Education and technology:

The challenge of sustainability in Latin America

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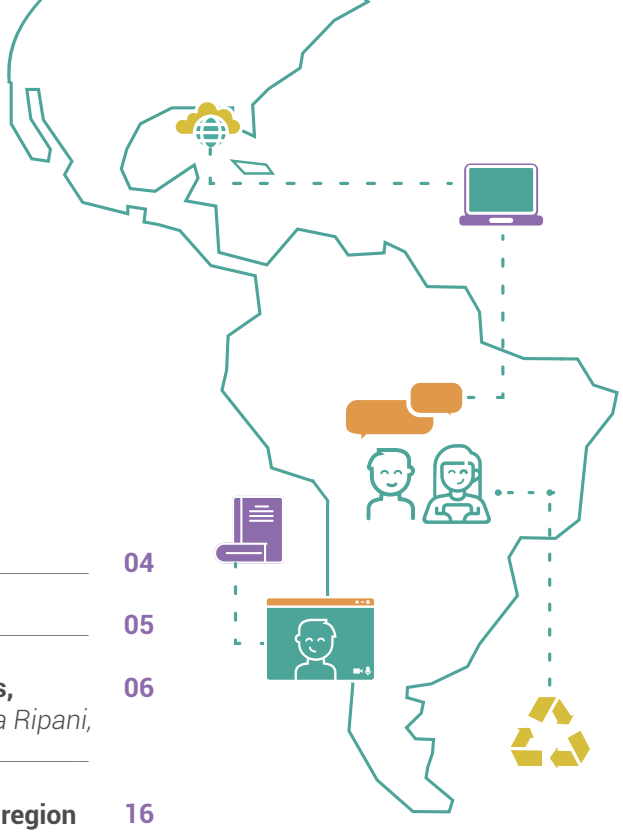


Abstract

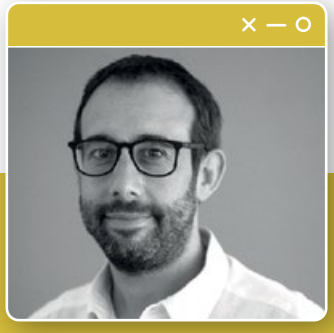
Foreword

How to build sustainable, resilient education systems in the region is a challenging, complex question that has been taking on considerable significance since the outbreak of COVID-19. Having flexible education systems that can be remodelled at a pace consistent with the changes we are experiencing and can withstand the different disturbances that may occur is a current challenge in which technology plays a key role.

Technology is not a solution for education, but there is no future in education without technology. Having or providing education systems aided by technology with quality infrastructure and solutions means providing more students with education that is more accessible and, therefore, more sustainable and less prone to interruptions. This leads to a new challenge directly linked to reducing inequality in access not only to devices and connectivity, but also to their proper use and to quality education through technology. The pandemic has shown that those who purposefully use available technology for education do better than those who do not.

It is essential to contextualize solutions, understand how countries make technology available and what technology is used locally. How to promote technological infrastructure to enhance learning will depend on each country's possibilities, reality, the cultural relationship with the technologies and any available gradual knowledge. It is an ongoing process that calls for a systematic strategy of investment in and improvement of technological capabilities.

This issue facing the region today is one of the debates promoted by Uruguay's Ceibal Foundation, which seeks to strengthen digital education policies in the region as part of its mission, which focuses on promoting research, innovation and dissemination projects on technology and learning in collaboration with the national and international academic and education community. The Foundation coordinates the Alliance for the Digitalization of Education in Latin America (ADELA), the implementation of the Rural and Inclusive Digital Education project in Honduras and Nicaragua, both initiatives funded by the International Development Research Centre (IDRC Canada), and collaborates with UNESCO in its efforts to monitor the education goals for sustainable development related to the proper use of technology. We at the Ceibal Foundation hope that this document will be a significant contribution to the regional debate, a key piece for the building of a sustainable future in Latin America.



Leandro Folgar

President, Ceibal Foundation and Plan Ceibal, Uruguay

Introduction

Through this publication, the Ceibal Foundation proposes strengthening the articulated debate on how technology can promote inclusive, equitable and sustainable quality education in Latin America. The challenges posed by the COVID-19 pandemic are an opportunity to identify the adaptations or solutions that education systems have failed to come up with, thus affecting their basic functions, such as ensuring inclusion and equity.

This analysis document seeks to address the sustainability of education systems in the region and the role of technology in the context of sustainable development understood as the balance of social, e nvironmental and economic aspects in the management of resources and their durability over time.

Today, the region needs to build resilient education systems that will ensure sustainable development. Any social transformation requires collaboration among a wide range of players and stakeholders. The systematization of their knowledge of the diversity of contexts, their ideas and experiences, the challenges, available resources and possible adaptations – particularly for the more vulnerable groups – facilitate the search for suitable solutions for the building of a sustainable future.

This publication brings together the views of policymakers, interviews with leaders from international development agencies and non-governmental organizations with a high impact on the region, as well as best practice experiences implemented in education systems in Latin America. The document is part of the work that the Foundation has been carrying out to strengthen digital education policies in the region on the basis of research, innovation and dissemination projects, including the coordination of the Alliance for the Digitalization of Education in Latin America (ADELA), funded by the International Development Research Centre (IDRC Canada).

It is also part of the collaborative actions that the Ceibal Foundation is undertaking together with UNESCO in the context of the Global Education Monitoring (GEM) Report, whose objective is to monitor progress in reaching education targets as part of the Sustainable Development Goals. In addition to being a member of the GEM Report Advisory Board, the Ceibal Foundation is the organization responsible for leading the regional consultation process on technology and education in Latin America for the next report (2023).

Education, technology and **sustainable development: perspectives, opportunities** and **challenges** in **Latin America**

Education, technology and sustainable development: outlooks, opportunities and challenges in Latin America

By **María Florencia Ripani**,
Director of the Ceibal Foundation, Uruguay.

The 2030 Agenda, adopted by the United Nations General Assembly in 2015 (United Nations, 2015) is the most significant agreement with the greatest consensus on what kind of world is desirable. Its 17 Sustainable Development Goals (SDGs) present a clear projection of the future with a prospective sense of longevity (Costanza et al, 2016). These goals provide the notion of sustainable scale for the projection of a safe operating space for humanity (Rockström et al. 2009).

Promoting compliance with the SDGs is an extremely challenging undertaking that calls for a people-centred, multidimensional approach, that is, one that integrates sociocultural, economic, and environmental dimensions. This task also requires identifying barriers to sustainable development, such as inequality – one of the main problems in Latin America –, and opportunities, many of which can result from transformative approaches in the field of education and technology.

The preparation of an education and technology or a digital education proposal in the region with a sustainable development perspective is not limited to SDG 4, Quality Education, aimed at ensuring inclusive and equitable quality education and promoting learning opportunities for all. Most of the SDGs (United Nations, 2015) regard technology as a substantive dimension in bringing about the necessary changes for sustainable development. Among them, SDG 1, No Poverty, aims to guarantee that all men and women, in particular those most vulnerable, have access to new technologies; SDG 2, Zero Hunger, sets the goal of increasing investments in technological development in order to increase agricultural production capacity in developing countries; SDG 5, Gender Equality, stresses the need to improve the use of enabling technology, in particular information and communications technology to promote the empowerment of women; and, finally, SDG 17, Partnerships for the Goals, presents technology as one of the 5 dimensions of its goals and aims to improve regional and international cooperation in science, technology and innovation, in addition to increasing knowledge by making technology available.

A sustainable education strategy requires considering SDG 4 together with other associated goals that will facilitate systemic change to build a sustainable future in a world that is increasingly interconnected and aided by technology. This calls for hard work: analyzing the complex interconnections among the goals, developing the appropriate means to achieve them comprehensively, and devising a narrative of change capable of identifying the necessary social and political transformations in a given socioeconomic and geopolitical framework (Costanza, 2014; Costanza et al, 2016; Ostrom, 2014).

Considering the above ideas, the Ceibal Foundation – in the context of the Alliance for the Digitalization of Education in Latin America (ADELA) project, funded by the International Development Research Centre (IDRC Canada) – seeks to identify opportunities and challenges in order to facilitate sustainable development at the intersection of education and technology in the specific geopolitical context of Latin America on the basis of the opinions and perceptions of key stakeholders in the region. Another context of this challenge is the commitment made by the Ceibal Foundation to lead the consultation process in the region for the UNESCO Global Education Monitoring (GEM) Report. The Foundation, which is a member of the GEM Report Advisory Board, presents in this publication the main questions proposed for the 2023 report, which revolves around education and technology. Included in this document is a detailed presentation by Manos Antoninis, Director of the UNESCO Global Education Monitoring Report, of the consultation process and the main lines of research.

The systematization and visibility of the ideas and outlooks of the key stakeholders in the region can contribute to strengthening the consistency of the policies for the promotion of the goals set by the 2030 Agenda. They are also part of the culture, which must be understood as a facilitator and driving force of the economic, social and environmental dimensions of sustainable development (UNESCO, undated).

Through ADELA, the Ceibal Foundation conducted semi-structured interviews with 11 policymakers (Colombia, Costa Rica, Ecuador, El Salvador, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru and Uruguay), which were systematized by means of the interpretive analysis method (see Figure 1). The Foundation also interviewed 4 representatives of international organizations: IDRC Canada, the Inter-American Development Bank (IADB), and the think tanks Inter-American Dialogue and the Brookings Institute (see section "The view of international organizations with an impact on the region").

This analysis occurs in a very significant context: evidence of the difficulties of self-regulation of education systems has been exposed by the crisis caused by the COVID-19 pandemic. This same scenario has given rise to attempts at innovation, which were mentioned in the interviews conducted and integrated into this analysis.

In addition, the section "Best practice experiences in the region" presents cases selected by those responsible for implementing national public policies on digital education in Latin America which they therefore regard as significant.

We also include information on ADELA, described by the policymakers consulted as one of the fundamental spaces for the articulation of sustainable development in education and technology in the region by virtue of its substantial contributions to regional cooperation and the construction of knowledge.

Finally, an example is presented of applied research for the production of sustainable solutions aimed at vulnerable communities: "Rural and Inclusive Digital Education", which seeks to upgrade education in rural schools in Honduras and Nicaragua with the help of technological and cultural mediation, another initiative led by the Ceibal Foundation and funded by IDRC Canada.

Analysis

The information gathered to analyze the views of regional leaders is varied, but common elements can be identified, including some perceived as opportunities and challenges, which, although presented below in independent sections, are interrelated.

Opportunities

Among the main opportunities is the understanding of the pandemic as an event that accelerated the acceptance, innovation and sense of urgency of the integration of technology as a fundamental resource for aiding learning, an area in which education had fallen behind other more innovative social fields, such as medicine or communications (see interviews in the section "The view of international organizations with an impact on the region").

On the other hand, and although all the sectors consulted are well aware of the high level of inequality in the region, the restrictions caused by the pandemic resulted in a clearer, more tangible perception of the extent of the inequalities in education communities – urban versus rural schools, and public vis-à-vis private schools – and the issue of vulnerable groups, particularly indigenous people, girls and women, and the disabled (see interview with Naser Faruqui, and Ineguality in Figure 1).

They point out that vulnerable populations ought to be placed at the core of the strategies designed and implemented. To benefit these sectors, it is particularly important to use a systemic approach rather than looking at technology in isolation in order to take advantage of its potential as a promoter of inclusion (see interviews with Naser Faruqui and Mercedes Mateo Díaz, and Emerging Dimensions in Figure 1).

All those consulted value digital technology highly as an innovative, essential resource for the present and future of inclusive and equitable quality education. Among the advantages, they cite the possibility of customization, ubiquity and improved learning management based on data, in addition to the availability of more entertaining and user-friendly formats for students, which is more likely to lead to greater student motivation and retention and improved learning (see interview with Mercedes Mateo Díaz and Emiliana Vegas, and Media and Meaningful Use in Figure 1).

They stress the difference between mere access to technology and its meaningful use, and identify opportunities arising during the pandemic related to the production and provision of educational resources taking into account the diversity of the education community and the contexts of disadvantaged sectors (see interview with Naser Faruqui, and Emerging Dimensions in Figure 1). In addition to content localization initiatives – development of bilingual multicultural digital platforms –, they cite the integration of content produced by the rural and indigenous communities themselves. They also identify adaptation experiences for vulnerable populations or populations with no access to digital environments, such as the use of mass media (television, radio and printed material), and the exemption of charges for data consumption for those who have mobile devices, which is in many cases the only way to access content (see Connectivity, Media and Emerging Dimensions in Figure 1).

Another key aspect for digital integration into educational practice, the closing of socio-educational gaps and the meaningful use of technology, is teacher training, both initial and in-service (see interviews with Emiliana Vegas and Ariel Fiszbein, and Teacher Training in Figure 1). Although there is widespread understanding of the existence of gaps in this field, teacher training is identified as an opportunity to promote sustainable development, with specific areas to be promoted, such as the management of virtual means of teaching – production and curatorship of digital resources, use of data, customization, etc. – and the specific integration of technology into the different curricular areas (see interview with Naser Faruqui and Teacher Training in Figure 1).

They argue that ownership of technology in education must be taken in articulation with human interactions, while bearing in mind the development

of socio-emotional capacities, that is, understanding the teacher as a key player who uses technology as a facilitating resource or complement (see interview with Mercedes Mateo Díaz and Emiliana Vegas).

Another aspect on which there was consensus and a greater impact on the agenda of educational public policies in the region is the need to build methods and curricula with more flexible teaching-learning approaches, including digital skills and use of extended and blended learning spaces; that is, a change in the conception of the space assigned by the brick-and-mortar school as an almost exclusive place for educational practice (see interview with Ariel Fiszbein and Emerging Dimensions in Figure 1).

In the interviews analyzed, the education community comes across as strengthened, aware that the extension of the educational space requires the active intervention of families and responsible adults as facilitators of learning (see interview with Ariel Fiszbein and Education Community in Figure 1).

They stress the need to generate innovation ecosystems for the systemic integration of digital education (see Equity and Inclusion and Emerging Dimensions in Figure 1), and point out the significance of integrating technology-related innovation that permeates public education systems from the outside – such as fast-track certifications – in order to strengthen the role of schools as promoters of social mobility (see interview with Mercedes Mateo Díaz).

The region's policymakers see international organizations as enabling the promotion of transformative changes, but they underline the significance of considering national contexts, supporting tried and tested solutions in different countries (see interview with Naser Faruqui and International Organizations in Figure 1). The international organizations point out that the strengthening of national agencies that support innovation and science can promote inclusive quality education in the developing world (see interview with Naser Faruqui).

As regards ADELA, the Alliance is perceived as a fundamental space for regional collaboration through exchange among peers in the search for solutions to common problems, as unanimously stated by the 11 policymakers interviewed for this publication. They stress that in a context of great inequality and a shortage of resources, it is important to know what other countries are doing in order to solve similar problems, which makes it easier to solve them quickly and efficiently. ADELA is also perceived as promoting the medium- and long-term view for the development and implementation of public policies on digital education and innovation. The policymakers value access to the practices of countries more advanced in the development of digital policy and with more favourable conditions in the region, such as Uruguay, which serves as an example and an opportunity to produce ideas for adaptation to other contexts within a framework of sustainability.

Challenges

As the conceptual analysis of the perceptions of the policymakers shows, inequality is identified as the main factor of the digital divide and of an uneven distribution of resources restricted by poor funding in a context of socio-educational gaps that go beyond the technological dimension (see interview with Ariel Fiszbein and Mercedes Mateo Díaz, and Inequality and Equity and inclusion in Figure 1). The equitable and inclusive integration of technology, including access and use, runs into difficulties when it comes to coverage in all national territories, adaptations to the diversity of students and teacher qualifications, among other factors.

Although all the various perceptions highlight the significance of understanding connectivity as an essential, indispensable service, access restrictions are identified, mainly in rural communities and vulnerable groups, which make it necessary to develop adapted approaches, such as the use of intranet-type networks (see interviews with Mercedes Mateo Díaz and Emiliana Vegas, and Connectivity in Figure 1). In this regard, it is necessary to seek sustainable solutions based on the technology available in most households in the region: mobile phones (see section "Applied research for sustainable solutions: Rural and Inclusive Digital Education in Honduras and Nicaragua"). Although several of the interviewees stress the need to facilitate connectivity and access through these devices, their systemic integration as teaching and learning resources still seems a challenging task yet to be undertaken.

There are challenges related to a scenario in which the media have an increasingly substantial role in teaching and learning practices (see Figure 2). This involves both interactive media – digital platforms or social networks –, as well as mass media – radio and television, and even printed material –, particularly in the more vulnerable countries or areas with restricted access to the internet and computerized devices (see interview with Mercedes Mateo Díaz).

The sectors consulted are aware of the need to develop new skills to achieve a meaningful use of technology and an inclusion-orientated educational practice proposal (see interview with Emiliana Vegas and Equity and inclusion in Figure 1). This is something that emerges above all in relation to teacher training (see Figure 3), the need to adapt the curriculum, and the development of key skills for digital citizenship (see interview with Ariel Fiszbein and Emerging Dimensions in Figure 1).

They also identify the need to increase the participation of women in STEM[1] careers (see interview with Naser Faruqui and Emerging Dimensions in Figure 1), and they all point out the lack of innovative resources and programmes for the integration of girls and women into the meaningful use of technologies and for ensuring that there is a transformative approach to all educational materials that will promote gender equality.

Finally, the problem was mentioned – albeit only by some of them – of technological waste in schools and communities, as well as the need to develop policies on treating technological waste and raising awareness for a change of habits (see Emerging Dimensions in Figure 1).

1 - Science, technology, engineering and mathematics.

Final considerations

The following are the main opportunities as pointed out by the policymakers and leaders of international organizations with influence on the region, including the sense of urgency in the integration of technology understood as an innovative, essential resource for the present and future.

Customization, ubiquity and improved learning management are the main contributions of digital technology, with the teacher standing as a key player who uses it as a facilitating resource or complement. That is to say, there is a new appreciation of the significance of ownership of technology combined with human interactions, for which teacher training is understood as fundamental for the promotion of the meaningful use of technology.

They also value as an opportunity a systemic approach with the generation of innovation ecosystems and more flexible learning proposals – with extended spaces –, for which it is necessary to strengthen the digital skills of teachers and students in coordination with the education community as a facilitator of learning.

Another opportunity they point out is the greater clarity about inequalities in education communities that were exposed by the pandemic, which led to adaptations for vulnerable populations.

They also highlight opportunities that can be created in coordination with international organizations contemplating national contexts, and ADELA is identified as a fundamental space for regional collaboration.

Regarding the challenges, they highlight inequality as one of the main causes of the digital divide in a context of uneven distribution of resources and poor funding. Given the restricted access to connectivity – viewed as an essential service –, which particularly affects the most vulnerable contexts, there is consensus on the need to come up with sustainable solutions through technologies available at home and approaches adapted to the diversity of local contexts, including specific strategies with a gender approach.

They believe new skills must be generated for a meaningful use of technology, including the management of media, platforms and digital content. This is possibly a challenge for the whole education system, not only teachers and students, and requires new skills from technical teams, those responsible for education portfolios and, fundamentally, coordination with other areas of government, public and private organizations and stakeholders who have skills and resources that are increasingly significant in educational practice but are not part of the traditional qualifications required by education systems (see Emerging Dimensions in Figure 1).

There is no evidence of a widely-held perception of the need to integrate technology in education as a transformative resource for sustainable development at the environmental level. This is significant if one takes account of the fact that the degradation of coastal ecosystems, natural disasters and diseases have a greater impact on the most vulnerable populations and exacerbate poverty in the region.

The integration of technology into education as a transformative resource in all dimensions – social, economic and environmental –, as proposed by the SDGs, could promote sustainable solutions in a region where more than a quarter of the population lives in poverty. Thinking of sustainable education systems in contexts of change requires understanding them as complex systems, with non-linear dynamics that are not always predictable and are shot through with interdependences that affect their balance (Rockström et al. 2009); in short, the balance of mankind itself.

In the light of this complex scenario, Latin America can look ahead and project education systems better suited to both foreseeable and emerging challenges.

Figure 1

Conceptual analysis of perceptions of policymakers on digital education, technology and sustainable development in Latin America

Inequality

Resources
- Uneven distribution.
- Poor funding.

Digital divide
- Gaps in access and use
- Lack of adaptive resources - disability.

Socio-educational gap
- Public and private schools.
- Gap between urban and rural populations.

Equity and inclusion

Access
- Coverage throughout the country.
- Reaching all students.
- Barriers to funding

Meaningful use
- Different from mere access.
- Need for resources and pedagogies adapted to student diversity.
- Associated with improved learning.
- Conditioned by teacher training.
- Pending challenge.

Connectivity

Need
- Human right.
- Determining factor for access.

Restrictions
- Barriers to equitable access (budget constraints).
- Worst hit: rural communities and other vulnerable groups.

Adaptations
- Need for alternative approaches where there is no connectivity (e.g., intranet connections).

"Access to technology has created various gaps between inhabitants of urban and rural areas, which are even more accentuated in vulnerable and marginalized populations; gaps between the training received in public and private schools, which also leads to differences in the digital skills learnt and the qualifications for and management of technologies for professional practice".

Jhonatan González Sánchez
Director of Strategic Projects,
Ministry of Public Education, Mexico

"Delivering devices and infrastructure is not enough. It is necessary to develop policies that will integrate teacher training and the development of digital skills for all members of the education community, and develop and manage educational resources, but every public policy must be accompanied by funding".

Andrés Bedón
National Director of Technology for Education, Ministry of Education, Ecuador

"No country can think that it will never ever need to have a systematic strategy for investment in and improvement of technological capabilities to be used by as many people as possible in the country".

Leandro Folgar
President, Ceibal Foundation and Plan Ceibal, Uruguay

"If there is no connectivity, there's hardly anything you can do – even if devices are available. Nor is it enough to have connectivity and devices if there's no culture of digital education that will allow shorter, more flexible, more accessible processes for vulnerable groups".

José Luis Cabrera
Director-General of Curriculum and Assessment, Ministry of Education, Honduras

"There is 100% coverage through mobile devices. Even indigenous communities access information through mobile phones, so what we want to do is enhance that access through concerted action with other agencies and telephone companies: a plan to access the learning domain for free".

Lilian Demattei
Director-General of Science and Technology, Ministry of Education and Sciences, Paraguay

Media

Digital media - innovation

- Modernization and innovation of education systems.
- Enhanced distribution of computerized devices (systematized processes, prioritized deliveries).
- Significance of using digital platforms (LMS) - content management and interactivity.
- Coordinated management with other government departments/areas.

Mass media - continuity

- Valuing the role of the mass media (radio/TV) and printed materials in ensuring access (particularly vulnerable groups/rural communities during suspension of face-to-face classes).

Mobile phones - resilience

- Use associated with the suspension of classes due to the pandemic (in many cases, the only way to access content).
- Establishing partnerships with various mobile telephony providers to exempt data for access to educational sites.

"For the integration of technologies, there must be a focus on multiplatforms and partnerships with public radio and television services to disseminate audio-visual, television and radio programmes that will complete the teaching processes for the students."

Juan Andrés Beltrán Sarmiento
National Adviser on Innovation and Cooperation, Ministry of Education, Colombia

"Digital technologies enable more customization, regular, timely, and apposite feedback that allows evidence-based decisions to be made, which contributes to the quality of education".

Leandro Folgar
President, Ceibal Foundation and Plan Ceibal, Uruguay

"Most of the population has access to at least a telephone: the point is how this technology can be put to the best use rather than just using it for calls or messages."

José Luis Cabrera
Director-General of Curriculum and Assessment, Ministry of Education, Honduras

Community

Strengthening partnerships

- Extended education community as a partner for teaching and learning.

Extending educational space

- Families and responsible adults facilitate learning beyond the classroom and face-to-face lessons.

"We must bring into the education system not only teachers and students, but also families, neighbours, and communities, as well as the different partners from the public and private sectors and universities."

Victor Freundt
Director of Technological Innovation in Education, Ministry of Education, Peru

Teacher training

Key to digital integration

- Required for meaningful use of technology.
- Necessary to integrate into initial teacher training and as a refresher while in service.

Socio-educational gaps

- Importance of developing both soft skills and training for online teaching (production and curatorship of digital resources, use of platform data for ´ learning customization and management).
- Specific integration of technology for the different curricular areas.

"Teachers need training in the use and management of education platforms in virtual environments, alternative ways of assessing learning, and content creation. Furthermore, they shouldn't be afraid to innovate or, for instance, use social networks to give students guidance or communicate with fellow teachers".

William Mejía Figueroa
National Director of Educational Research, Ministry of Education, El Salvador

Emerging dimensions

Cross-cutting areas and determining factors

- **Curriculum:** integration of digital skills, digital citizenship and more flexible approaches.
- **Security:** safe use and cybersecurity for students, teachers, families and education infrastructure.
- **Ecosystems:** Systemic integration of digital education.
- **Digital policy management:** dependence on coordination between different education areas/other government agencies for the implementation of public policies on digital education (infrastructure development, curriculum adaptation, teacher training, etc.).
- **Gender:** Demand for more resources and programmes to integrate girls and women into technology.
- **Educational resources, participation and diversity:** participatory production with rural and indigenous communities.
- **Accessibility:** demand for more resources and technologies for the disabled.
- **STEM and programming:** integration into compulsory education.
- **Environment:** developing policies for the treatment of technological waste and raising awareness for a change of habits.

"It is necessary to make a big change in education in order to incorporate digital transformation and integrate strategies into the curriculum so as to equip students with 21st century skills: not only the use of technology, but also communication, teamwork and STEM skills."

Adlay de Freitas
National Director of Educational Information Technology, Ministry of Education, Panama

"It is necessary for all students to be able to access digital resources that will allow education to go beyond what is done in the classroom with a vision of accessibility and inclusion, and that access should be entirely free."

Gabriela Castro Fuentes
Director of Technological Resources in Education, Ministry of Public Education, Costa Rica

"The educational innovation ecosystem goes far beyond the provision of content and resources by technological means. It has to do with building comprehensive strategies that will involve the access and participation of the education community, including concerted efforts with indigenous communities so that the content is created by them according to their needs".

Juan Andrés Beltrán Sarmiento
National Adviser on Innovation and Cooperation, Ministry of Education, Colombia

International organizations

Articulation with national contexts

- Necessary to understand specific contexts to find effective solutions (integration on the agenda of countries in the region).
- Supporting tried and tested solutions in countries receiving assistance.

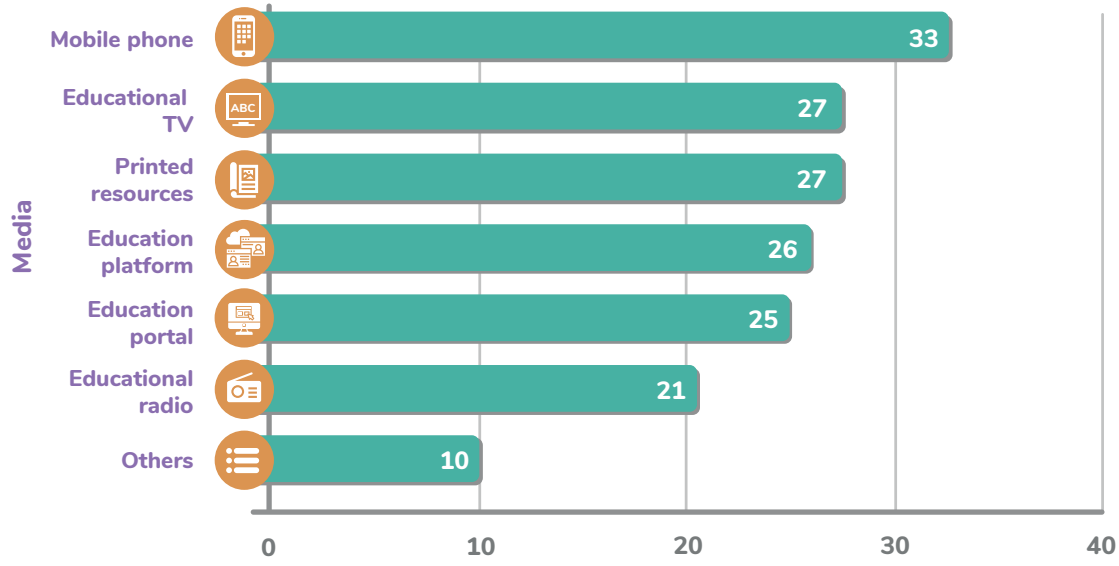
"It's best to know the context, the reality of each country and make the capabilities of these organizations available to the institutions so that the interventions are more effective and quicker."

William Mejía Figueroa
National Director of Educational Research, Ministry of Education, El Salvador

Source: Ceibal Foundation and ADELA, 2021
Methodology: interpretive analysis based on semi-structured interviews with 11 policymakers (Colombia, Costa Rica, Ecuador, El Salvador, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, and Uruguay) conducted between September and November 2021.

Figure 2

Media most widely used for distance education

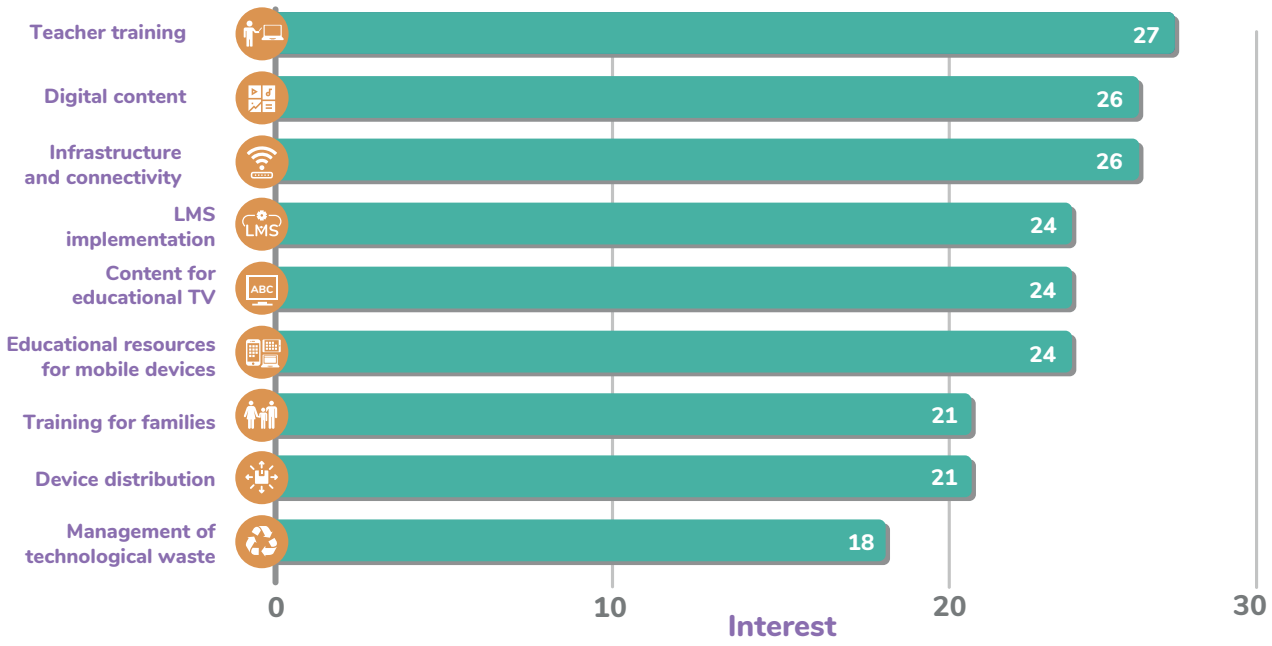


The data are the sum of the values assigned by each respondent for the most widely used medium in distance learning presented by the survey (with 0 not applicable and 4 being the highest value).

Source: 2021 Challenges Survey, Ceibal Foundation and ADELA
Methodology: self-administered online survey of policymakers from 9 countries (Colombia, Costa Rica, Ecuador, El Salvador, Honduras, Mexico, Paraguay, Peru, and Uruguay) in April 2021.

Figure 3

Main challenges



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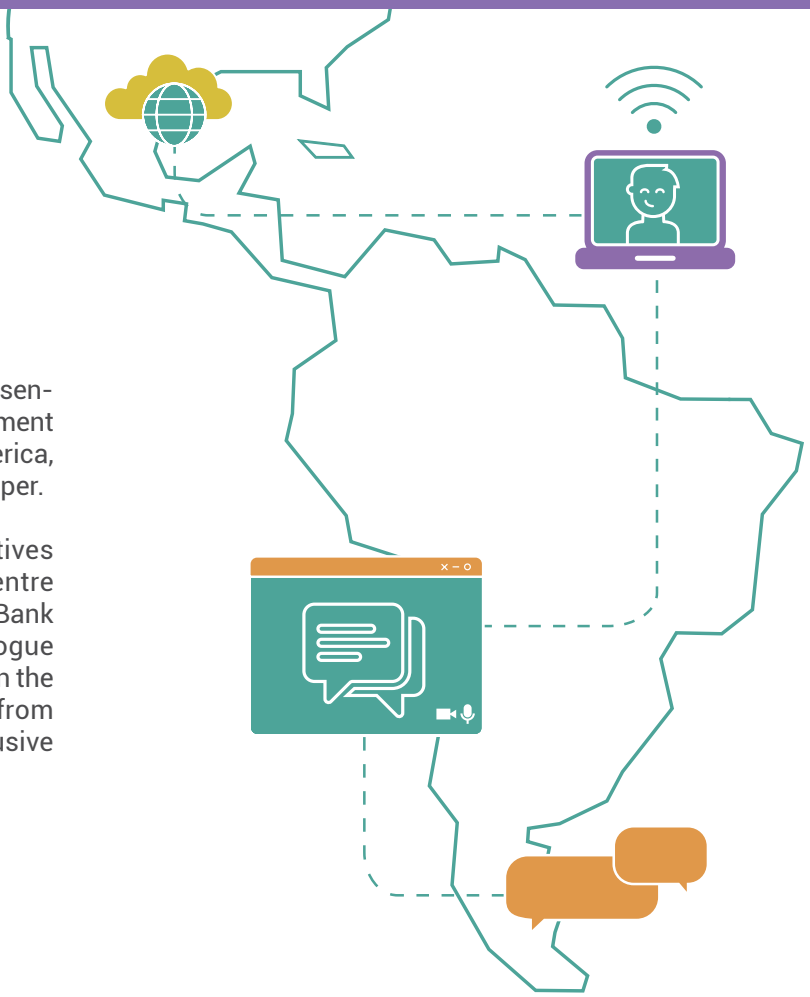
The **view** of **international organizations** with an **impact** on the **region**

Interviews

The **view** of **international organizations** with an **impact** on the **region**



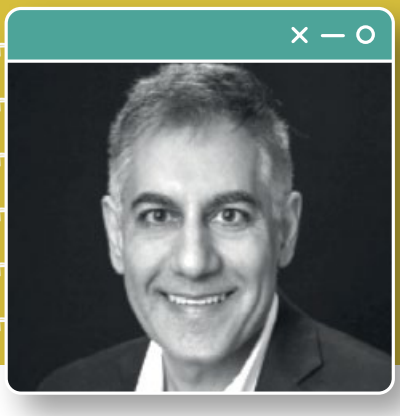
The contribution of international organizations is essential in the implementation and sustainable development of education and technology policies in Latin America, so their outlook is extremely important for this paper.

The Ceibal Foundation interviewed representatives of the International Development Research Centre (IDRC Canada), the Inter-American Development Bank (IDB), and the think tanks Inter-American Dialogue and the Brookings Institution to have their views on the opportunities and challenges that can result from the field of technology in order to promote inclusive and equitable quality education in the region.

Interview

Naser Faruqui

Director of Education and Science, International Development Research Centre (IDRC Canada)



How can education systems use technology to enhance development and inclusion?

Technology, by leveraging information networks and mobile phones and the internet across the world, but certainly in the developing world as well, offers us some opportunity to reach more people and to do it more effectively. It has a lot of promise, but historically the way IDRC sees it is as a tool which has benefits and also risks.

It's particularly important to ensure that the technology actually enhances inclusion and does not amplify inequities. We often find that low-tech is as effective or more effective at reaching vulnerable populations. We know that not everybody has a computer but just about everybody has a mobile phone, so it is important to design resources and content that can be accessed through mobile phones.

Another key aspect is that the teachers are trained, including teachers from low-income settings and including teachers that represent marginalised groups and understand perhaps the context better than others. You need to take a systems approach and not look at technology in isolation. You have to look at it along with everything else: how it's being used, who's being trained, who's being supported.

What educational strategies would you consider prioritising to promote equal access for vulnerable populations, including the disabled and indigenous people?

IDRC is supporting the knowledge and innovation exchange for the Global Partnership for Education[2], which is the biggest network of funders that have been trying to improve quality and access to education and achieve Sustainable Development Goal 4.

IDRC's raison d'être is to ensure that policies are informed by the best available evidence that's out there, including in the area of education. Unfortunately, in the area of education, like in so many areas in development, it is the middle income and the higher income that gets served first, and vulnerable populations, disabled people, indigenous people and so forth have been left behind.

First of all, you have to understand the context, and we're really trying to identify the best innovations that exist and scale them but at the same time support additional research in areas where we don't actually have the answers.

The second part of it is placing vulnerable populations at the heart and at the head of the strategies designed and rolled out, and not trying to reach them after the fact, including in teacher training.

The third one is unpacking the strategies, because you can't have a one-size-fits-all strategy. You need to differentiate your strategy and that's where the research and understanding the context does its work. That's the big challenge; scaling some of the promising innovations that have worked and testing them in the lower-income areas with marginalised groups to ensure that we then know how to implement them effectively. It's critical because we don't just want to be focused on being technologically innovative to embrace the best technologies that are out there that can improve education. We also want to ensure that we're doing so in an inclusive way.

How do gender gaps related to technology and technological leadership affect development and social mobility, and what can education do to achieve a transformative change?

Nobody disagrees with the idea that technology can improve development, but we all understand that it's not a panacea, and it needs to go hand in hand with systemic change and focusing on socioeconomic issues.

In parallel, women have to be a critical part. Strategies that just focus on men or better represented, more powerful groups are always going to fail. In developed countries, and even more so in developing countries, women are outnumbered, and the ideas that are coming forth tend to be kind of majority rule, from men who don't take into account particular factors that may affect women and inhibit their development.

It's quite important to encourage more women to enter STEM[3] careers; careers that we know have less than 30% of women in developing countries.

Initially, women are actually overrepresented at graduate levels in training; there's a sort of feminisation of higher education that you see in many developing countries, but then they drop off. The additional point is ensuring that women enter, remain and excel in STEM

2 - https://www.globalpartnership.org/.

3 - Science, technology, engineering, and mathematics.

> *It's quite important to encourage more women to enter STEM careers; careers that we know have less than 30% of women in developing countries.*

careers. So, we have to work on the foundational part as well as we work on the coolest edgy innovations and try to scale them to improve education.

How can the overabundance of information produced by technology be used in an effective and efficient way to improve learning and management of education systems?

I'd first say that in some contexts we have an overabundance of information, but in other contexts we don't. Certainly, educational innovations, applications, and software that produce data on certain students' learning in real time can be fantastic to enable the teachers and others to adjust and tailor the teaching to that particular student. it is happening in higher-income settings, but it's not happening so much in developing countries, and there's no reason it shouldn't. So, in some contexts we don't have enough information.

The second part is a broader point about data in terms of science, technology and innovation that relate to education. That's been an area that IDRC has been working on for a long time – big data for development but also open, carefully shared data.

Another aspect is building the capacity of not just the people who are developing the data, but also governors and education ministers; building their capacity to manage and use the data in a way that can inform programmes in the future and make policies better.

What role do regional cooperation and the link between science, innovation and education play in promoting development opportunities in the areas where they are most needed?

It's something that we at IDRC have been reflecting on for some time. Historically, we at IDRC started by supporting individual scientists at addressing their particular development challenges including in the area of education. That continues to be important, but we've realised that we needed to ensure that the organisations or the institutions who run those scientists were also strengthening their capacity.

For a long time IDRC circumvented the science infrastructure in developing countries because it wasn't necessarily very effective, there weren't independent peer-revied processes for supporting science and so forth. But that is really starting to change. So, one specific way is building the capacity of science granting and innovation agencies.

Organisations like IDRC need to have countries take ownership of their science funding and convince their governments to value science funding for development more.

Some councils in Latina America have come to us, to IDRC, to say, "Can you helps us? We want to do this. We're going to do it anyway", and that's what we really like to do. It's not kind of coming and saying, "You should do this", but actually our role is to listen and to help to address something that's demand-driven.

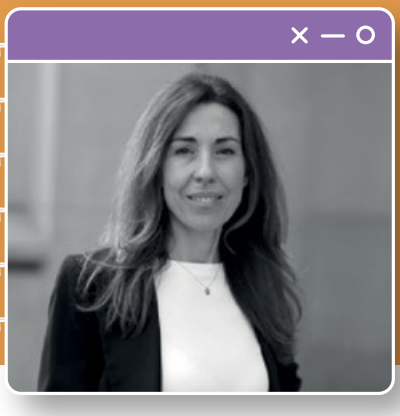
As regards regional cooperation, it's critical that they learn from each other, that they share their experiences, that they work with each other and that there's collaborative research.

> *As regards regional cooperation, it's critical that they learn from each other, that they share their experiences, that they work with each other and that there's collaborative research.*

Interview

Mercedes Mateo Díaz

Chief of Education, Inter-American Development Bank (IDB)



What education problems can technology solve?

Technology is the opportunity we haven't had for decades in Latin America to solve the problem of equity and quality in learning at the same time. The pandemic has led to an education emergency, but the crisis in the education system had started earlier on. Half of 15-year-olds basically didn't understand what they were reading, compared to 20%, 23% of all other students in OECD (Organization for Economic Co-operation and Development) countries. That's talking about foundational skills. If we move on to the field of 21st century skills; digital skills: learning to learn, communication, critical thinking, etc., those weren't even part of the curriculum what was taught in most of the countries in the region.

Digital technologies offer a unique opportunity as they contribute to scaling while reducing costs, because we know that the issue of resources in the region is far from insignificant.

Another important issue is customization. The pandemic broadened pre-existing learning gaps. If earlier on we were facing a context of extreme heterogeneity in the student population, now we have an even more heterogeneous population with even bigger gaps. A 2.5-year learning gap may have developed between a high-income student and a low-income student during the pandemic, so it's necessary to customize learning. It's not about remedying learning but about accelerating it proportionately, and the only way to do it, in view of the size of the problem, is through technology.

Ubiquity and working asynchronously is another key aspect. That is, any student should be able to access the educational platform that allows them to study at the time that best suits them and wherever they are.

How can education systems ensure that all students have access to technological resources to make sure that there are no gaps between different students and schools?

There are at least two key pieces to the jigsaw here. One is connectivity, which has to be seen as a right that all citizens should have access to. The citizen, the teenager, the child who is not connected today has neither economic nor education opportunities.

Until we get there, education systems should guarantee access to the digital experience no matter whether or not there's connectivity. The experience of surfing the net can be recreated without the machine you are working on being directly connected to the virtual world, to the internet.

So, while we guarantee connectivity, that is, the full experience, we should be able to generate the more restricted experience in a controlled virtual environment not necessarily connected to the internet.

> ***connectivity, which has to be seen as a right that all citizens should have access to. The citizen, the teenager, the child who is not connected today has neither economic nor education opportunities.***

How can technology help provide education to vulnerable and even hard-to-reach students?

One of the things that we have seen during the pandemic is that education systems have innovated a lot in terms of how they responded to emergency distance education. There are examples in radio, television and other types of tools, including WhatsApp and social networks, which have made it possible to generate some kind of educational experience with technology. For example, through tutorials on WhatsApp or other types of digital connections you can support the student who is working autonomously. Tutorials have had a very positive impact not only in terms of improving learning, completing a course or passing a particular exam, but also completing the school year.

Combining technology with some kind of remote support that includes interaction with a human is key and effective for students who are in highly vulnerable conditions or are hard to reach. Ceibal had extremely innovative experiences before the pandemic in this regard, such as remote teachers using technology to connect to a face-to-face classroom so the students

are taught English by a teacher sitting in England, Argentina or another country where that capacity is in place. So, there are countless possibilities that help us reach vulnerable students who do not necessarily have immediate access to the resource in the space where they are but can connect to those resources that will support their learning.

> ***Combining technology with some kind of remote support that includes interaction with a human is key and effective for students who are in highly vulnerable conditions or are hard to reach.***

And what would be the possible negative consequences of the use of technology for the challenges of education in terms of access, equity and inclusion?

One of the risks of technology is to see education as the industrial production machine that makes workers, injects youth and children with the skills they need for producing and we forget about the whole human dimension. If a young person is learning through a platform and their socio-emotional skills and mental health are not taken care of, if their ability to collaborate and relate to other students is not fostered, if they are not given a whole set of complementary skills, such as inclusion, diversity, the ability to coexist peacefully with others, a skills gap may open up.

In this line, another negative impact of technology is related to what I would call the human touch. Technology can reach many more people because it's cheap. What we don't want to happen in the end is for high-income children to study with good teachers, have the chance to continue knitting, cooking, experimenting, playing sports, making music and doing everything that makes them all-round human beings while low-income children end up in front of a digital device because that's what can be paid for with public resources.

How can the school promote technological innovation and development that will contribute to social mobility?

If there is anything good about COVID-19, it's the fact that the education system has left its comfort zone. We are no longer the same as we were before the pandemic, and that creates an opportunity for change.

Secondly, it's not that school may promote education and social mobility; school must do both. If there is a space for innovation, that's school. If we don't innovate in the way children learn, how and where can we innovate? Not that it's an obligation; it's the raison d'être of education.

Family and school are the determining factors of economic possibilities, of the human capital that you build up for working, producing, moving socially. If a family cannot provide that because it is low-income, the school has to. It is an imperative, not an option.

Outside the formal education systems, some education services are becoming available that are giving traditional formal education a run for its money, both at the school and work level. Non-formal services are emerging that give young people those skills that school or training systems didn't give them, and in some cases at a relatively low cost and in record time. Just to give you an example, Google offers a six-month certificate in digital skills and advertises it as the equivalent of a university degree in terms of job prospects. Besides, we're talking about 80% employability rates in many of these programmes, which means this form of training is really gaining ground and has the potential of bringing quality education ta a mass audience.

Interview

Ariel Fiszbein

Education Programme Director, Inter-American Dialogue

What is the role of technology in terms of access, equity, inclusion and quality in education?

The answer to that question has changed a lot in the last two years in that before the pandemic it would have been more theoretical: "We believe that...", while now it is more practical: "We know that...".

The incorporation of technology is part of modernization and the change that has to occur in response to how the world is changing, the options that are out there, the daily life in which teachers, children, parents, families operate. That, which was perhaps obvious to experts until two years ago, is now obvious to most people, I believe.

In terms of the 4 aspects you mentioned – access, equity, inclusion and quality – technology opens doors. For instance, in remote rural schools, where there is no chance of having specialized teachers in each subject, it is possible to use the internet to access those human resources that are available to children elsewhere. Similarly, technology can give teachers new tools to make teaching processes more meaningful, a determining factor of quality.

How can the integration of technology contribute to the management of the education system and technological development?

The dimensions in which educational management can be transformed through the use of technology range from the most traditional administrative issues to the most sophisticated things, such as assessing learning. This is a very good example of an area in which modernization hasn't reached the education system in a structured way. Even though information technology has been incorporated into management, in many cases it is not integrated for effecting the cultural change that its incorporation into the daily management of schools implies; it's a matter of efficiency.

On the other hand, in order to promote technological development, we know that from the point of view of today's labour market, digital skills – understood not only from the most trivial point of view of knowing how to operate a computer, but of knowing how to function in a digital world – are prioritized by employers in virtually every industry and sector. Although we discuss these issues more in technical education, higher education, I think it's obvious and natural that it should also be part of the discussion in basic education.

> ***The incorporation of technology is part of modernization and the change that has to occur in response to how the world is changing, the options that are out there, the daily life in which teachers, children, parents, families operate.***

How can technology contribute in education to developing global citizenship and the appreciation of cultural diversity?

Meeting people from other contexts and exchanging information, knowledge, and experiences with them, and I mean especially from other countries and within the same country, is crucial in that it opens your mind.

It is a major source that generates respect for diversity, appreciation for diversity. Technology naturally makes it possible to do that at a lower cost. I don't think it's detrimental to the value of educational exchange programmes, but since they are more expensive and feasible with students towards the end of the education process, the use of technology in this field is a way to achieve this experience at a low cost and at younger ages.

What skills do you think it is essential to develop in teachers, students and the education community for full integration into a culture increasingly influenced by technology?

Digital skills, which, in the definition that I like to use, includes not only the bare essentials, but is much more comprehensive. For teachers, it is crucial to be able to take advantage of the possibilities offered by technology and teach in a different way. **It's part of a deeper cultural and pedagogical change that goes from seeing the teacher as the one who gives you information and knowledge to someone who promotes and facilitates the creation process.**

Now, thinking about the students, it also contemplates skills that we sometimes include in the definition of socio-emotional skills, such as teamwork and cooperation, which are very important when it comes to making full use of technology; I mean, it's not just about sitting down to watch a videoconference. I would also consider the issue of security and protection, skills that the community at large needs.

And something that took on increasing significance during the pandemic is the role of parents. What we don't know is how long it's going to last, but there's no doubt parents have had to improvise during this period and learn as they go. So yes, they too have new skills to develop.

What changes are necessary in education systems for students to learn the necessary skills for living and working in a technology-driven world?

The sixty-four-thousand-dollar question is whether education systems will see the post-pandemic period as going back to normal; that is, whether they will try to recover that sense of normalcy that's obviously been lost, or whether they will accept the disruption and build from it.

My fear is that they will try to go back to normal and close the door to a deeper transformation. Before the pandemic, an intelligent outlook on technology was "How can we use it as a factor that speeds up, expedites things, changes relationships within the system itself for moving on to a more dynamic learning model?" That was the role; now we have this wonderful opportunity that I don't think will be seized.

One possible approach is a top-down strategy. In other words, we are going to update curricula, we are going to change teacher training, we are going to design a new school. That's fine, but we are going to lose a generation, because those are very long processes, and in Latin America, given the political instability, there's hardly any continuity to most efforts. That strategy, if it's the only one or the main one, will not work. The alternative to that is a bottom-up strategy, that is, loosening up and creating conditions and incentives for innovation to occur in a much more decentralized way. There are obviously many risks because it's not going to happen in the same way everywhere, but it seems to me that in order to prevent any possible inequalities and imbalances, we shouldn't try to set up a solid block, but rather take remedial action.

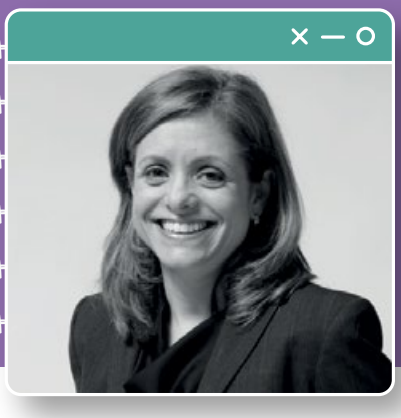
So, what I think is necessary, as far as the system and the leadership of ministries are concerned, is to welcome disruption as a strategy for change.

> ***"It's part of a deeper cultural and pedagogical change that goes from seeing the teacher as the one who gives you information and knowledge to someone who promotes and facilitates the creation process."***

Interview

Emiliana Vegas

Co-Director and Senior Fellow, Center for Universal Education, Brookings



What technology-related public policies do you think it is necessary to implement in order to promote the construction of sustainable, resilient education systems in Latin America?

Public policies have to analyze what they want to achieve in the first place. Our proposal is that they should improve learning and bridge the gaps between groups. It's necessary to start by understanding the extent to which there is access to technology and connectivity, and how teachers and students are using technology for teaching and learning.

On that basis, there are four comparative advantages of technology that could be better exploited.

The first is that it allows us to scale quality education. There are areas where it is very hard to find teachers who have the content and can share it. Technology allows us to take advantage of and capitalize on a teacher's lessons in any country in Latin America so that other children can have access at a lower cost.

Secondly, we're aware today of the heterogeneity with which our children learn and their levels of learning. Regardless of how great a teacher is, they have to serve a very diverse group, and technology can be very useful when it comes to customizing education, so that each student can interact with the content with their teacher's support and at their own pace.

Thirdly, we all learn as we apply the concepts to real-life problems. Technology can allow students to access endless opportunities for practice.

Finally, technology is also a tool that can make the teaching and learning process more entertaining for students, can retain them in school, and keep them interested.

When you use these 4 comparative advantages, it is possible to really make that leap forward that we want and need.

What changed after the pandemic and what challenges have emerged in the region in relation to the major role of technology in the design of educational public policies?

One of the great things that the pandemic brought about on the positive side is that if there was any resistance among some adults in the system – teachers, heads of schools, etc. – to using and taking advantage of technology, we have overcome it.

We now have the problem of unequal access, which we have always had, but it has become much more apparent, and it greatly limits learning opportunities, especially when schools have been closed for so long in most countries. The challenge is still there and persists after the pandemic in terms of how to ensure access to devices and connectivity for all students and all teachers.

But more important than that is the challenge related to building or rebuilding our education systems so that they can be adapted day after day to better serve each student so that they can gain not only basic knowledge in mathematics, reading and writing, but also the important knowledge to function and be effective in the complex world we live in: critical thinking, collaboration, communication, digital skills.

> ***One of the great things that the pandemic brought about on the positive side is that if there was any resistance among some adults in the system – teachers, heads of schools, etc. – to using and taking advantage of technology, we have overcome it.***

How can education systems incorporate the use of technology through the reform of study plans, the redesign of teaching materials and training or support for teachers?

Decisionmakers in the field of educational policies should build on an agreement with society, with the main stakeholders: teachers, the productive sector, civil society organizations, society at large, and ask themselves: what skills do we think an individual graduating from the education system must definitely have and master? That should be the basis for developing syllabi and materials to support the student along that path, while recognizing that each individual, each student will acquire this learning at their own pace.

People have to be given training not in knowing and memorizing, which is what most of our systems have done so far, but in learning to learn, learning to apply knowledge and to assess the quality of the content and discriminate it.

How can education systems support teaching staff? What training models can help foster the proper use of technologies in teaching and learning practices?

What I have seen globally that works best is teacher communities of practice where teachers with facilitators from the system learn from each other. When teachers learn from and with their peers, they tend to take much more advantage of the experience and apply it better; they tend to see the value of it.

So what we need to do is build teacher networks, which don't have to be face-to-face; they can be facilitated by connectivity.

How do technologies promote knowledge through more attractive formats for students? How important is it to create open educational resources or open-source solutions so that they are more inexpensive?

Systems can support the use of technology for learning through play, by providing and doing. During the pandemic, a number of companies and industries unexpectedly benefited from so many schools and businesses having to work remotely and go online, and derived a number of economic benefits. So why not create a technology fund in education where companies share a minimum percentage of their profits and proceeds, where international organizations with industry and research experience can make technology more accessible, cheaper and free-use, and which helps monitor the student's learning in their educational experience?

If you had to choose a priority effort for public policies in the region in the next 10 years, which do you think would be the most important?

Perhaps the most important policy we can develop is recognizing that education is a fundamentally human process and that technology is our ally, but it isn't a substitute for human beings or the role that they play in the process of teaching and learning. The key is still the teacher. There's plenty of evidence that this is the main factor not only in learning, but also for the social-emotional well-being of students.

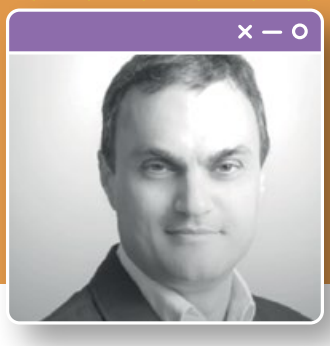
We have to train teachers in digital skills so as to change their role from the ones who teach to the ones who facilitate learning; from the ones who know everything to the ones who have access to information and can facilitate it. The pandemic gives us a very important opportunity because no one can deny now that technology is an ally.

> ***We have to train teachers in digital skills so as to change their role from the ones who teach to the ones who facilitate learning; from the ones who know everything to the ones who have access to information and can facilitate it.***

2023 GEM report on technology and education: consultation process and main lines of research

2023 GEM report on technology and education: consultation process and main lines of research

By **Manos Antoninis,** Director of the Global Education Monitoring Report, UNESCO.



The Advisory Board of the Global Education Monitoring (GEM) Report[4], which the Ceibal Foundation is part of, thought forward and chose technology as the theme of the 2023 GEM Report before the onset of the COVID-19 pandemic. The Report will focus on the education problems that technology can solve and the conditions that must be met for technology to support education and contribute to the achievement of the Sustainable Development Goal about education (SDG 4)[5]. It will gather global evidence of how education systems have incorporated the use of technology, review the description of technology in education that appears in the Education 2030: Incheon Declaration and Framework for Action, the foundational documents of SDG 4, and analyze how it has grown in significance in the context of the COVID-19 pandemic. It will also discuss the various opinions on the role of technology in education.

It will highlight the case of the "technophiles", who, driven by enthusiasm and idealism, marvel at how technology broadens horizons in all areas of life and advocate education incorporating the latest developments, from computers and devices to software and applications, and the "techno-sceptics", who argue that there is no place for automation in education and learning and oppose the growing influence of technology providers.

The Report recognizes that the pandemic was a turning point in the use of technology in education. The closing of schools as a result of COVID-19 forced governments to resort to distance education to guarantee the continuity of learning. While the poorer countries used radio and television programmes, tools that some of these countries had already been using before the pandemic to reach the most remote populations, the richer countries created learning platforms where very often the high rates of device ownership and fast internet connection contributed to the continuity of learning. The digital divide prevents much of the student body and teaching staff from having adequate internet connection, the appropriate equipment, the necessary skills or the right study environments to make the most of online platforms. In Latin America, the region of the world where schools were closed the longest due to the pandemic, countries have designed a number of distance learning strategies using different tools such as radio, television, mobile phones and online platforms. Despite government efforts to ensure the continuity of learning, large differences were observed between the poorest and richest households in terms of internet access (45% vs. 98%) and access to computers (29% vs. to 94%). Countries such as Chile, Colombia and Uruguay favoured online learning solutions, while countries with less internet connectivity offered classes on television and radio (IADB, 2020; British Council, 2021).

While the use of technology in education started before the pandemic, COVID-19 placed even higher expectations on technology. The pandemic showed us that technology can bring great opportunities for education systems, but also huge challenges.

What do we mean by educational technology?

Technology refers to the application of scientific knowledge in any area of life, including education. Educational technology is characterized by three attributes that show its complexity. Firstly, it takes many shapes and encompasses a range of overlapping, integrated, and stand-alone tools, such as computers, books, maps, monitors, TV sets, cameras, telephones, radios, and tutors. It can be one-to-many, individual and peer-to-peer technology. It can be professionally produced or have user-generated content. It can be technology specific to schools and a place or it can go beyond time and space. It requires a different infrastructure, design, content and pedagogy and can promote different types of learning. Secondly, it works in many ways. It offers content, creates student communities and connects teachers with students. It provides access to information. It can be used for formal or informal learning and can assess what has been learnt. It may require students to learn individually or in groups; online or offline; on an independent or interconnected basis. It is made up of infrastructures and materials and involves people with different roles. Furthermore, it is complex and evolves constantly. Thirdly, despite its diversity, it is increasingly integrated. The convergence of technologies such as applications and devices, the rapid development

4 - The Global Education Monitoring Report (GEM Report) is an editorially independent, authoritative and evidence-based annual report published by UNESCO. It is the international community's tool for monitoring progress towards achieving SDG 4.
5 - Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

of new technologies, the migration of applications to the cloud, and the protean nature of the internet often cause the failure of attempts to differentiate, classify, and assess technologies.

SDG 4 places high expectations on technology

The achievement of SDG 4 depends on the opportunities and challenges created by technology. The Incheon Declaration clearly explains: "Information and communication technologies (ICTs) must be harnessed to strengthen education systems, knowledge dissemination, information access, quality and effective learning, and more effective service provision" (§ 10). In the Education 2030 Framework for Action, education systems are urged to "be relevant and respond to [...] technological advances", as well as to help children, youth and adults acquire "the flexible skills and competencies they need to live and work in a [...] technology-driven world" (§ 6). In addition, the existence of "relevant teaching and learning methods and contents [...] taught by well-qualified, trained teachers [...] supported by appropriate information and communication technologies (ICT)" (§ 14)" was elevated to a criterion of quality education. Targets 4.3, 4.4, 4.5, 4.a and 4.c include explicit references to the role of technology in education.

Main lines of research of the 2023 GEM Report

In September 2021, the GEM Report published the Concept Note for the 2023 GEM Report. It is a working document intended to provide a basis for regional and thematic consultations, foster dialogue between experts and policymakers, and elicit feedback from the report's multiple stakeholders working in the area of educational technology. The concept note recognizes that technology is evolving at a dizzying pace and research on technology in education is as complex as the technology itself. The fact that many of the benefits are not easy to assess empirically given their ubiquity, complexity, usefulness and heterogeneity is one of the biggest challenges when analyzing the use of technology in education. The concept note lists some of the education challenges that technology can solve.

1. **Access, equity and inclusion.** Technology can help serve disadvantaged populations and ensure that the content reaches all students in more attractive and inexpensive formats. The 2023 GEM Report will explore:

- The use of radio, television and online platforms to ensure education for populations living in rural and remote areas.
- The use of free university degrees and massive open online courses that offer opportunities to populations that have traditionally been marginalized.
- The use of technology in emergency contexts and the use of technology to guarantee the inclusion of disabled students.
- How the COVID-19 pandemic tested the ability of distance education to ensure the continuity of learning at all levels of education globally.

2. **Access to content.** Technology acts as a tool for access, dissemination, improvement, substitution and automation in teaching and learning. The 2023 GEM Report will analyze:

- The way in which ministries of education and schools address the issue of the format and cost of content, including purchasing materials from international companies and creating their own content.
- The opportunities offered by the open education movement in response to the cost and commercialization of content and platforms that used to be free, which may threaten access to quality opportunities for all.
- How to bring more knowledge to students in attractive and low-cost formats.

3 **Quality.** Education systems use technology to improve the acquisition of basic skills and enhance learning. The 2023 GEM Report will study:

- The opportunities offered by technology to teaching staff for innovation through the use of different programmes and tools.
- The use of customized programmes that adapt to each student's capacity and pace of learning.
- How technology can support the development of basic skills but also pose a challenge in the classroom.

4 **Digital skills.** Online environments expose students to new ideas, sources of information, and forms of communication and collaboration, but they also require skills for harnessing their potential. The 2023 GEM Report will analyze:

- The new skills that are required for the development of digital content, such as coding and programming, and the digital gap that exists in their acquisition in several countries.
- The challenges related to misinformation, disinformation and the polarization created by digital spaces, as well as security problems related to the use of social networks and the use of instant messaging.
- The negative health effects of gaming, entertainment, and video game addiction and the consequences of increased screen time.

5 **Technological development.** Education systems can support technological development through courses, technical, vocational and higher education centres, or scholarship schemes. The 2023 GEM Report will analyze:

- How technology can contribute to improving the management of the education system.
- How technology can help improve data collection and analysis to improve decision-making and practice in education.

The 2023 GEM Report will study three conditions that must be met for technology to support education. First, there is the distribution of **access to technology** in education within and between countries in terms of infrastructure and networks such as electricity and internet access, as well as the distribution of individual devices such as laptops, tablets and smartphones. It includes public policies that promote the provision of technology, and international strategies and programmes that seek to improve the availability of technology in education in the poorer countries and serve the more disadvantaged populations. Secondly, there is **governance and regulation**, that is, the laws and policies developed by countries to promote rules and regulations for legal protection in terms of privacy and security, and the transparent and participatory governance methods in the use of educational technology that can help governments make the right decisions for the benefit of current and future generations. Thirdly, there is the **training of teaching staff**, which implies education systems supporting all teaching staff in teaching, using and managing technology effectively.

The Ceibal Foundation and the consultation process for the GEM Report in Latin America

Technology is evolving at a dizzying pace, and research on technology in education is as complex as the technology itself. With this complexity in mind and for the purpose of encouraging dialogue and eliciting feedback on the lines of research proposed in the concept note, the GEM Report is implementing a process of regional and thematic consultations. These consultations seek to compile examples of best practice and evidence that illustrate the positive and negative repercussions of the use of technology in education. The Ceibal Foundation, which works on promoting, developing and coordinating research, innovation and dissemination projects on technology and learning in collaboration with the education and academic community in Uruguay and internationally, was chosen to lead the consultation process in Latin America. This process seeks to promote a dialogue with policymakers and educational technology experts in the region to collect new evidence at the national and regional levels that will contribute to understanding the challenges and opportunities of education and technology in Latin America. It is done online through a website open to the general public and with specific virtual or face-to-face events where we invite experts to discuss the ideas that we put forward in the concept note.

We thank the Ceibal Foundation and ADELA[6] for their support in the consultation process and we hope that together we can promote the generation of research and evidence-based practices that will contribute to the achievement of SDG 4, while mindful of the opportunities and challenges related to technology.

Certain SDG4 Goals are related to technology

Goal 4.3 calls on policies and programmes for the 'provision of quality distance learning ... with ... use of technology, including the Internet, massive open online courses and other modalities ... to improve access' (§45). Goal 4.4 on skills for employment, decent jobs and entrepreneurship is monitored through two technology-related indicators: the proportion of youth and adults with ICT skills (indicator 4.4.1; self-reported) and with at least a minimum level of proficiency in digital literacy skills (indicator 4.4.2; directly assessed). Technology is presented as a potential contributor to equity under goal 4.5, where 'distance learning, ICT training, access to appropriate technology and necessary infrastructure' can 'facilitate a learning environment at home and in conflict zones and remote areas, particularly for ... marginalized groups' (§57). Mobile technology 'holds great promise for accelerating progress' towards goal 4.6 on adult literacy (§59). Under goal 4.a on learning environments, countries are invited to ensure that 'every institution ... has ... appropriate learning materials and technology' (§66). The relevant indicator on the proportion of schools offering basic services (4.a.1), includes access to the internet and computers for pedagogical purposes, and adapted materials for students with disabilities. Finally, under goal 4.c, the Framework for Action reminds countries to provide teachers 'with adequate technological skills to manage ICT and social networks, as well as with media literacy and source criticism skills, and provide training on how to address challenges of pupils with special education needs' (§74).

6 - Alliance for the Digitalization of Education in Latin America, a regional project led by the Ceibal Foundation and funded by IDRC Canada.

The **key role** of **collaboration networks** for **sustainable development** in **education** and **technology:** the **ADELA** case

The **key role** of **collaboration networks** for **sustainable development** in **education** and **technology:** the **ADELA case**

Latin America suffers from deep structural problems and socio-economic differences that have their correlate in education, both in terms of learning achievements and chances for social mobility, leaving vulnerable groups -including indigenous communities, rural populations and women- in a situation of social risk. Digital education and regional cooperation are a possible path towards improving education opportunities in the region. In this context, the Ceibal Foundation implements the Alliance for the Digitization of Education in Latin America (ADELA) project – funded by Canada's International Development Research Centre (IDRC) – which aims to generate knowledge for the development of policies that will promote more inclusive and equitable quality education through digital resources.

ADELA is a regional network comprising policymakers in the areas of innovation and education, as well as research centres, universities, think tanks and various NGOs from Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, the Dominican Republic and Uruguay. Its purpose is to improve the ability of governments to assess, monitor and promote evidence-based practices and policies with a focus on cost-effective solutions adaptable to vulnerable communities, with the ultimate goal of promoting the development of innovations in digital education.

The ADELA network was established as a fundamental space for dialogue, analysis and collaboration for policymakers in Latin America which facilitates the exchange of resources, best practices and lessons learnt, as well as workable solutions for low-income countries, which is essential in the most unequal region in the world.

Since the beginning of the COVID-19 pandemic, ADELA has focused on surveying and systematizing the needs of the region on the basis of surveys and interviews with policymakers to encourage the search for solutions to common problems and promote the continuity of learning, technical support and regional cooperation.

ADELA holds cooperation and knowledge transfer meetings between countries, as well as webinars and events for policymakers and technical teams. These spaces are highly valued by countries as they help solve problems common to the region and showcase benchmark experiences which are an opportunity for adaptation to each particular context.

In order to provide concrete solutions to the challenges identified, calls were made for rapid response and applied research mechanisms. For instance, a training course was run in how to educate during a pandemic with the participation of more than 140 members of technical teams and teachers from 8 countries in the region (see Figure 4).

ADELA has been working to promote the closing of gender gaps in education systems in the region. In this context, the document "Gender and COVID in Digital Education and STEM: Resources to address gender gaps in Latin America" was released in 2021. The publication presents a compilation and analysis of the interventions in Latin America, best practice experiences related to initiatives in distance and digital education, and a toolkit aimed at policymakers for the integration of the gender approach into ICT-aided distance education interventions.

The ADELA network also works on the generation of cost-effective innovations that will provide solutions for learning in the context of the pandemic and to structural problems of education in the region, such as poor performance in basic reading skills (PISA 2018). In this regard, the Ceibal Foundation, through ADELA, is developing a functional prototype of an application for learning literacy in Spanish for 6-year-old children, with a view to providing solutions to the lack of ubiquitous digital resources for distance and blended education.

Figure 4

ADELA: main activities 2020 – 2021

Figure 4 below shows the main activities that ADELA has undertaken over the last two years to strengthen public policies on digital education and innovation in Latin America.

Activity	Description
Systematization of challenges	Annual survey based on self-administered surveys and in-depth interviews with policymakers in the areas of digital education and innovation in the region.
Knowledge transfer	More than 50 activities for countries to share experiences, best practices and lessons learnt, including: • Specialized technical assistance of Plan Ceibal in issues such as Open Educational Resources (OER), training for families, device management, LMS application, single sign on, among others. • Bilateral exchanges between countries. For instance, Colombia shared with El Salvador its experience in the implementation of mobile classrooms, and with Mexico its content strategy for the responsible use of new technologies and the internet. Costa Rica showed El Salvador its experience of technology for students with disabilities. Mexico shared with Honduras its investment study for equipping its educational TV studios.
Rapid response mechanism	Public calls for proposals on providing solutions to common challenges. For instance, training was provided by Business Action for Education (EDUCA), with the collaboration of the Catholic University of Uruguay (UCU) and the Organization of Ibero-American States (OEI) aimed at training technical and teacher teams.
Applied research	Calls for applied research projects within the context of the Education Sector Fund "Digital Inclusion", led by the Ceibal Foundation in conjunction with Uruguay's National Research and Innovation Agency (ANII), on research initiatives that will provide specific solutions to problems or needs in Latin American countries. In 2020, 5 projects were selected for funding.
Webinars and meetings	17 meetings were held with a total participation of more than 1,100 attendees for synergy among policymakers in the region. Initiatives or documents from international organizations such as UNESCO and the Inter-American Development Bank (IADB) were also presented.
Training content	Development of training resources for technical, territorial and teaching teams. Examples: Distance teaching, Cascade and networked distance training, Internet searches, Distance learning, LMS: assessing and choosing a learning management system, Functional assessment matrix of an LMS.
Compilation of best practices and resources	A catalogue of more than 50 resources shared through ADELA.
Gender and COVID in Digital Education and STEM	Publication and webinar "Gender and COVID in Digital Education and STEM: Resources to address gender gaps in Latin America". It includes a toolkit aimed at policymakers for integration of the gender approach into ICT-aided distance education interventions.
Application prototy-+e - literacy	Production of a functional prototype of an application for Spanish-language literacy aimed at for 6-year-olds.

Best practice experiences in the region

In the context of the ADELA and Playing and Learning projects, both funded by IDRC Canada, the following are 11 best practice cases in education and technology selected by policymakers from member countries of the network with a view to helping solve problems common to the region from a sustainable perspective.

Colombia

Project name: Planes territoriales de Innovación (Territorial innovation plans)

Implementing institution

Ministry of Education with the direct support of EAFIT[7] University in 16 Education Secretariats of the country, as well as the support of 14 Education Secretariats through a chatbot available on the Colombia Aprende portal.

Problem

Bringing to the territorial authorities the strategic lines of educational innovation on digital transformation and technologies that develop public policies in Colombia for equity, improved quality, ICT integration and ownership, and the bridging of gaps.

Solution

Developing Territorial Plans for Educational Innovation in order to manage educational innovation in coordination with the strategic lines defined by each Secretariat of Education based on the needs and capacities of the territories.

In 2021, the Ministry and EAFIT signed a contract to strengthen the territorial, urban and rural capacities of the secretariats of education through territorial plans.

The initiative involves implementing four central lines of action: disseminating content for the management of educational innovation and devising territorial plans; supporting 16 secretariats for the development of their plans; designing a dissemination strategy and tool for content self-management; and piloting the self-management tool.

Innovation

The Secretaries of Education were organized into 3 levels depending on their link with innovation strategies: exploratory (they have not implemented any initiatives/programmes for educational innovation), integrative (they have started planning some initiatives/programmes) and transformative (they have initiatives/programmes in place).

Additionally, a School of Secretariats was implemented to strengthen the strategic and technical capacities of the teams of education secretariats. It is a space for sharing knowledge and experiences among peers guided by international experts that will contribute to their improved performance in the territories.

Content compiled:

1. Educational innovation Territories: compiles inspirational experiences and conceptual and methodological keys for the development of territorial innovation plans, recognizing the diversity of populations, cultures and practices in specific education contexts.

2. ICT Tool Atlas: contains infographics with the location of educational resources aimed at strengthening the digital skills of the education community.

Sustainability

The project is sustainable insofar as it was the education secretariats themselves that made their diagnosis and created their own plans. This strategy leaves a team in the secretariats with installed capacity to implement the territorial innovation plans starting in 2022.

The strategy can be scaled at the national level to other secretariats of education, and also by other countries that would like to implement a sustainable programme whereby territories create their innovation plans based on the needs of the regions, cities, resources and start work on transforming educational practices.

Highlights

In 2022, the territorial innovation plans will focus on the STEM approach, closing gaps, and the family-school partnership.

7 - EAFIT, (originally the School of Administration, Finance and Technological Institute), is a Colombian private university. https://www.eafit.edu.co/institucional/Paginas/informacion-institucional-universidad-eafit.aspx

Colombia

Project name: Portal Colombia Aprende[8]

Implementing institution

Educational Innovation Office, Ministry of National Education.

Problem

Refining the user experience, simplifying and creating a number of satellite platforms to enhance the complementary services or content of "Portal Colombia Aprende" so that its prominence would result in scenarios of inclusion, equity, innovation and transformation of practices. The health emergency caused by COVID-19 accelerated the restructuring of "Portal Colombia Aprende". A technological transition was not enough; it was also necessary to intervene in the strategic approach and the roles and processes of the team after 17 years.

Another goal was to promote educational innovation and the transformation of pedagogical practices through the ownership of digital educational resources that go beyond disciplinary issues and that propose the implementation of collaborative projects, active learning methodologies and the STEM + A approach to education.

Solution

A digital ecosystem connecting platforms, tools and content to support educational innovation and blended learning models.

Three platforms were made available to the entire education community for the use and exploitation of content: "Aprender Digital", "RED Aprende" and the content section of the main portal; a platform for connection and work with peers: "Contacto Maestro"; and another for educ tional innovation and digital transformation: "CoLab".

Innovation

Includes a content use and ownership strategy with an ongoing exercise of active listening, running monthly thematic campaigns and compiling content to support the community in specific processes.

Sustainability

Through coordination with the communication teams of the country's education secretariats and the sharing of best practice experiences among the countries in the region.

Highlight

The networked platforms and collaborative mobilization actions drew more than 10 million users and 15 million visits in 2020 and 2021.

8 - For access to project content: https://www.colombiaaprende.edu.co/

Costa Rica

Project name: Plataforma de comunicación y colaboración entre docentes y estudiantes (Platform for communication and collaboration between teachers and students

Implementing institution

Ministry of Public Education, Directorate of Technological Resources in Education (DRTE) and Management Information Systems Office (DIG).

Problem

Maintaining the links among the different stakeholders of the education system to contribute to the continuity of learning in schools.[9] Coordinating and organizing the administrative processes necessitated by the pandemic and its impact on schools and households. Suspension of ongoing professional training of teachers.

Solution

National implementation of a digital platform to promote communication and the continuity of educational processes through a public/private agreement on an account providing access to different services in the cloud.

The platform is of a formal nature and legally recognized, which is why it is free and safe for students and teachers to access in order to ensure equity. Additionally, it is accessible for multiple populations.

Its use was integrated into the pedagogical strategy to address distance education processes. A service desk was set up for inquiries on its use.

It managed the first digital automatic enrolment record with database storage, which enabled the creation of over a million email accounts for the entire student population, which prompted the swift creation of a platform where students and teachers could start communication and collaboration processes in a safe domain.

9 - Over one million students saw their education interrupted in March 2020 due to the closing of educational institutions.

Innovation

The use of email accounts as a national and official strategy helps create teacher and student work teams in schools to: collaboratively plan projects, attend individual and collective virtual sessions, share material in different formats, administer and manage assignments, assess, create evidence portfolios, cooperative and collaborative work, and access information.

It also allows students to move forward at their own pace with more autonomous learning and develop collaborative digital skills.

At the administrative level, it helps organize education processes related to distance education.

Sustainability

Access to the toolkit will be possible beyond the emergency period. There is a cooperation agreement between the Ministry of Public Education and the private sector that provides the solution.

Highlights

In August 2020, there were 665,660 active platform users. In October 2021, after the resumption of face-to-face classes, 473,819 are still active.

Ecuador

Project name: El Mundo Virtual de Eugenia[10] (Eugenia's Virtual World): safe use of the internet and proper use of digital technologies

Implementing institution

Undersecretariat for Educational Innovation and Good Living and National Directorate of Education Technologies, Ministry of Education of Ecuador. It included partnerships with multilateral organizations and universities.

Problem

Addressing the issue of cyberstalking against minors and crime using digital devices. A report from the State Attorney General's Office states that over 70 cases of online grooming were reported in Ecuador between March and August 2020. In 2020, 203 cyberspace crimes of various kinds were committed. Cybercrime increased in relation to previous years, and the number of students aged 5 to 15 years old with smartphones increased from 12.2% in 2019 to 20.8% in 2020.

Solution

"El Mundo Virtual de Eugenia" (Eugenia's Virtual World), a campaign for the entire education community (students, teachers, families, authorities) aimed at identifying and raising awareness of the risks and dangers of the use of the internet and digital technologies.

Strategies it implements:

- **Training and capacity building** for members of the education community to develop their digital skills.
- **Digital Educational Resources** in various free and open access formats to motivate knowledge, identification and prevention of the risks associated with browsing digital platforms.
- **"El Mundo Virtual de Eugenia"** (Eugenia's Virtual World) Platform.

Innovation

The platform "El Mundo Virtual de Eugenia" is freely accessible at no cost and serves as a repository of educational resources for the development of digital skills.

It also features didactic guides for teachers, students and their families.

Sustainability

The project builds on the Digital Education Agenda[11], which guarantees its implementation and funding.

Highlights

"El Mundo Virtual de Eugenia" articulates with the "Eugenia y las Ciencias" (Eugenia and Sciences) project, which promotes access by adolescent girls and women to the world of science, ICTs and STEM. Implementing country

10 - For access to project content: https://recursos2.educacion.gob.ec/euinicio/ and https://www.youtube.com/watch?v=bkCRhOnTkDw&list=PLkiLdIOniqYv2r0agfcQ8_OUWNQvOahli.

11 - The Digital Education Agenda is a strategy of the Ministry of Education of Ecuador that sets out the guidelines for the inclusion of Information and Communication Technologies (ICTs) to effect changes that will contribute to transformation. https://educacion.gob.ec/agenda-educativa-digital/.

Implementing institution

National Teacher Training Institute (INFOD), Ministry of Education.

Problem

Training teaching staff to generate a safe, healthy, enriching environment that will promote suitable spaces for the socio-emotional development of students and teachers and help them cope with the psycho-emotional consequences of the pandemic.

Solution

Socio-Emotional Skills (SES) Programme involving the ongoing training of teachers at the national level as part of the plan "The joy of going back to school". This online training includes an organized learning process that encourages autonomous work and involves 12 webinars and nine customized virtual tutoring sessions in small groups.

Innovation

The process of training SES trainers was aimed at professionals in psychology and education so that a team of specialists could be put together that would contribute to the implementation of the teacher training process at the national level. Creativity and emotional health were regarded as two integrated elements to offer not only specialized technical support but also a more humane teaching practice focused on the diversity of educational spaces.

Sustainability

The project has made it possible to establish a benchmark in SES training in El Salvador. In this regard, the Central American Education and Cultural Coordination (CECC), of the Central American

Integration System (SICA), selected the country for the design of a proposal on the development of socioemotional skills at the regional level.

Work is underway to implement the SES training process via WhatsApp, (considering the technical adaptations in the design of educational resources, virtual learning objects and training methodologies for the delivery of tutored sessions, as well as mechanisms for monitoring and assessing learning).

Highlights

Three key outputs:

A national framework of socioemotional skills for training in basic and secondary education.

Pedagogical guides for teachers to develop SES in their students (82 pills with classroom activities).

Training for teacher trainers.

12 - For access to project content: https://sites.google.com/clases.edu.sv/infod-formacionhse

Implementing institution

Coordinación General @prende.mx, Secretariat of Public Education.

Problem

Devising a strategy so that children, adolescents and youth will still follow their syllabi in the context of the pandemic and limited access to the internet by the population, in addition to reducing the education lag of secondary education in rural and indigenous communities.

Solution

Revitalizing "*Telesecundaria*"[13], a television project that started in the 1960s, and launching "Aprende en Casa"[14](Learn at Home), which seeks to serve the student community so that they will carry on with their studies and complete the syllabi of the school year.

As a result of technological convergence, it was also necessary to implement and strengthen digital platforms that would allow students with internet connection to access audio-visual and digital educational resources to strengthen their expected learning.

These tools also promote digital skills at the teacher level.

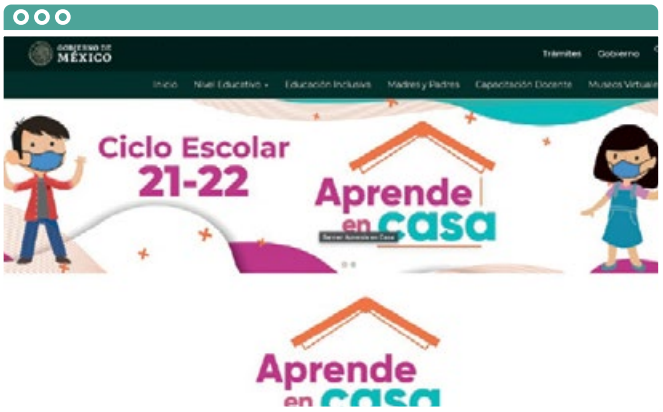
Innovation

The health emergency made it possible to bring encrypted education models to terrestrial television through the efforts of television stations participating in the Network of Educational and Cultural Radio and Television Broadcasters of Mexico, A.C. At the same time, the "México X" platform has been a fundamental tool in strengthening the digital skills of the teaching community. The "Nueva Escuela Mexicana" digital platform was also launched so that students and teachers would have all the tools to strengthen knowledge in one place.

Sustainability

"Aprende en Casa" (Learn at Home) has shown that it is not a short-lived project but a transitional one that is sustainable over time. Its foundations were laid by the tele-education of the 1960s, and in the XXI century it was ready to tackle a crisis.

The Telesecundaria modality has the potential for scaling and adaptation to the needs of each country



Highlights

The implementation of new channels for the broadcast and distribution of audio-visual and digital educational resources has allowed children, adolescents and youth to continue their academic training. From the day the "Learn at home" project was first broadcast to October 31, 2021, the Ingenio Tv channel reached more than 15 million viewers in the ratings.

As regards the "México X" platform, it has registered almost 200,000 visitors, while the "Nueva Escuela Mexicana" platform registered more than 14 million until October 31, 2021.

13 - Distance education model implemented in the '60s and still relevant today which has reduced the education lag and dropout rates. It offers an alternative for children, adolescents and youth living in rural, indigenous communities, with difficult access and limitations in terms of technological tools to continue their studies after completing primary education.

14 - Mexico's plan for the continuity of learning while schools are closed due to the COVID-19 pandemic. https://aprendeencasa.sep.gob.mx/

Panamá

Project name: *Correo institucional para docentes y estudiantes para una comunicación eficiente* (Institutional e-mail for teachers and students for efficient communication)

Implementing institution

Ministry of Education of Panama.

Problem

Finding a way to offer a distance education solution in the virtual modality in the shortest possible time for the purpose of delivering integrated, efficient, safe tools to allow the country's official education to carry on despite the COVID-19 pandemic.

Solution

Creating and delivering an institutional email account to students and teachers using an authentication platform to get their credentials. From a mere 2,000 accounts held by teachers only, the total number of accounts had risen to 36,000 teacher accounts and 295,000 student accounts by July 20, 2020.

Innovation

The delivery of one single credential in the institutional email modality contributed to more dynamism in interactions with technology, minimizing support times and enabling direct communication in real time.

Sustainability

The goal has always been the long-term view, together with the deployment of connectivity to enable the use of the tools. This will make it possible to apply them as resources that will support face-to-face education and have a robust system to respond to crisis situations diligently and expeditiously.

Highlights

The project aims to promote the technological competence of teachers through continuous training, improved access to virtual platforms and services for students and teachers, and offer resources to complement and support the teaching-learning process.

Panamá

Project name: *ESTER*[15] learning platform

Implementing institution

Ministry of Education of Panama in collaboration with the Authority for Government Innovation

Problem

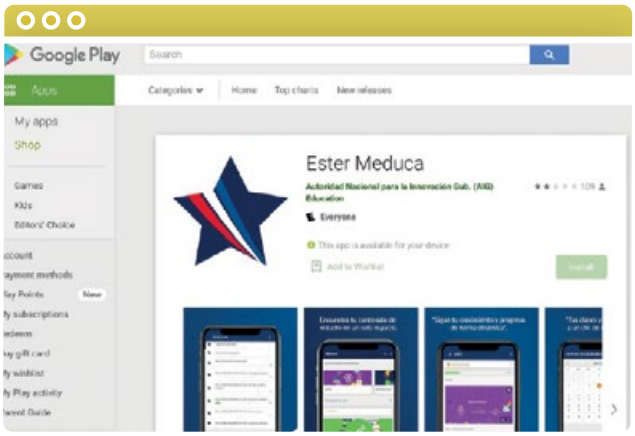
Not having a unified, resilient learning platform for situations where face-to-face education is impossible, as was the case with the COVID-19 pandemic, and not having a standardized digital curriculum that would guarantee the achievement of learning objectives, regardless of the context or resources of each school.

Solution

ESTER, an open-source learning platform, and a digitalization strategy for the prioritized curriculum of the twelfth grade.

Innovation

Development of the web version of Ester and a mobile application for access from any device and content download for offline consumption.



A module was also added that connects the institutional email of all teachers and students with the ESTER platform and offers single login so that the entire student and teacher population can use this platform without additional steps. In addition, it contributed to the adoption of the institutional email domain meduca.edu.pa as a centralized communication and meeting point.

15 - ESTER learning platform: https://play.google.com/store/apps/details?id=com.moodle.ester&hl=en_US&gl=US

Sustainability

Because it is an open-source platform, it is designed in such a way that it allows scalability in the coming years without incurring an additional licensing cost and, because it is hosted in the cloud, it can grow on demand. In addition, adopting a content digitalization methodology involving teachers from the education system makes it independent of licences or content providers. It is possible to continue updating and adding functionalities, themes and activities on the basis of developments in the national curriculum, inherent in a continuous transformation of national education and the instruction it provides.

Highlights

Allows rapid adaptation to remote teaching situations. It also adapts to scenarios such as multi-grade schools and hard-to-reach areas with unstable connectivity which can be reached though various formats such as offline servers or guides supported by the platform. Implementing country

Paraguay

Project name: *Tu escuela en casa* (Your school at home)

Implementing institution

Ministry of Education and Sciences.

Problem

Addressing contingency actions through public policies to mitigate the impact of COVID-19 and support the education community (teachers, students and families) with different alternatives to guarantee the continuation of education.

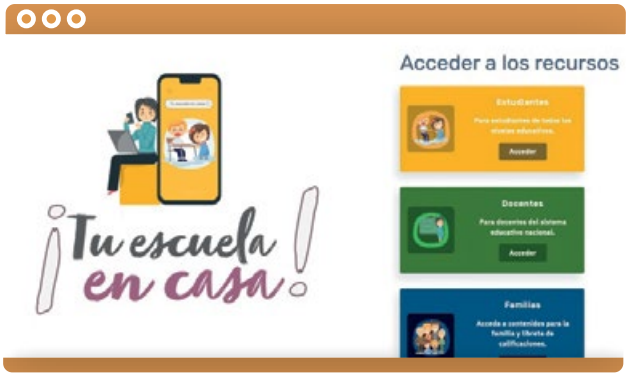
The pandemic left a large number of students without face-to-face classes; an unprecedented situation that called for immediate responses from all education systems for the implementation of distance learning.

Solution

"Tu Escuela en Casa", a digital resource platform that presents available academic materials for preschool, elementary school, middle school, inclusive education and lifelong learning. It is aimed at the different stakeholders in the education community: students, teachers and families. It has a module to facilitate and centralize the daily management of assignments for the student and the teacher.

Innovation

The site can be accessed from any mobile device. The next version, available in 2022, will have interactive digital content for children to learn by playing.



It will also make it possible to monitor learning, do and assess online exercises, customize content and have libraries organized by education levels.

Sustainability

As part of the change management process, there is an ICT application monitoring policy, so the plan is to continue using the "Your school at home" portal with the incorporation of new functionalities, an online assessment system for students, for teacher performance and standardized assessment.

Highlights

New versions feature very important elements for the effective monitoring of student learning. All the topics will be related to the skills and competencies that must be developed by each student of each grade or course. These competencies will be associated with indicators, exercises and online assessments for measuring learning in real time.

Implementing institution

In 2021, the Ministry of Education and Culture and the Technological University of Uruguay (UTEC) joined the early work of the National Administration of Public Education (ANEP) and Plan Ceibal.

It also includes the participation of private companies, writers and teams with an educational approach in the areas of data analysis, behavioural economics, digital learning experience, computational thinking, chess, and others.

The novel was produced by the Red Global de Aprendizajes[17] (Global Learning Network).

Problem

Promoting "learning by doing" through real-life problems and putting the power of the narrative developed in spaces "inhabited" by students at the service of learning in order to motivate their participation.

The changing patterns of children's and adolescents' cultural consumption make it necessary to explore new media, formats and possibilities, and inspire the teaching community to tap the new resources.

Solution

"*Misterio de Cabo Frío*" is the first transmedia educational novel. It seeks to turn students aged 10-15 into the protagonists of the story.

It is available in various formats: a radio play on Spotify, a book on *Biblioteca País*[18], and a game on desafioprofundo.org which integrates challenges in the areas of Computational Thinking, Chess, and others.

The digital learning experience has a single Ceibal user-login, and it seeks to improve the student's experience through data analysis.

There is a space for teacher support and articulation with colleagues.

Innovation

Design of an experience with "a gamified story" as the connecting thread and use of a novel as a learning environment for exploring new narratives.

Sustainability

It offers many possibilities for scaling: it has hardly any marginal costs for new users and can be sustained over time with a low investment. It is currently available to any public or private student from Uruguay who has a Ceibal login. The challenge that remains is about opening the proposal to students from other countries. Usage data provide key information for optimization.

Highlights

As of October 2021, more than 13,000 students have solved the mystery. This figure accounts for more than 6% of students aged 10-15 in the Uruguayan education system.

Part of the team is already working on the next story, to be released in 2023.

Creativity and technologies building the future of learning. Implementing country

16 - For access to project content: https://redglobal.edu.uy/es/articulo/desafioprofundo.

17 - The Global Network is an international collaborative initiative that integrates new learning pedagogies in 10 countries on different continents through a common framework of actions and research. Uruguay participates through ANEP (National Administration of Public Education) and Plan Ceibal. https://redglobal.edu.uy/.

18 - Plan Ceibal's Biblioteca País seeks to democratize access to reading and culture by supplying content of interest to the education community and the general public free of charge and accessible from any device. https://www.ceibal.edu.uy/biblioteca.

Project name: *Login Único* (Single Sign On) - Improvements in the implementation of the Single Sign On (SSO) of Plan Ceibal

Implementing institution

Plan Ceibal and Ministry of Education and Culture (MEC) of Uruguay.

Problem

Solving safe registration for public education students and being able to safely use digital platforms in learning processes. Before the start of the project, the use of platforms was prioritized without paying attention to safe access. In the context of a pandemic, with a virtual or blended education modality, this functionality has become a high priority.

Solution

A comprehensive project that provides safe registration and usability as the main hubs, with a focus on the beneficiary. The goal was to achieve a scalable platform that complies with best practice in information security.

Innovation

A project with internal development based on modern standards and technologies. The innovations focus on the technological architecture deployed to support the solution, the functionalities with a focus on the beneficiary, the omnichannel approach, the user experience and the use of data analytics for decision making.

Sustainability

A nationwide project providing inclusive access to all Plan Ceibal beneficiaries. It can be replicated at the international level, where the realities and contexts, education policies and processes of each country must be taken into account.

Highlights

It encourages the development of digital skills through safe, responsible use of platforms. It provides metrics on access, usability and user experience for decision making. An additional achievement is a substantial drop in cybersecurity incidents on learning platforms.

Applied research for **sustainable solutions: "Rural** and **Inclusive Digital Education** in Honduras and Nicaragua"

Applied research for **sustainable solutions: "Rural** and **Inclusive Digital Education** in Honduras and Nicaragua"

Designed and led by the Ceibal Foundation, the programme seeks to enhance both digital and cultural educational resources available in rural communities in order to strengthen distance education. The initiative is being implemented with the support of IDRC Canada and the Global Partnership for Education (GPE), the largest international fund for financing in education.

Uruguay's Ceibal Foundation is implementing the *Rural and Inclusive Digital Education* project, which seeks to enhance the education systems in Honduras and Nicaragua and make them more equitable and inclusive through the effective use of digital technologies and their adaptations to the sociocultural reality of rural environments.

The research advocates the integration of available technologies and cultural and communication practices typical of the rural education communities of both countries, and also seeks to bridge the gender gap and address the inequalities associated with multiculturalism and bilingualism. It proposes combining the use of low-end mobile phones – available in most rural households – and other adaptations for integration with the use of educational media, such as television and radio. "The project seeks to highlight the significance of both technological and cultural capital with a participatory approach and respect for each community's culture, integrating the communication capabilities of traditional media with resources available in the communities, in addition to their own narratives," says María Florencia Ripani, director of the Ceibal Foundation.

> ***"This is a very participatory project that will allow us to start creating better opportunities for our education community."***
>
> *Gloria Menjivar, Deputy Minister of Education of Honduras.*

The initiative has a wide network of partners in the region, including the UNESCO multi-country office in San José, the *Coordinación General @prende.mx* of the Secretariat of Public Education of Mexico and educational institutions of Honduras and Nicaragua, including the education portfolios, the Francisco Morazán National Pedagogical University (UPNFM) and the Ricardo Ernesto Maduro Andreu Foundation for Education (FEREMA) of Honduras and the National Autonomous University of Nicaragua (UNAM). The project was selected through an international call by the International Development Research Centre (IDRC Canada) and the Global Partnership for Education (GPE), the world's largest fund dedicated to transforming education in lower-income countries, comprising over 20 countries – some of them the most developed in the world – as well as multilateral organizations and foundations.

The Ceibal Foundation's *Rural and Inclusive Digital Education* initiative – with an estimated duration of 32 months – will use tried and tested innovations in the region as a basis for strengthening teaching and learning with the aid of ICTs (Information and Communication Technologies). It will seek to determine which experiences of effective use of digital technologies are scalable to Honduras and Nicaragua and what adaptive approaches are required in each sociocultural context.

For this purpose, the project will develop learning strategies based on the integration of educational television and existing digital systems to facilitate access to pedagogical practices and resources resulting from participatory production methodologies. The main innovations that will be taken as benchmarks are two national solutions in the region aimed at guaranteeing the continuity of learning during the COVID-19 pandemic: Ceibal en Casa (Ceibal at Home), the proposal implemented by Plan Ceibal in Uruguay with a focus on digital resources, and Aprende en Casa (Learn at Home), implemented by the Ministry of Public Education of Mexico with a focus on educational television.

The former case, *Ceibal en Casa*, was implemented jointly by Plan Ceibal and the National Administration of Public Education (ANEP). It turned a programme initially intended to strengthen teaching on the basis of face-to-face lessons into a fully digital distance learning solution, which made it possible to guarantee the continuation of education. The plan achieved high levels of coverage both at the primary and secondary levels, with full adaptation of content, platforms, training and educational resources at no cost in order to ensure equal access to education. Another outstanding feature was its multidimensional design, which articulates technology with the social context of teachers, students, and families (Ripani, 2020).

As regards *Aprende en Casa*, it showed the potential of a distance education strategy based on television and its adaptations, particularly in contexts with unequal internet access such as rural populations and bilingual multicultural communities. This plan is potentially transferrable to low- and middle-income countries (Ripani and Zucchetti, 2020).

Rural and Inclusive Digital Education will provide the guiding principles for public policies, pedagogical guidance, technical standards for the design of educational content, training resources and guidelines on how to achieve the intended scaling, so that each stakeholder can intervene in the space and make it their own within the realities of their community and country. It is aimed at officials from education portfolios and educational television stations, as well as technical teams, teachers, students and their families; rural leaders, non-governmental organizations and the media, among other stakeholders.

> ***"The initiative will contribute to the coordination efforts made by the education system in Nicaragua, where education in the country and the use of technological tools play a key role."***
>
> *Luis Alfredo Lobato Blanco, Deputy Rector General of UNAM-Managua, Nicaragua.*

The project will also seek to identify what factors enable, encourage or hinder the implementation of specific innovations in each country and their potential in terms of improving equity in education in rural communities in Central America.

In order to choose effective approaches for scaling and implementing these innovations in the rural education systems of Honduras and Nicaragua, the project plans to devise sustainable ways of integrating television with accessible digital media – since there are contexts of restricted connectivity –, by adapting, for instance, to the use of mobile phones, community radio and other resources that will promote interaction among teachers, students and their families.

This project consolidates the leadership of Uruguay's Ceibal Foundation as an institution that, together with Plan Ceibal, works towards the development of technology-aided education in the region to promote quality, inclusion and equity.

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