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# Digital Transformation and Educational Innovation in Latin America in the Context of Covid-19

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## Abstract

A documentary review is carried out regarding the production of scientific publications on the variables Digital Transformation and Educational Innovation within the framework of Covid-19, with the purpose of knowing the main characteristics of the volume of publications indexed in the Scopus database, which total 164 documents, platform through which the data is collected, allowing, through the distribution by year of publication, country of origin, area of knowledge and type of publication, to highlight relevant aspects as well as to identify some examples to know the position of different authors on the proposed topic. The methodology used corresponds to a quantitative analysis of the data on the volume of scientific production,

with a bibliometric study, and a qualitative analysis of the research works cited in the body of this document. Among the main findings, it is highlighted that in terms of research concerning Digital Transformation and Educational Innovation in the context of the pandemic generated by Covid-19 in the educational field. Brazil is the Latin American country with the highest number of publications, registering a total of 55 documents. The area of knowledge with the highest number of contributions to publications was Social Sciences with 101 publications, and of the Latin American institutions, the Tecnológico de Monterrey (Mexico) is the one with the highest production during 2020 and the first semester of 2021.

**Keywords :** Digital Transformation, Educational Innovation, Covid-19, Latin America

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## 1. Introduction

March 2020 was the month that put multiple sectors worldwide on edge, due to the declaration by the World Health Organization (WHO) of a pandemic, due to the high numbers of contagion derived from the appearance of COVID-19, so governments globally adopted social isolation measures, quarantine that made it impossible, in most cases, to attend multiple activities, such as tourism, business, education, among others (Inter-American Development Bank, 2020); such isolation measures suddenly changed the way society developed the different daily activities.

In terms of education, educational institutions migrated their face-to-face modality to remote access, that is, to the use of virtual platforms to continue with the teaching-learning processes, evoking modalities such as the one developed by Dave Cormier and Bryan Alexander in Canada in 2008, called MOOC, as an acronym for Massive Open Online Course (Lopez-Meneses & Vazques, 2020), on which many academic models were based to virtualize the contents of the subjects at all levels of training. In this way, educational processes were given continuity, changing the paradigm of virtuality as an option, therefore, students and educators were forced to withdraw from the classroom and share knowledge through electronic devices such as computers, cell phones, tablets, among others. In this sense, the teaching staff took on an unprecedented challenge, updating not only the way they shared their classes in the classroom, but also their knowledge in the use of digital tools created by designers with the purpose of recreating the classroom environment within a digital space, thus innovating the traditional teaching processes. However, the above was also a challenge for all educational institutions, since the challenge was greater for the administrative management of these institutions, to keep teachers updated and motivated through training focused on new knowledge and motivation that in turn would be transmitted to students, preventing a possible high number of desertion (Artavia & Castro, 2019).

The above allows opening an interesting debate on the effects of Digital Transformation in Education to face the restrictive measures proposed to reduce the high infections and deaths generated by the transmission of COVID-19 in Latin America and the whole world, so that the importance of studies on this topic allow knowing different alternatives of strategies proposed to carry out their academic training. For this reason, a review of scientific papers published in high impact journals indexed in the Scopus database is proposed, which will allow answering the question: How has the production of scientific publications been related to the study of the variable Digital Transformation and Educational Innovation in the framework of Covid-19, identified during the year 2020 and the first semester of the year 2021?

## 2. General objective

To analyze from a bibliometric and bibliographic perspective, the production of high impact research papers on the Digital Transformation and Educational Innovation variable within the framework of Covid-19 identified during 2020 and the first half of 2021.

## 3. Methodology

Quantitative analysis of the information provided by Scopus is performed under a bibliometric approach on the scientific production regarding the variable Digital Transformation and Educational Innovation in the framework of Covid-19 at the Latin American level. Also, from a qualitative perspective, examples of some research papers published in the area of study mentioned above are analyzed from a bibliographic approach to describe the position of different authors on the proposed topic.

The period between the two semesters of 2020 and the first semester of 2021, the date on which this research is carried out, is taken into account.

The search is performed through the tool provided by Scopus and the parameters referenced in Table 1 are established.

### 3.1 Methodological design

Table 1 shows the methodological design proposed for this research.

**Table 1.** Methodological design.

	PHASE	DESCRIPCION	CLASIFICACION
PHASE 1	DATA COLLECTION	The data collection is carried out by means of the Search tool in the Scopus web page, by means of which a total of 164 publications are identified.	Published papers whose study variables are related to Digital Transformation and Educational Innovation within the framework of Covid-19. Research papers published during 2020 and the first semester of 2021. Limited to Latin American countries. Without distinction of area of knowledge. Without distinction of type of publication.
PHASE 2	CONSTRUCTION OF ANALYSIS MATERIAL	The information identified in the previous phase is organized. The classification will be done by means of figures and tables based on data provided by Scopus.	Word Co-occurrence. Year of publication Country of origin of the publication. Area of knowledge. Institutional Affiliation



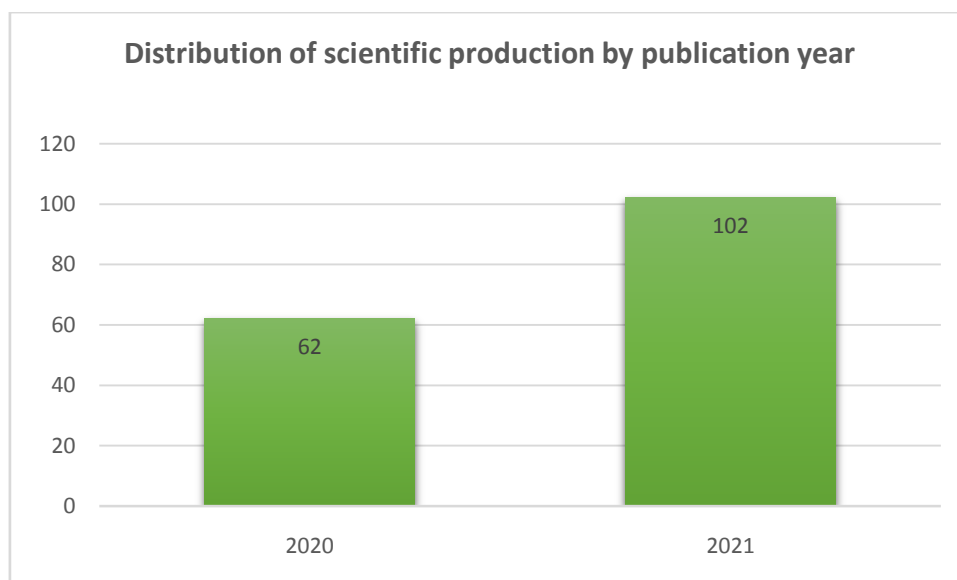
sector through innovation and digital transformation, gives continuity to academic processes through the use of digital tools of great help to not interrupt academic training at different levels.

Figure 1 shows a large number of words related to Distance Education as the common denominator within the strategies proposed by the educational institutions, as well as an important frequency in the use of keywords from the area of Medicine and academic training in the same field.

Thus, it can be inferred that everything related to digital strategies for the continuity in the training processes, became a very useful tool in the framework of COVID-19 thus becoming the main study modality even when traditionally it was only seen by students as an option within the different methodologies of education, and was aimed only at people with specific needs who for different conditions could not attend a classroom in person. However, with the advent of the aforementioned disease, all educational institutions invested resources and efforts in the digitization of academic content to provide students with the possibility of not interrupting their academic training.

#### 4.2 Distribution of scientific production by year of publication.

Figure 2 shows how the scientific production is distributed according to the year of publication, taking into account that the year 2020 and the first semester of 2021 are taken.



**Figure 2.** Distribution of scientific production by year of publication.

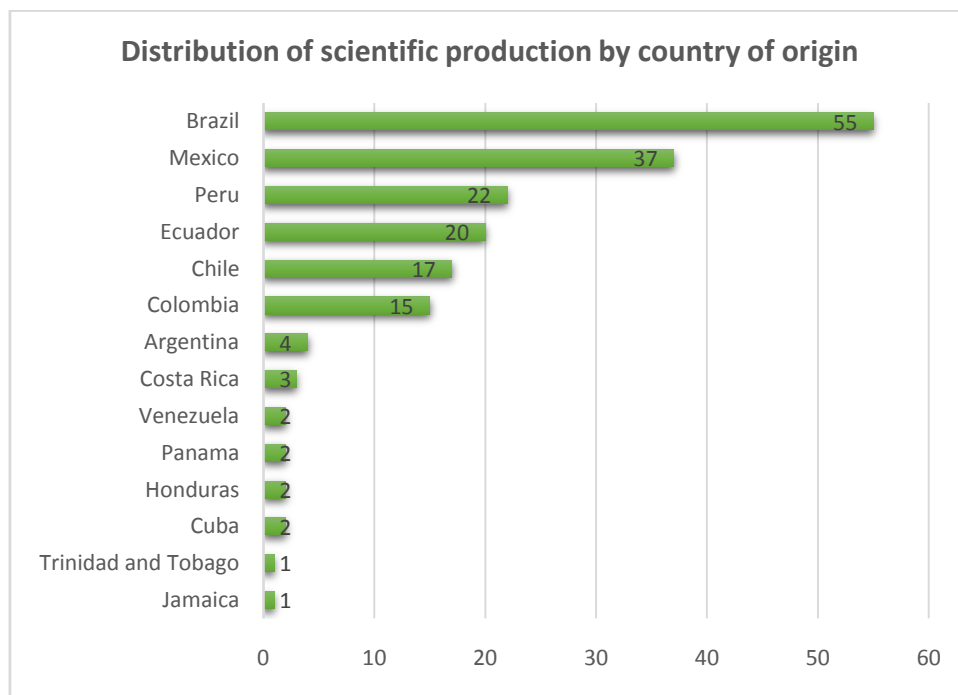
**Source:** Own elaboration (2021); based on data provided by Scopus.

Due to the nature of the variables under study, the temporal limitation allows visualizing the scientific production of the year 2020 and that of the first semester of the year 2021, where a total of 102 publications are reached at the time of the edition of this article, unlike the whole previous year where 62 documents were registered, among which is the conference article entitled "Appropriation of competencies in students who migrated from the traditional education model to an online education model, derived from COVID-19" (Cotero et al., 2020) whose purpose is to describe the whole set of skills that both students and teachers must develop to assimilate all the new knowledge imparted remotely, as well as to establish the definitions of distance education, virtual education and online education, which is of great importance when establishing strategies in any of the three modalities, since there are different characteristics in each of them. In this way, it is supported from the scientific analysis of these variables, how the digital transformation went from being an option to an almost mandatory reality, promoting innovation at different levels of academic training.

From 2021, the article entitled "Big data for biomedical education with a focus on the covid-19 era: An integrative review of the literature" (Khamisy-Farah, et al., 2021) which performs a documentary review on biomedical education that allows a tour of the published literature concerning studies in training in the area of medicine, and how COVID-19 has impacted teaching methodology, mainly recognizing the change that education has undergone in attention to the policies established by central governments to slow down the high numbers of contagions during the framework of the aforementioned disease.

### 4.3 Distribution of scientific production by country of origin.

Figure 3 shows the distribution of scientific production according to the nationality of the authors.



**Figure 3.** Distribution of scientific production by country of origin.  
**Source:** Prepared by authors (2021); based on data provided by Scopus.

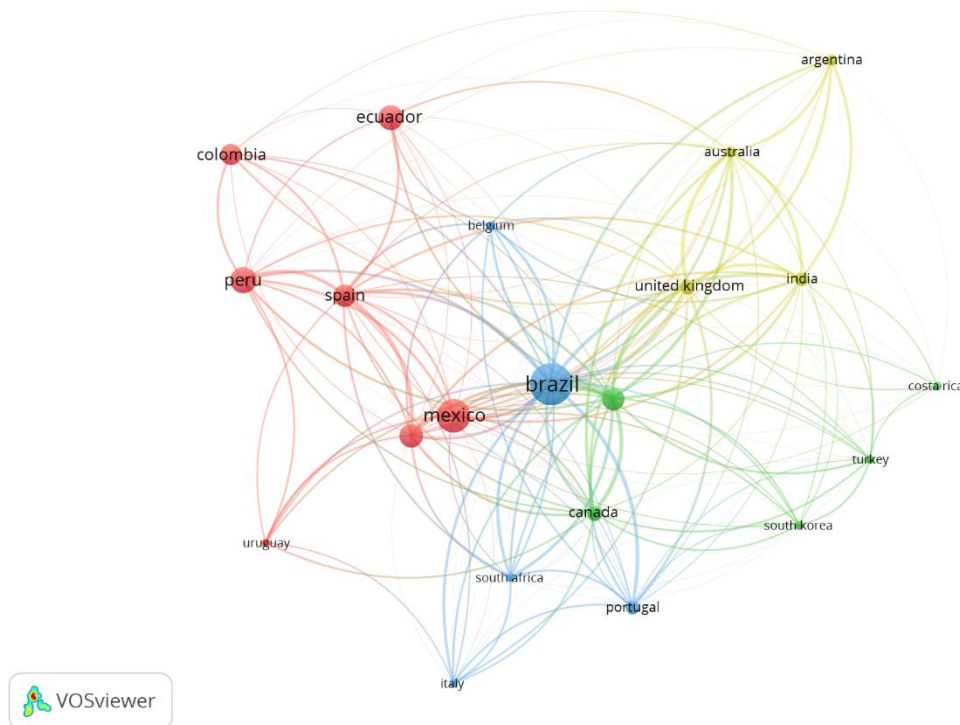
Of the Latin American countries, Brazil has the largest number of publications on the topic proposed by this document review, registering in Scopus a total of 55 documents during the year 2020 and the first semester of 2021, among which is the article entitled "The "digital desert": Repercussions of COVID-19 in Education in Spain and Brazil" (Vieira et al., 2021) whose objective was to know the perceptions of teachers and lecturers of Basic Education in Spain and Brazil, on the repercussions of Covid-19 in Education. A semi-structured interview was conducted with 12 Basic Education teachers from both Spain and Brazil, identifying a great latent trauma within the motivation of teachers, who were abruptly forced to develop skills in the use of digital platforms, most of whom stated that they did not have the knowledge and praxis necessary for the mastery of these tools. The above constitutes an opportunity identified for educational institutions, in terms of continuous training of their teachers through training to keep them updated in terms of the ability to manipulate all the technological resources necessary for training through remote, virtual or distance education.

Mexico has the second highest number of publications within the Latin American community, with a total of 37 publications, followed by authors from Peru and Ecuador with 22 and 20 documents, respectively.

At this point, it should be noted that the production of scientific publications, when classified by country of origin, presents a special characteristic and that is the collaboration between authors with different affiliations



to public and private institutions, and these institutions can be from the same country or from different nationalities, so that the production of an article co-authored by different authors from different countries of origin allows each of the countries to add up as a unit in the overall publications. This is best explained in Figure 4, which shows the flow of collaborative works from different countries.



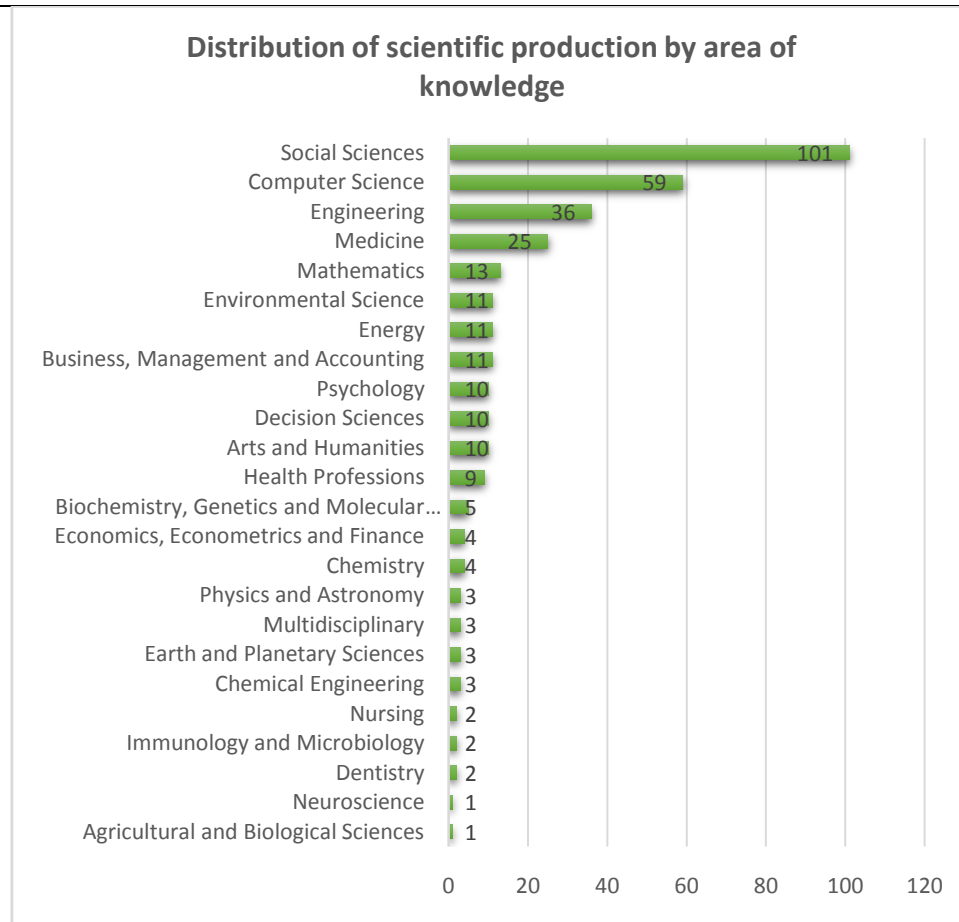
**Figure 4.** Co-authorship between countries in Latin America.

**Source:** Prepared by authors (2021); based on data provided by Scopus.

Brazil shows to be the Latin American country with the highest number of participations in research works with authors of other nationalities, as is the case of authors from Mexico, Belgium and Spain. Colombia, Peru and Ecuador also present research in common. An example of this is the article "*Aprendizaje a distancia sincrónico: experiencia de estudiantes y profesores desde una perspectiva de género*" (Lara-Prieto, et al., 2021) which has the participation of authors from Mexico and Chile and its purpose is to describe the experience of teachers in the implementation of digital strategies for the academic training of their students in the context of the pandemic generated by COVID-19. Among the strategies implemented by the university is the application of the Flexible Digital Model (MDF) to give continuity to the academic offerings. The challenge consisted of transferring 55,000 classes per week to the SDM, serving 90,000 students with 9,400 professors, all in one week. At the end of the academic period, a survey was applied to measure the perception of professors and students regarding the model, with the purpose of analyzing its context and supporting, through feedback, the possibilities for improvement.

#### 4.4 Distribution of scientific production by area of knowledge

Figure 5 shows the production of scientific publications distributed according to the area of knowledge through which the different research methodologies are executed.



**Figure 5.** Distribution of scientific production by country of origin.  
**Source:** Prepared by authors (2021); based on data provided by Scopus.

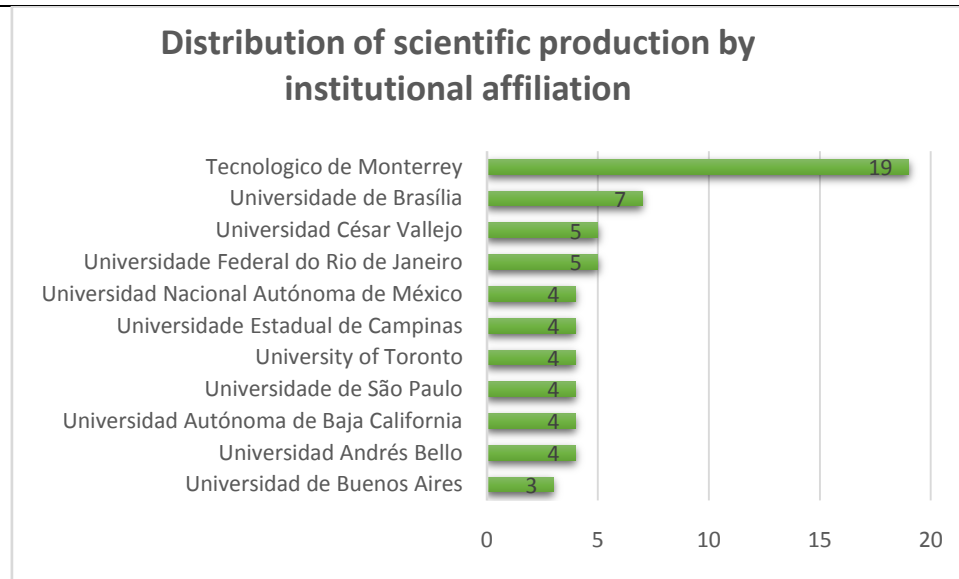
Social Sciences is the area of knowledge that supported through different theories and bibliographic material, the scientific production of publications related to Digital Transformation and Educational Innovation in the framework of COVID-19. A total of 101 documents were produced from this area, among which we find the article entitled "*COVID-19: the impact of a global crisis on the teaching of sustainable development*" (Leal, et al., 2021) whose objective was to analyze to what extent COVID-19 as a whole and the blockage it triggered in particular, which has led to the suspension of classroom teaching in universities around the world and influenced teaching in subjects related to sustainable development, concluding the study thanks to an applied survey, that teaching in subjects related to sustainable development, can be potentiated through innovation and incursion of support in technologies within the study methodology.

Due to the nature of the study, it is also identified that studies derived from Computer Sciences also make an important contribution to the bibliographic resources referring to the aforementioned topic, 59 documents talk about the technological tools that are proposed in attention to the entire student community within their training process. Engineering is in third place with 36 publications and Medicine is in fourth place with 25 documents.

#### 4.5 Distribution of scientific production by institutional affiliation.

Figure 6 shows how the bibliographic production is distributed according to the institutional affiliation of the participating authors.





**Figure 6.** Institutional Affiliation

**Source:** Own elaboration (2021); based on data provided by Scopus.

Figure 6 shows the distribution of scientific production identified through the execution of Phase 1 of the Methodological Design according to the institutional affiliation of the authors participating in the research projects. It should be noted that only the first eleven positions are registered, within which the first place is for the Tecnológico de Monterrey with 19 publications. Of the authors affiliated with that institution, there is an article entitled "*Education in Latin America: Towards digital transformation in universities*" (Argüelles-Cruz et al., 2021) whose purpose is to describe how as a result of the measures adopted to reduce the high numbers of contagion by Covid-19, Educational Institutions were forced to develop innovative strategies to give continuity to the academic training process, This is how an unprecedented interest has been awakened in recent history, to propose pedagogical models supported by the use of digital tools for the virtualization of subject plans, leaving more and more available, the possibility of accessing education remotely, thus expanding the field of action of educational institutions.

The second place goes to the University of Brasilia (Brazil) which registers 7 publications among which is the article entitled "*Improving the digital skills of older adults in a pandemic environment of COVID-19*" (Garcia, et al., 2021) whose objective is to discuss the implications of the COVID-19 pandemic in the education of older adults, as well as how to develop digital skills in a pandemic scenario. This is in response to the needs of older adults, who represent one of the groups with the highest risk of death from the disease. In this way, it seeks to develop the necessary skills so that this group of people can access different digital devices and develop their academic training.

## 5. Conclusions

Thanks to the bibliometric analysis proposed by this research, it is possible to determine that among the Latin American countries, the one with the highest scientific production registered in the Scopus database is Brazil with 55 documents published in high impact journals during the year 2020 and the first semester of the year 2021. However, the educational institution with the highest number of records according to the identification carried out through Phase 1 of the methodological design was the Tecnológico de Monterrey (Mexico), which registered 19 publications in total. This allows inferring that the impact generated by the appearance in the world of COVID-19 has motivated researchers to consider the insertion of new and better technologies to guarantee the fulfillment of the academic calendar from the virtuality.

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The research, for the most part, was managed through theories framed in the Social Sciences, due to the nature of the subject studied, since it seeks to establish the social impact included in political, economic and cultural factors, among others, of the measures adopted by Latin American educational institutions that promoted the application of virtual strategies for remote access to academic training seeking to give continuity to the teaching-learning process. However, this meant for teachers and students an additional challenge for which little preparation was evidenced, since the use of new technologies turned out to be complex in the execution of strategies designed by the Educational Management. Thus, educational institutions at all academic levels were urged to train their teachers in the technological resources to be used for the virtualization of the contents of the different subjects.

In some cases, a lack of motivation on the part of teachers was identified, since their traditional methodologies constitute an ingrained part of their professional development. In some cases, teachers of older ages found the use of these platforms complex, transmitting to students a feeling of uncertainty and insecurity, which in many cases led to the postponement and desertion of academic courses. This represented an additional challenge for the administration of both public and private educational institutions, since motivation is a fundamental factor in a process of abrupt change such as the one experienced in the global academic world.

Innovation is a fundamental factor in all the academic offerings of the different educational institutions, since it constitutes an opportunity to keep both teachers and students updated. For this reason, the acceptance of the changes adopted in response to the restrictive measures imposed to reduce the high rates of infection by COVID-19 was an interesting aspect to study in several publications, since it generated great awareness of the susceptibility to changes that are sometimes optional, and at other times mandatory, as in the current case in the context of the pandemic generated by the disease mentioned above.

Thus, this study concludes by highlighting the importance of knowing the current status of Digital Transformation as a proposal that evolved from being an option to an obligation on the part of educational institutions at different academic levels, and how innovation becomes a necessity to face different situations such as the one experienced since the declaration of pandemic by the World Health Organization. It is important to highlight how innovation in academic training can mean great advances in educational inclusion, since it expands the field of action of educational institutions, reaching places where, due to different situations, such institutions do not exist, through the design of technological programs that allow remote access to training and academic sessions. However, in Latin America, it is evident the socioeconomic situation of many families who do not have resources to ensure students, the availability of digital tools and internet access, so it has become a struggle and a purpose by government policies, so that thousands of children and adolescents do not interrupt their training process thanks to restrictive measures to reduce the numbers of contagion. On the other hand, there is also a population which is worthy of attention, older adults who still have the intention of learning, but who, due to factors such as age, do not have the necessary skills to manage platforms and tools for virtual or remote education. For this reason, the academic community has proposed to help this population to develop this set of skills and abilities in order to further meet the objectives of inclusion in education. This represents an important resource for any research conducted with the future of education in Latin America in mind.

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