



Review article

## Impact of ICTs on basic education in Latin America

### Impacto de las TIC en educación básica en América Latina

### Impacto das TIC na educação básica na América Latina

Jhoansson Victor Manuel Quilia Valerio<sup>1</sup>



<https://orcid.org/0000-0001-8255-2578>

Joel Alberto Alfaro Mendoza<sup>2</sup>



<https://orcid.org/0000-0002-6757-3351>

Margaret Aurora Riveros Ávila<sup>3</sup>



<https://orcid.org/0000-0001-6407-4824>

<sup>1</sup> University of San Martín de Porres. Peru



[jhoanssonquiliavalerio@gmail.com](mailto:jhoanssonquiliavalerio@gmail.com)

<sup>2</sup> National University of Barranca. Peru



[jalfaro@unab.edu.pe](mailto:jalfaro@unab.edu.pe)

<sup>3</sup> César Vallejo University. Peru



[rmargaret.1791@gmail.com](mailto:rmargaret.1791@gmail.com)

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#### ABSTRACT

In recent decades, Information and Communication Technologies (ICT) have been considered revolutionary elements capable of generating a significant impact on teaching-learning processes, although in regions such as Latin America, this task has represented a challenge due to problems of the area. This article focused on analyzing the evolution that ICTs have had within the educational sector in recent years, including the COVID-19 pandemic, and the advantages they offer for the future of Latin American education. For this, a general review of the bibliography related to the presence of ICTs in the educational field of Latin America was carried out, focusing on the period corresponding to this pandemic. Scientific articles were collected from scientific databases such as Scielo, Redalyc, Scopus, among others. Based on this work, it was concluded that the arrival of the Covid-19 pandemic and global migration towards virtual education resulted in a strong challenge for the region's educational systems, which have been able to deal with their deficiencies and cope with the hasty transition to a virtual education mediated by ICT. In the end, it is possible to affirm that this health crisis came to serve as a boost for this region to finally move towards successfully adopting these digital tools within the educational field.

**Keywords:** ICT; education; Latin America; pandemic.

#### RESUMEN

En las últimas décadas, las Tecnologías de la Información y las Comunicación (TIC) han sido consideradas elementos revolucionarios capaces de generar un impacto significativo en los procesos de enseñanza-aprendizaje, aunque en regiones como América Latina, esta tarea ha representado un desafío debido a problemas propios de la zona. El presente artículo se enfocó en analizar la evolución que han tenido las TIC dentro de su sector

educativo durante los últimos años, incluyendo la pandemia por COVID-19, y las ventajas que ofrecen para el futuro de la educación latinoamericana. Para ello, se llevó a cabo una revisión general de la bibliografía relacionada con la presencia de las TIC en el ámbito educativo de América Latina, con enfoque en el periodo correspondiente a esta pandemia. Se recopilaron artículos científicos de bases de datos científicas como Scielo, Redalyc, Scopus, entre otros. A partir de este trabajo, se concluyó que la llegada de la pandemia por Covid-19, y la migración a nivel mundial hacia una educación virtual resultó un fuerte reto para los sistemas educativos de la región, que ha sido capaz de lidiar con sus deficiencias existentes y sobrellevar la apresurada transición hacia una educación virtual mediada por las TIC. Al final, es posible afirmar que esta crisis sanitaria llegó a servir como un impulso para que esta región finalmente se encamine a adoptar exitosamente estas herramientas digitales dentro del ámbito educativo.

**Palabras clave:** TIC; educación; América Latina; pandemia.

## RESUMO

Nas últimas décadas, as Tecnologias de Informação e Comunicação (TIC) têm sido consideradas elementos revolucionários capazes de gerar um impacto significativo nos processos de ensino-aprendizagem, embora em regiões como a América Latina, essa tarefa tenha representado um desafio devido aos problemas da área. Este artigo se concentrou em analisar a evolução que as TIC tiveram no setor educacional nos últimos anos, incluindo a pandemia do COVID-19, e as vantagens que oferecem para o futuro da educação latino-americana. Para isso, foi realizada uma revisão geral da bibliografia relacionada à presença das TICs no campo educacional da América Latina, com foco no período correspondente a esta pandemia. Os artigos científicos foram coletados em bases

de dados científicas como Scielo, Redalyc, Scopus, entre outras. Com base neste trabalho, concluiu-se que a chegada da pandemia de Covid-19 e a migração global para a educação virtual resultaram em um forte desafio para os sistemas educacionais da região, que souberam lidar com suas deficiências e enfrentar a transição apressada a uma educação virtual mediada pelas TIC. Ao final, é possível afirmar que essa crise sanitária veio servir de impulso para que essa região finalmente avance para a adoção com sucesso dessas ferramentas digitais no campo educacional.

**Palavras-chave:** TIC; educação; América Latina; pandemia.

## INTRODUCTION

The different technological tools that allow the production, sharing, storage and processing of information in the form of images, texts, audios, among others, are known as Information and Communication Technologies (ICT). In recent times and with the technological advances of the time, ICTs have continued to evolve (Camacho et al., 2018). From this, a great variety of technologies have appeared, ranging from Internet services, such as search engines or databases, to mobile devices, such as cell phones or laptops. In this sense, its increasing massification has been responsible for creating a new technological and social context, being the protagonists of important changes in various areas of society, especially in the educational field (Karam et al., 2019).

In the educational context, ICTs have been introduced as revolutionary elements capable of generating a significant impact on the teaching-learning processes, expanding the educational system towards virtual environments (Pando, 2018). This in turn is

supported by the closeness that children and young people of the 21st century have with ICTs, who are exposed to the use of them from an early age, and quickly adopt them as an important element of their daily lives and their social interactions. (Area et al., 2018). However, it was the Covid-19 pandemic that was responsible for giving due relevance to the educational value of ICTs. As a result of this crisis, the educational system was forced to make important changes to migrate its activities towards a distance modality (Rivera et al., 2022).

In Latin America, interest in incorporating ICTs into educational systems has been present in recent decades, seeking to improve the quality of their education (Formichella & Alderete, 2017). However, and despite the digital inclusion public policies implemented by Latin American governments, the region had presented difficulties in effectively adopting them, observing unequal levels of digital adoption among countries (Rivoir, 2020). With the arrival of the pandemic in this region, the unequal access of the population to technological tools was the main problem for the transition to a virtual modality, beginning an important effort to eradicate this so-called digital divide (Varas et al., 2020).

From the new normality, generated by the Covid-19, the application of ICT in the educational field went from being a mere recreational application to having greater relevance in improving the quality of its activities, while maintaining the continuity of academic activities. In this context, the objective of this article was to analyze, from the reflexivity approach, the evolution that ICTs have had within the educational sector in Latin America in recent years. In turn, it sought to explore the fundamental role they played during the Covid-19 pandemic and the advantages they offer for the future of Latin American education.

## DEVELOPMENT

The research methodology used consisted of a general review of the bibliography related to the presence of ICT in the educational field of Latin America, with a focus on the period corresponding to the Covid-19 pandemic. In this way, this article focused on exploring the history of ICTs in Latin American territory, and the progressive impact they have had on their educational systems before and after the arrival of Covid-19.

Scientific articles from scientific databases such as Scielo, Redalyc, Scopus, among others, were collected using keywords such as "impact", "basic education", "Latin America" and "pandemic". The bibliographic analysis focused on the collection of information, in search of obtaining updated information on the subject matter.

The literature review retrieved a large number of articles by entering the keywords into the database search engine. Of this number, a total of approximately 62 articles were initially collected after being deemed relevant by briefly reviewing their title and abstract. From this resulting bibliography, a total of 40 bibliographic references were finally selected after a more detailed review.

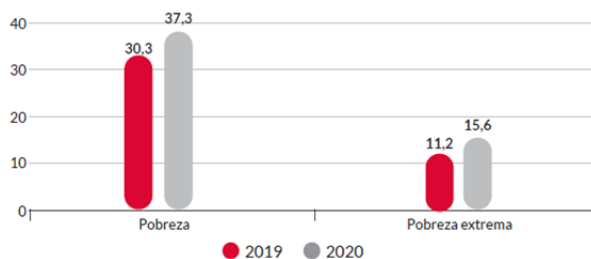
### History of ICT in Latin America

Historically, the adoption of ICTs in Latin American territory has been slowed down by a technological infrastructure that is insufficient, in addition to a lack of interest on the part of governments and institutions to support the massification of new digital technologies (Quiroga et al., 2017). . In addition to this, Latin America is a region characterized by elitist parties in governments, deficient social services, discrimination, problems in its working capital market, among others, generating significant inequalities among the countries that comprise it (Rodríguez & Sánchez, 2017). As a result of this, there are important

deficiencies regarding factors such as the number of places available with connectivity, public or private, the speed of the Internet network, or the quality of digital devices, which define the degree of access to ICTs. of the population (Escuder, 2019).

Given the complex social contexts of each country, different governments have presented different ideas and priorities regarding the task of incorporating ICT within their territory. This same context of Latin America has been responsible for this uneven growth that has been registered in the region regarding the use of ICTs, which was reflected primarily in the percentage of the population with access to them (Guanilo & Dávila, 2021). For many years, the presence of digital technologies in the home was closely related to their socioeconomic level, which has limited their access to certain social sectors. In the year 2000, only 15% of Latin American households had a computer and Internet access, a figure that rose to 19.1% by 2006 and has continued to rise (Gajardo, 2020).

From this, what is known as the digital divide has been generated, that is, the differentiation that occurs between people, institutions or companies that have access to ICTs and the Internet in a particular way, and those that are not capable of do it (Cabero & Valencia, 2019). This situation is closely related to the high levels of poverty registered in the region, one of the main obstacles that prevent improving the percentage of access to ICTs in the general population. The subsequent Covid-19 pandemic was able to increase this problem, as seen in figure 1 (Gajardo, 2020). In this context, this digital divide becomes more evident between the urban and rural areas of the countries, the latter being the ones that present the greatest difficulties, mainly economic, to implement an adequate digital infrastructure (Álvarez & Alderete, 2019).



**Fig. 1-** Percentage of population in a situation of poverty between 2019 and 2020.

Source: Extracted from Bárcena (2021).

Inefficiencies regarding the use and application of ICTs have represented for years one of the main problems to overcome in order to achieve digital progress in the region. This, in turn, is the factor causing another digital divide, since, although Latin America has considerably improved the presence of ICT in its territory in recent years, low levels continue to be seen compared to other more developed regions of the planet (Quiroga et al., 2017). In general, regarding the use of ICT, there has always been a marked difference between developed countries and those that are developing, as is the case of Latin American countries. In the more developed regions, there is a higher percentage of access to tools such as computers or the Internet, compared to the others; figures that have not varied considerably in recent years (Cabero & Valencia, 2019).

### **ICT within Latin American basic education**

Since children are already born into a technology-dominated environment today, they often have access to it from an early age. Consequently, this has led the new generations to develop digital skills in an innate way, becoming known as digital natives (Cobos et al., 2021). Within the educational field, the inclusion of ICT allows children and young people to continue developing their digital skills through a series

of technological tools that create a new educational experience for them, fostering their motivation to learn (Martínez, 2018). The educational use of digital devices and the internet has created an interconnected scenario that allows students to access a wide variety of information and digital resources (George, 2021).

Within Latin America, educational systems have had a series of deficiencies to address, including illiteracy in the region, the level of access to education, the lack of development of critical judgment, creativity and innovation, and the low presence of ICT in educational training. For this reason, during the last three decades, various Latin American countries have sought to improve the quality of their educational systems through the design of public policies, programs and projects focused on including ICT in their academic activities, although with uneven results (Escribano, 2018). While there are Latin American countries with a high percentage of their educational institutions that have an ICT presence, such as Chile and Cuba with more than 90%, or Peru with 82%, there are in turn countries like Guatemala and Paraguay that present percentages of 6 and 11% respectively (Bullón, 2021).

The public policies implemented in Latin America sought to improve digital inclusion in the region. For this, they focused mainly on improving the digital infrastructure with its respective technical support, as well as innovating in educational practices based on the development of digital skills in teachers and students (Rivoir, 2020). In order to reinforce digital education in Latin America, the measures applied by the governments included implementing laboratories with computers or tablets in educational centers, promoting the acquisition of personal computers for students and teachers, and improving education in science subjects. computing, among others. Additionally, a greater presence of ICTs was beginning to be

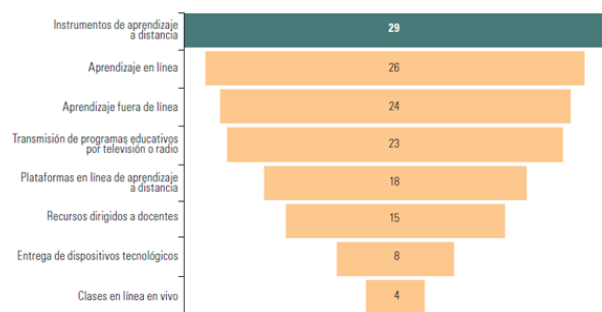
observed in the academic curricula of educational institutions (Lugo et al., 2020).

Although multiple initiatives related to ICT in education have been developed, most of these were interrupted before achieving a lasting impact. Consequently, considerable improvements have been achieved regarding the level of access of its population to ICT in recent years, although there is still little progress regarding its application within the educational field (Cortés, 2017). Despite this slow progress, the region has maintained progressive innovation in its educational processes through the acquisition of technological tools. It was not until the arrival of the Covid-19 pandemic that ICTs finally gained due relevance in the educational field, while the technological problems and insufficiencies that had to be eliminated to deal with the crisis that had arrived became evident (Bullon, 2021).

### **ICT in education during pandemic**

As a result of the suspension of educational activities worldwide, UNESCO estimates that 500 million students saw their education affected by this situation, 30% being students from Latin America. Within the health crisis that the planet experienced, this region was forced to apply emergency measures that would guarantee the continuity of educational activities in its territory while seeking to control the spread of the virus (Chen & Zhao, 2021). In response to the restrictive measures imposed, most countries around the world opted for a migration towards virtual education. However, given the existing deficiencies in the Latin American educational sector regarding the scope of ICTs, the governments of this region had difficulties establishing a clear path to follow that would allow them to successfully migrate towards this modality (Aravena, 2022).

Based on these measures, the different countries of Latin America opted for various strategies to carry out distance education under the online and offline modality, among which the use of virtual asynchronous learning platforms stood out. The different strategies implemented and the number of countries that used them can be seen in Figure 2 (ECLAC, 2020). In the midst of the pandemic and with these changes within the educational system, there was a considerable increase in dropout levels. Given the deficiencies of the region, there were many students unable to access the scheduled activities, and they completely disassociated themselves from learning. For this reason, the studies that have analyzed this problem have referred to this situation as a significant setback of almost a decade in education (Gallegos, 2022).



**Fig. 2-** Distance strategies applied by countries of Latin America and the Caribbean

Source: Extracted from ECLAC (2020).

Virtual education was not a new concept within the Latin American educational systems; however, it was a little explored modality that was far from being correctly implemented. With the need for an abrupt migration towards distance education, it was the educational systems of Latin America that presented the greatest difficulties, given the existing technological limitations in the region (Gonzales et al., 2022). From one moment to the next, virtual scenarios broke into the educational field without many countries being prepared to take on this

challenge. Consequently, this brought a series of difficulties, both for governments and for the students and teachers themselves, who found themselves in a completely different educational environment from previous years (Aguilar, 2020).

As a result of this drastic change in people's daily lives, the adaptation process has caused many of them to experience both physical and mental health problems, especially academic or work-related stress (Robinet & Pérez, 2020). Those who have been most affected by this change towards virtual education have been the teachers, who have been responsible for changing their teaching-learning strategies to adapt to their new remote activities and provide quality education (Hernández et al., 2021). This challenge was particularly difficult for those teachers who had little knowledge about the use of ICTs, one of the many existing problems in Latin America caused by the digital divide that has been present in the region for years (Aravena, 2022).

Since the majority of teachers in Latin America had few digital skills, they presented poor performance that did not meet the required educational quality criteria (Reyna, 2022). The most affected areas were undoubtedly rural areas, where the impact of the digital divide can be appreciated to a greater extent by not having basic infrastructure or technology for virtual education, nor the financial resources to acquire it. (Bonilla & Muñoz, 2022). In addition, the differences between a private and a public education were evidenced, regarding issues such as the use of digital tools such as school websites, social networks or videoconferences in students between 6 and 15 years old. While the first sector showed a percentage of use of 81%, the second showed only 63% (Martínez, 2021).

## **Opportunities for post-pandemic improvement**

Despite the existing educational and technological gaps in Latin America, it was largely possible to guarantee the continuity of academic activities during the pandemic. This was an important reason to move away from traditional teaching methods and favor the presence of new technologies within educational processes (Roca, 2022). Education reforms that had been pending for years finally received the necessary support to develop and enable a digital transformation in education. More and more projects have begun to appear aimed at promoting the use of ICT and the development of transversal skills within basic and secondary education, which in turn are receiving greater financial support (Modé et al., 2021).

Based on the experiences lived during the Covid-19 pandemic, it is important to highlight that the objective should not be to return to traditional teaching once the health crisis has passed. On the contrary, what has been learned during this period must be rescued and continue to use ICT to eliminate existing deficiencies and continue to undertake quality education for all (Leiton et al., 2022). Tasks such as digitization and hybridization of learning must be scaled up with the support of public policies, as well as industries and telecommunications companies. Personal devices must play a more fundamental role in the education of children and young people, which is why access to the necessary technological equipment must be facilitated, as well as mobile connectivity packages (Cañarte et al., 2021).

Additionally, the task of carrying out a continuous improvement of their digital skills, as well as applicable methodologies within a virtual modality, continues to fall on teachers. Within a new normality where ICTs are increasingly present and virtual

education is here to stay, it is essential that public policies promote the digital training of teachers, and provide them with the necessary technological tools (Calderón & Velásquez, 2022). After teachers were forced to improve their digital skills in a hasty manner, the post-pandemic era represents an opportunity for them to continue with this development in a more efficient way, and be able to generate a good educational environment and a quality learning (Escribe, 2022).

## **CONCLUSIONS**

Although interest in incorporating ICTs into educational systems in search of improving the quality of their education has been present in Latin America, this has always been a region with a complicated context and a series of internal problems. Together with the disinterest of its governments and deficient public policies, an important group of factors have prevented it from advancing correctly towards a massive incorporation of ICT within basic education, maintaining low levels compared to other more developed regions. Despite the advantages offered by ICT within the educational field, due importance was not given to its implementation until the arrival of the Covid-19 pandemic, at which time the region was forced to take hasty measures to correct these deficiencies.

As a result of the pandemic situation, an important change was generated within Latin America regarding the implementation of ICTs. While the projects prior to the health crisis did not achieve a lasting impact on education, the new projects and public policies aimed at this objective have been better executed, and even received greater funding. From this, it has been possible to identify them to achieve digital growth in the region, both those that were previously present and those that appeared as a result of the pandemic. In turn, it has made it possible to recognize the existing digital gaps

that affect millions of children, youth, and even teachers, especially those who receive or provide public education or who reside in rural areas.

Based on the lessons learned during the hasty transition towards a virtual education mediated by ICTs, it is concluded that, although Latin America has taken a great effort to adapt, the situation has served as an impetus for the region to finally move towards adopting digital tools within the educational field. It is essential that the changes made in Latin American education, even if they were emergency measures, are not lost. The progress made in terms of reinforcing educational quality through technology should not remain a half job, it must continue to be supported by both teachers and the different governments so that the region can continue to progress digitally, and be capable of providing an education of the highest quality for children and young people.

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