated into the main Ceibal learning management system, becoming universally accessible to all primary and secondary public school teachers and students.

In addition, a special section of the program's site was specifically created to provide content and guidance on how to support pedagogical continuity from home, targeting parents and students' families. This material was also delivered through other platforms, such as social networks.

In order to guarantee educational continuity during the health emergency, Ceibal and the National Administration of Public Education (ANEP) worked together to transform a program based on face-to-face learning into an online learning program. Ceibal en casa was the contingency plan implemented by the Uruguayan government to mitigate the educational disruption due to the closure of schools during the COVID-19 pandemic.

Ceibal en casa was mainly based on digital mediation and was implemented immediately after the announcement of the school closures, thanks to the deployment of pre-existing digital resources.

The disruptive scenario of the pandemic generated enormous challenges but also opportunities to redefine a digital plan that achieved a systematized growth over time and with a high level of ownership and appreciation of the educational community, in a context marked by the expansion of the socio-technological ecosystem.

During 2020, Ceibal was a key player in the reconfiguration of the education system, becoming the main learning environment for children and young people in Uruguay, as well as a mediator between teachers, students and their families. The CREA educational platform reached 91% of students in 2020.

During 2020, Ceibal, as Uruguayan's pedagogical innovation agency, in coordination with ANEP, has generated, supported and implemented combined pedagogical formats to contribute to educational continuity both in contexts of school closure and reduced attendance. Based on existing infrastructure and coordination efforts jointly set up with ANEP, new models of combined education and adaptations of projects already underway allowed

students to continue their learning processes even in the context of the COVID-19 pandemic. During class suspension, these platforms registered an increase in users of 53% in primary, 124% in secondary and 165% intechnical-tertiary education, according to system data.

Specific training was provided to teachers to improve interaction with students through digital platforms; communication campaigns and distribution strategies for educational resources were presented in a visible, accessible and user-friendly way. Work was also done on the socioemotional impact caused by social isolation. We also worked with strategic partners, such as ANEP - National Administration of Public Education - and UNICEF, for the joint development of the guide "Psycho-emotional support for families during the coronavirus quarantine", which presented guidelines on how to navigate the quarantine while taking into account social wellbeing.

Main problems addressed

The main problems that Ceibal en casa had to address in relation to the COVID-19 pandemic were those related to the disruption of pedagogical activities due to school closures and the resulting challenging context of social isolation. In order to cope with this situation, the program has two dimensions: one related to the provision and adaptation of technical and pedagogical infrastructure and resources, and the other addressed the social and emotional impact of social isolation.

Adapting the technical and pedagogical infrastructure and resources.

Ceibal en casa required training teachers and providing support on how to interact with students exclusively through digital platforms, in both synchronous and asynchronous exchanges.

Communication campaigns and content delivery layouts were also necessary in order to make the educational resources visible, accessible, and easy to use. To this end, Ceibal en casa organized a strategic process of data collection and collation in order to study the changes in use and the reach of the digital educational resources. This information made it possible to adjust and introduce innovations to the program. Through learning analytics, Ceibal en casa monitored the use of the platforms, specific resources, and general trends, including high demand times and days. This information was complemented with telephone and e-mail surveys to teachers.

Addressing the social and emotional impact of social isolation.

This focused on providing support on how to cope with the social and emotional impact of isolation and on providing relevant information about well-being. The target audience – teachers, students and their families – were reached mainly through digital communication channels with specific messages according to their needs, including Ceibal's educational platforms, sites and social networks.

To sum up, what makes Ceibal en casa an interesting program is its combination of a robust pre-existing digital infrastructure, pedagogical resources, and data access and collation, and its remodeling through specific innovations to adapt to the emerging situation.

Main problems addressed: Infrastructure.

Ceibal en casa main implementation challenges were related to providing infrastructure and services. This was mainly due to the exponential increase in the use of Ceibal learning digital platforms across Uruguay during quarantine. In this respect, the main concern was to guarantee the provision of resources to all students, particularly those from disadvantaged backgrounds.

Most difficulties were solved with contingency plans, which, in some cases, involved cooperation of key partners. For example, Ceibal en casa made an agreement with the National Telecommunication Agency (ANTEL), the national internet provider and market leader, and Claro, a private internet provider, to facilitate access to educational resources and platforms without using internet data; this was key to guarantee equal access to educational resources.

Also, a special contingency procedure was designed and put in place to deliver computers to students while ensuring physical distancing. This was key in order to reach students in rural or vulnerable areas. Likewise, it was necessary to create a protocol to safeguard sanitary measures for essential in-person activities (5%) on Ceibal premises (e.g., computer repairs).

The rest of the activities (95%) were conducted remotely using internal and external virtual communication networks and systems, thanks to the virtual systems previously adopted by Ceibal.

Finally, it was crucial to increase the capacity of the technological infrastructure by 400% and to redesign its architecture to increase concurrency capabilities, allowing night maintenance shifts to avoid service downtime during peak hours. In order to deal with the increasing customer service demands, Ceibal en casa implemented an automated end-user tool, which included account set-up and password reset functionalities. (Florencia Ripani. M. (2020), Uruguay: Ceibal en Casa (Ceibal at home), Education continuity stories series, OECD Publishing, Paris)

During the pandemic, internet connectivity became necessary to access education. Ceibal reshaped its connectivity service, creating a strategy to provide free access to all students and teachers across the country. This strategy addresses the importance of connectivity as an indispensable condition for accessing education and expands the definition of the right to education. It also highlights the importance of teacher training in digital pedagogies to build more resilient educational systems and the crucial role of a governmental agency dedicated to education innovation to facilitate these processes.

Ceibal Integrado (Integrated Ceibal) developed for the first response plan for school closures. In 2020, Ceibal en casa had prioritized the contact between students, teachers, and families through the devices, internet connectivity, and cloud infrastructure. Ceibal Integrado started as a consequence of the monitoring connectivity metrics and attrition rates in education at different stages of the pandemic. The reality was that the benefits of the solutions available were not equitably distributed. Plan Ceibal, in agreement with the National Administration of Public Education and the Ministry of Education, decided to implement a strategy to mitigate the effect that school closures had on internet access for students and teachers.

Ceibal Integrado managed to overcome the connectivity challenge by facilitating free access to all students and teachers across the country. The decision, which had no precedent in Uruguay or the region, was key to guaranteeing inclusion and equity in accessing education.

This innovation involves vital stakeholders and specific technologies already available to the Uruguayan school system. CREA Contents and Resources for Education and Learning (Contenidos y Recursos para la Educación y el Aprendizaje) is an LMS with virtual classrooms and interaction tools that comprise the entire database of public schools students and teachers. In March 2020, education authorities declared CREA the official platform for education continuity. This declaration created a spike in connections, and the use-rate grew exponentially (Plan Ceibal, 2020). In 2021, Plan Ceibal integrated an open-source video conferencing tool into CREA for virtual lessons.

This whole initiative involved complex negotiations and a series of actions to implement this nationwide innovation successfully. The process required agreements with edtech providers, the setting up of servers in the country, management of cyber-security issues, tech integrations, and agreements with telephone companies to zero-rate data consumption for education. All these changes made the Uruguayan public education system available to students at school or home. Online access and video conferencing for education became completely free of charge for all students. Consequently, the usage of Plan Ceibal platforms and video conferencing tools in 2021 increased by 25 per cent compared to 2020, when Uruguay had records of coverage and access to Plan Ceibal's platform ecosystem. The removal of barriers to connectivity substantially impacted the type of use and the number of students and teachers accessing the combined models implemented during the first semester of 2021, making CREA one of the top five sites in Uruguay.

Pairing those infrastructure optimization strategies with focused adaptations of the educational programs and contents transforms the daily practices of students, teachers, and families, even when schools remain closed.

The timeline of the process illustrates how fast this innovation unfolded.

In April 2020, Ceibal started migrating all its pedagogical frameworks and educational programs online. Ceibal en Inglés, which delivers online lessons to more than 75,000 students with remote teachers from different parts of the world, had to adapt to the new reality. Teachers recorded four video lessons per week for each form until another approach was made available.

The computational thinking program, present in 1,764 groups in public primary schools and reaching over 35,500 students, made the necessary changes so that students could complete the missions assigned. Red Global de Aprendizajes, a network of schools and administrators implementing a competency-based model with active pedagogies in their communities, moved all their events and resources to a digital format supported by Plan Ceibal platform's ecosystem.

By the end of 2020, Ceibal had started a planning process in collaboration with ANTEL, and Blindside Networks (BN), the provider of Plan Ceibal's video conferencing tool, to migrate the service to local servers (in 2020, it was located on US servers). This strategy, together with negotiations with private

internet service providers (Claro and Movistar) was crucial to reduce costs of internet traffic and mobile telephone internet plans.

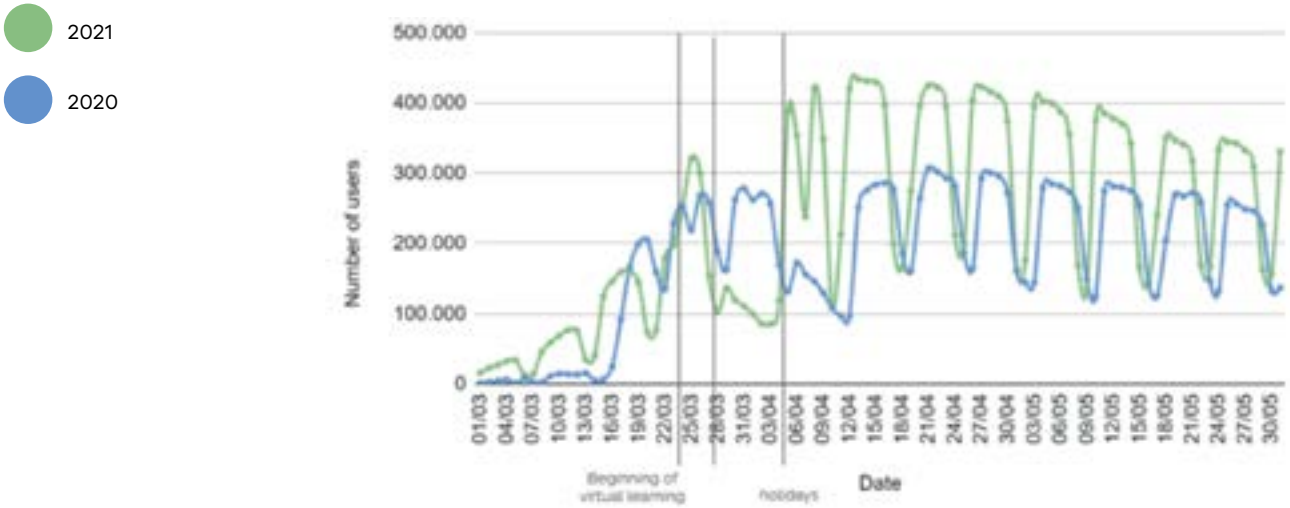
In January 2021, the telecom teams at Plan Ceibal and ANTEL started migrating the conferencing tool to ANTEL's Virtual Data Centre (VDC). This action allowed Plan Ceibal to identify the traffic generated in the platform and to understand the challenges of scaling up the solution to serve 800,000 users. The system's total capacity is now provided by the infrastructure available at VDC, securing the same use conditions at all times of the day, as well as responsiveness to the adjustments necessary for peak periods.

As a result, Ceibal delivered a series of interconnected proposals, providing pedagogical solutions to facilitate interaction between teachers and students through CREA. Before the COVID-19 pandemic, only 48 percent of students and 60 percent of teachers had explored this tool; and only 10 percent of students and teachers accessed the platform on a daily basis. During the pandemic, most teachers and students, for the first time, used CREA as their main medium for learning.

During the first phase of the Plan Ceibal response (Ceibal en Casa), the solution was accessible for most of the national education community – 88 percent of students and 95 percent of teachers – primarily to maintain contact and share learning materials with students, teachers and families. Further action was required to provide systemic access to vulnerable students and allow for more strategic use for community learning, which was addressed in the second phase (Ceibal Integrado).

Access to computers and the provision of online comprehensive pedagogical services did not guarantee reasonable connection rates of the most vulnerable students. Neither was it guaranteed that teachers would use or feel comfortable using the digital learning tools. In the light of the disturbance caused by changing teaching conditions and learning settings, the second phase of Plan Ceibal's response provided ambitious personalized training to teachers and access to the programs' learning platform, with an embedded video-conference service, at no cost, significantly increasing accessibility (see Figure 1). There was also a 25 percent increase in the usage and the recurrence of contact compared to the previous year when Ceibal registered all-time records. The connections to Plan Ceibal's platform ecosystem increased, and the number of assignments completed by students rose by more than 50 percent (see Figure 2). These were the fundamental elements to provide better access to what could be described as a virtual public national education system. Plan Ceibal showed distinctive aspects of resilience: its ability to self-organize, to increase its capacity, to learn and to adapt.

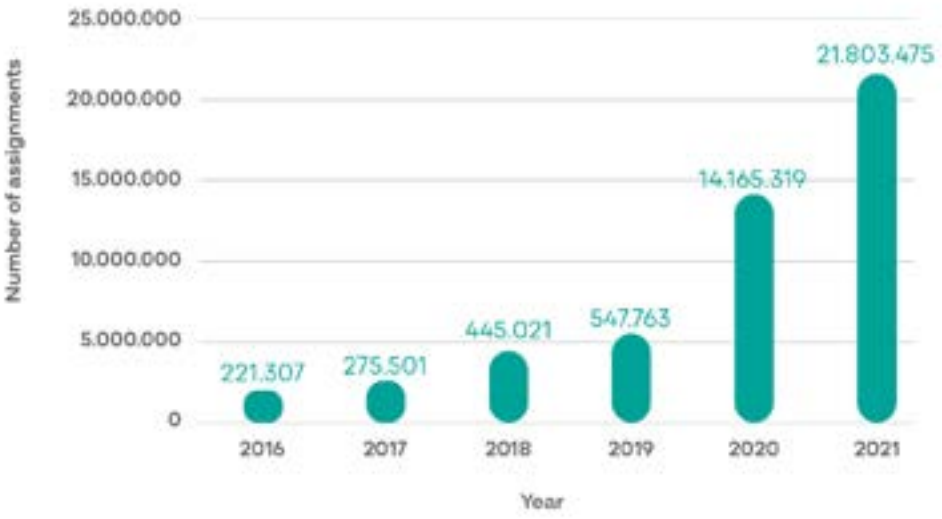
Figure 1: Equity in PC access by age group, according to income quintiles.



During this time, not only did the connection between students and teachers improve but also the delivery of pedagogical programs. The network Red Global de Aprendizajes trained more than 3,100 teachers in online courses on new pedagogies. Ceibal en Inglés was delivered at no cost once all the English video lessons were embedded in the relocated LMS. The computational thinking program provided more than 1,700 lessons each week. None of these results would have been possible at this scale without the innovations introduced. Ceibal Integrado increased the reach of schools and helped students gain autonomy while helping them develop digital skills in such a challenging situation.

Figure 2. Number of assignments completed by students in May at CREA LMS: 2016, 2021

Assignments turnes in by students



This initiative generates conditions that will enable education authorities and key stakeholders to think about sustainable hybrid education models and how to balance most of their components.

Ceibal Integrado could help leverage systems that could be scalable nationwide, create new blended formats of schooling, and exploit the potential of technology while extending learning outside school buildings.

The innovations represent a reorganization of elements, services and resources of the education system to face the challenges of a world of increasing complexity, uncertainty and disparity. Ceibal Integrado is: i) inclusive and student-centered, as it facilitates access to the national LMS to every student whenever and wherever (mobile data at no charge guarantees access from any place in the country to personal computers provided by Plan Ceibal or other devices); ii) multi-sectoral since it was possible, thanks to the collaboration of public-private actors, to reorganize infrastructure and commercial procedures and arrangements; and iii) quality-oriented, considering the enhancement of CREA as a result of the integration of a video-conference service. Additionally, and in alignment with public action ideas of UNESCO's Futures of Education initiative (UNESCO & International Commision on the Futures of Education, 2022), it expands the definition of the right to education, as it addresses the importance of connectivity and access to knowledge and information. At the same time, it highlights the need for sustained investment in innovation and technological infrastructure to provide quality education worldwide.

Technical infrastructure, professional development, pedagogical innovations and internet access may not address every issue facing education around the world. However, there is no equitable future for education without them.

This case study focuses on the analysis of infrastructure settings and suggests that technology is not a neutral component in the education ecosystem, but needs to be strategically deployed in order to guarantee an inclusive and equal approach to education.

Further research needs to be done to better understand how free models of connectivity can be sustained beyond emergency contexts and the implications of this for the quality of education. (Learning to Build Back Better Futures for Education, Raimers, Opertti, 2021 http://www.ibe.unesco.org/sites/default/files/resources/book_ibe_-_global_education_innovation_initiative.pdf)

Main problems addressed: Contents.

In coordination with the National Administration of Public Education (ANEP), Ceibal's contingency plan, Ceibal en casa, was able to sustain and expand the supply of educational resources. It also generated proposals adapted for teachers, students and their families, including content for socioemotional support, and new multiplatform communication strategies through social networks and television.

Also, a new learning environment based on multiplatform content was developed and distributed through multiple media ,including the National

Television of Uruguay (TNU), to provide access to educational resources. This included an educational magazine (TA, Tiempo de Aprender), a series hosted by young influencers (C+) in which, through a fictional plot, educational content was presented, and a participatory space (Tu Corto) in which young people create and share their own productions. In addition, a cycle for teachers (ENLACEvivo) to rethink and guide pedagogical strategies through interviews with experts was launched.

Ceibal offered digital platforms and services, as well as support and guidance to teachers, students and families to ensure distance learning in public primary and secondary schools, as well as private schools that chose to use Ceibal's platforms (Ceibal internal presentation).

Ceibal en casa offered two learning experience options. Students could interact with teachers and peers through the program's learning management system – which included social networking and videoconferencing functionalities – following structured and organized activities. Alternatively, they could access auto-assisted teaching platforms, books, games, challenges and other on-demand learning resources organized by age groups.

In order to facilitate the learning journey and provide clear options and support, Ceibal en casa deployed resources addressing the main actors involved in the pedagogical continuity agenda: teachers, students and their families. Through dedicated subsections on the program's site and social networks, specific communication and pedagogical strategies were delivered to engage each of the relevant groups in the proposed virtual learning environments. For example, students were offered games and creative activities relevant to the curriculum; teachers could access not only teaching resources but also consultation services, discussion forums, tutorials, and virtual training and guidelines for remote teaching. Finally, families received daily tips on how to support their children with recommended content for different knowledge areas. (Florencia Ripani. M. (2020), Uruguay: Ceibal en Casa (Ceibal at home), Education continuity stories series, OECD Publishing, Paris)

Find below a summary of the main initiatives that combine social media, websites and platforms to provide extra support for three main audiences: Teachers, Students, Families.

General guidelines: main courses of action.

Supporting ANEP in creating a massive distance learning environment using Ceibal´s ecosystem of Platforms.
LMS (CREA) as the main place of interaction among Sts and Ts. Math Platforms (PAM, Matific) Digital Library (Biblioteca País)

For teachers:

- Space in CREA that provides:
- Digital contents & resources.
- Teacher Development Section. Main focus:
- CREA use (Self assisted Course)
- Distance Learning and Online Teaching
- Recommendations about Ceibal ecosystem : Platforms and websites

(coding, Microbit,
Robotics)
● Two forums: Exchange and Troubleshooting.
● Virtual Workshops (ZOOM) for novice and Teachers in the use of our Platforms
● Virtual Workshops and Conferences on other education related topics (streaming with
guests, EnlaceVivo and Computational Thinking)

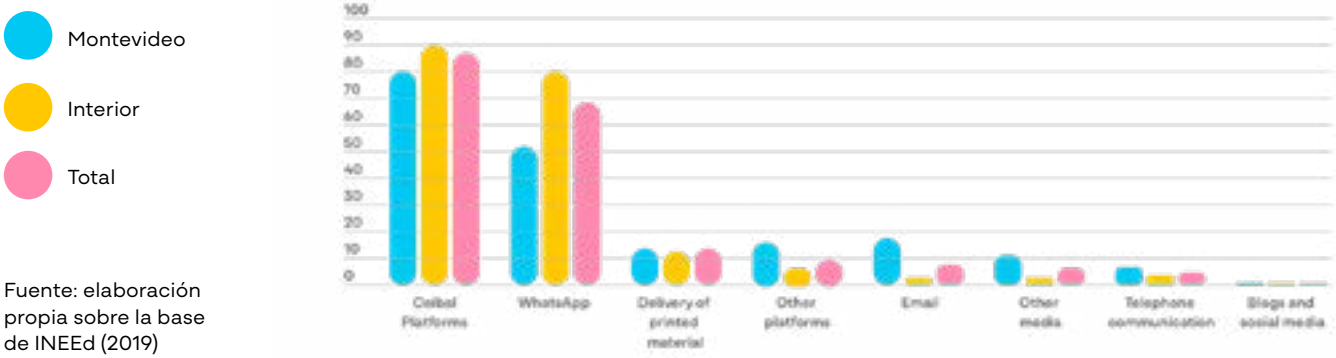
For students:

● A set of initiatives to promote autonomous learning.
● Audience: 10 to 15 year old Students.
It includes:
● A space in CREA (Group) with activities such as:
● Math Games & Activities
● DFC Creative Challenges #Mandálatuya.
● There are currently over 9000 Sts enrolled
● Ceilab Initiatives
● Weekly Webinars on Scratch & Scratch Junior
● Live Youtube lessons on MakeCode & Microbit (7 to 14 years old)
● Self assisted Courses on Coding (3d Modeling and Printing, Tinkercad, Open Roberta, etc.).
● CEI "Sing Along (TikTok or other apps)
● Social media posts recommending Ceibal´s ecosystem.
● For Primary Education:
● Adapted Courses to Online Learning
● The RT uploads 4 weekly videos (10min in total) and sets up activities in the platform connected to the videos.
● The RT and CT coordinate a time to work with students that can access remote communication tools.
● For Secondary Education (Middle School)
● Tutorials for Differentiated Learning uploaded in CREA for all teachers.
● A pilot for conversation classes is running to design the best way to do it.

For families
● A Communication strategy directed to families.
● Daily posts (social media, web campaigns and news on our institutional website) & live streaming.
● It provides:
● Recommendations of Ceibal resources.
● Hands on activities (mediated or not by technology)
● Tips on socio emotional aspects of social isolation.
● Webinars & Conferences with experts regarding issues of social isolation and homeschooling.
● Families support Guide created with UNICEF: ("Time to be at home: A help for families and educators in times of Coronavirus")

Source: Ceibal internal presentation, Mariana Montaldo.

Main resources to propose teaching proposals according to region and total. 6th grade. Year 2020



Fuente: elaboración propia sobre la base de INEEd (2019)

Source: Cierre de escuelas en pandemia, World Bank, Carbajal et al, 2022.

Main problems addressed: Reports

Ceibal en casa was monitored through data analytics and a survey completed by a nationally representative sample of teachers from primary and secondary education[2]. Based on data analytics, the reach of Ceibal en casa among primary and secondary students was 85% and 90%, respectively, increasing up to 95% among teachers, including teaching and training platforms[3].

Access to Ceibal's educational online resources increased by 452% in March 2020 compared to the same period in 2019.

2. The survey was conducted among 1,245 teachers; 636 answered the survey by phone, whereas the remaining were reached by e-mail and responded to the same questions on the SurveyMonkey platform. The results were processed by the Monitoring and Evaluation Department of Plan Ceibal.

3. The information and all data analytics presented in this section are based on Ceibal en casa internal reports produced from when schools closed, on March 16, to the end of May 2020, including single sign-on data taken from Google Analytics on Ceibal's site: ingreso.ceibal.edu.uy.

According to the survey's results, Ceibal resources were the most used to support teaching activities in public education (93%). Data collected suggests that 98% of teachers from public schools sent assignments to students, 90% received activities submitted by students and 87% used it to provide feedback. The activities that teachers reported doing the most frequently were sending homework, uploading documents and videos to support assignments, coordinating with colleagues, and creating groups of students and shared documents.

They also reported videoconferencing with other teachers as a regular activity (59% and 60% in primary and secondary education, respectively), although this activity was less frequent with their students (32% in primary education and 27% in secondary education).

The survey suggests that 92% of teachers were satisfied or very satisfied with the training activities provided by Ceibal, although 70% expressed the need for further training for a more effective use of resources. These data may reflect teachers' awareness of the potential of digital environments to enhance their teaching practices, which could be achieved through a higher level of digital literacy and specific professional development.

Ceibal is planning to use the information collected and lessons learnt through the implementation of Ceibal en casa to design a "Response Protocol for Massive Migration to Distance and Blended Learning" and propose a transition from an emergency phase solution to a normal time expansion and systematic integration of digital learning into face-to-face education.

The reach was calculated based on students who accessed any of the offered platforms at least once. (Florencia Ripani. M. (2020), Uruguay: Ceibal en Casa (Ceibal at home), Education continuity stories series, OECD Publishing, Paris)

Conclusions: Adaptability to new contexts

This solution could be adapted in countries which already have a digital resource infrastructure at a national scale – since it is built on Plan Ceibal, Uruguay's national digital education program.

Since Ceibal has a flexible and comprehensive combination of resources, experiences could be adapted to different countries, although they would require certain levels of investment and access to digital infrastructure and resources.

Ceibal has a long tradition of collaboration in the region. It has already started sharing the knowledge gained during the pandemic with low- and middle-income countries in Latin America through collaboration with Fundación Ceibal, which coordinates the Alliance for the Digitalization of Education in Latin America (ADELA).

The initiative allows for a larger scale use of the platforms in the future. The number of users of Ceibal's platforms grew exponentially during the school closures, reaching most public school students and teachers. (According to internal reports, the reach of Ceibal's platforms in primary public education increased from 42% in May 2019 to 85% in the same month in 2020, mainly due to the suspension of face-to-face classes. Similarly, reach among teachers increased from 58% to 95% in the same periods.)

This increase represents a unique opportunity for Ceibal to capitalize on the wider awareness among teachers, students and families about the importance of an available ecosystem for teaching and learning practices facilitated by digital technologies. It also represents a great opportunity to explore further effective models and pedagogical approaches suitable for massive use of platforms and digital environments in normal times.

Key points to keep in mind for a successful adaptation

1. Consider students and teacher´s access to technology and connectivity to analyze the suitability of a program mainly based on digital media.
2. Analyze the context and the layout of your existing program and make strategic adaptations, including technical and pedagogical infrastructure to cope with the increase in traffic and demand of educational content.
3. Build partnerships with internet and mobile phone providers to apply reduced rates or free access to educational resources.
4. Focus your strategy on enhancing the digital interaction between students and teachers, and the involvement and support of families.
5. Present all existing educational resources in a single output platform (this could be a site, and a mobile app).
6. Provide a robust LMS with communication features in order to keep a fluid exchange among teachers and students (videoconferencing and other additional functionalities might be needed).
7. Include adaptive and gamification platforms in order to facilitate teaching and make learning more accessible and enjoyable.
8. Collect as much data as possible to monitor progress and improve the layout of the plan as it is being implemented (it is crucial to determine questions, indicators and metrics to get the most from data access).
9. Design the program as an ecosystem and implement it with sustainable and scalable solutions with the ability to increase in scope and quality, and adjust to unpredictable future scenarios. (Florencia Ripani. M. (2020), Uruguay: Ceibal en Casa (Ceibal at home), Education continuity stories series, OECD Publishing, Paris)

Resources

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