

COVID-19: TERRITORIAL IMPACT OF DIGITAL TRANSFORMATION ON ACCESSIBILITY TO THE EDUCATIONAL SYSTEM IN LATIN AMERICA IN A CONTEXT OF COVID-19

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Abstract

A documentary review was carried out on the production and publication of research papers related to the study of the Digitization of academic content in Higher Education Institutions in Latin America during Covid-19 in the period between 2020 and 2021. The purpose of the bibliometric analysis proposed in this document is to know the main characteristics of the volume of publications registered in the Scopus database during the period 2020-2021 by Latin American institutions, achieving the identification of 345 publications in total. The information provided by this platform was organized using graphs and figures, categorizing the information by Year of Publication, Country of Origin, Area of Knowledge, and Type of Publication. Once these characteristics were described, the position of different authors regarding the proposed topic was referenced through qualitative analysis. Among the main findings of this research, it is found that Mexico was the country with the highest production with 33 publications. The area of knowledge that made the greatest contribution to the construction of bibliographic material referring to the study of the digitization of academic contents by higher education institutions during the Covid-19 pandemic was Social Sciences with 74 published documents, and the type of publication that was most used during the period indicated above was the journal article, representing 60% of the total scientific production. In this sense, the analysis addresses the territorial impacts generated by the digital transformation and the forms of access to the educational system in the framework of the Covid 19 pandemic, thus reconceptualizing the notion of distance and access time to educational institutions.

Keywords: Education, Digitization, COVID-19, Territorial Impact.

I. INTRODUCTION

Covid-19 is a virus whose transmission began in the Wuhan region of China in 2019 and

quickly spread to countries on different continents, so the World Health Organization (WHO) decreed a pandemic because of the

same disease in March 2020, to which a large percentage of countries responded to the suggestion to order citizens, mandatory restrictive quarantine, thus avoiding crowds through social distancing. Many economic sectors were affected, especially commerce, since this declaration generated great uncertainty due to the unknown and an uncertain future, and activities of this type were suspended, at least in the traditional way (Inter-American Development Bank, 2020).

The education sector was no stranger to the pandemic caused by the Covid-19 disease and resulted undoubtedly affected as classroom attendance was suspended until further notice, forcing teachers and students to recreate the academic environment through virtual tools such as those suggested by Dave Cormier and Bryan Alexander in Canada in 2008, called MOOC (Massive Open Online Course) (Lopez-Meneses & Vazques, 2020). This model was designed to expand educational coverage to people who for many reasons could not access academic training centers in person. In this way, what previously represented an option in training, became the only alternative to be able to continue the teaching-learning processes. In this sense, this analysis addresses the territorial and social impacts generated by digital transformation and access to education, in their spatial interrelation with technological innovation in a context of the Covid 19 pandemic.

However, the digitization of academic content alone did not represent the only challenge of education during Covid-19, so other variables of special attention were highlighted, such as the motivation of both teachers and students. For the first group, the main objective of the educational management, since most of the educators have not been familiar with the use of virtual tools to carry out the training process, the management of frustration was one of the challenges for the trainers.

One of the main strategies used by institutions was continuous training in the use of platforms designed for this purpose (Artavia & Castro, 2019). In this way, they sought to ensure success in the fulfillment of academic

commitments by students. The above represents one of the many challenges that the education sector faced during the Covid-19 pandemic, so knowing the implications of the restrictive measures regarding the digitization of academic content during that period, became a priority for the scientific community. For this reason, the development of this article has been raised, seeking to answer the question: How has been the production and publication of research papers on the study of the digitization of academic content in higher education institutions in Latin America during the Covid-19 pandemic during the period 2020-2021?

2. General Objective

To analyze, from a bibliometric and bibliographic perspective, the production of high-impact research works on the Digitization variable and its accessibility in Higher Education Institutions in Latin America during the Covid-19 pandemic during the period 2020-2021 in Latin American countries considering its impact on the territory.

3. Methodology

A quantitative analysis of the information provided by Scopus is performed under a bibliometric approach to the scientific production concerning the Digitization of academic content by Latin American Educational Institutions during the Covid-19 pandemic at the Latin American level. Likewise, it is analyzed from a qualitative perspective, with examples of some research works published in the area of the study mentioned above, from a bibliographic approach to describe the position of different authors on the proposed topic and from a territorial perspective to know the implications and effects of the territory and the various forms of access to education as a key factor that allows us to understand the level of socioeconomic development of the territories.

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

3.1 Methodological Design

Table 1. *Methodological design.*

	PHASE	DESCRIPTION	CLASSIFICATION
PHASE 1	DATA COLLECTION	The data collection is carried out using the Scopus web page search tool.	Published documents whose study variables are related to the study of the digitization of academic content by higher education institutions during Covid-19. Research papers published by authors affiliated with Latin American institutions. Research papers were published during the period 2020-2021. Without distinction of the area of knowledge. Without distinction of the type of publication. Territorial component in access to education (geographical aspect)
PHASE 2	CONSTRUCTION OF ANALYSIS MATERIAL	The information identified in the previous phase is organized. The classification will be made through graphs, figures, and tables based on data provided by Scopus.	Word Co-occurrence. Year of publication Country of origin of the publication. Area of knowledge. Type of publication
PHASE 3	DRAFTING OF CONCLUSIONS AND FINAL DOCUMENT	After the analysis carried out in the previous phase, the study proceeds to the drafting of the conclusions and the preparation of the final document.	

Source: Own elaboration (2022)

4. Results

4.1 Co-occurrence of words

Figure 1 shows the co-occurrence of keywords within the publications identified in the Scopus database.

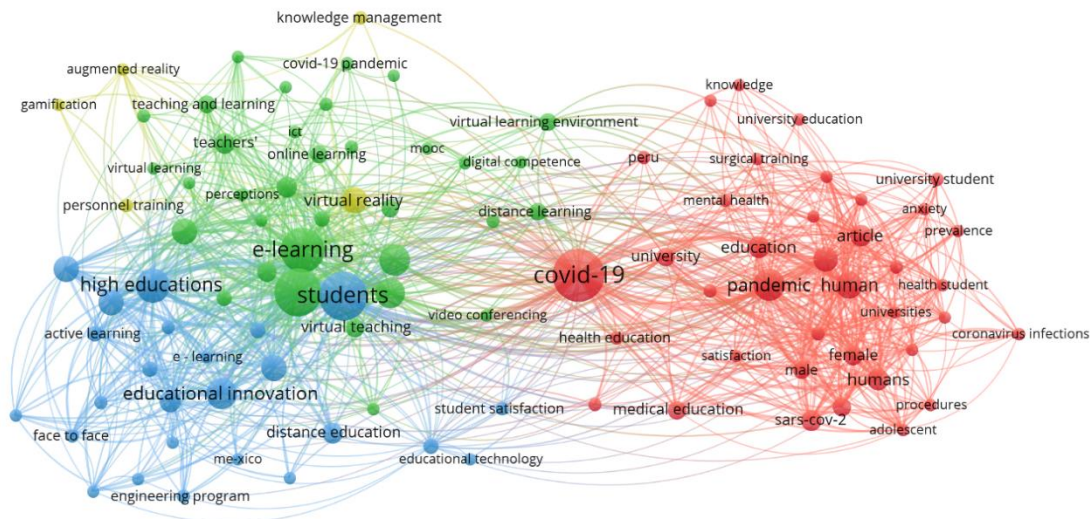


Figure 1. *Co-occurrence of words*

Source: Own elaboration; based on data provided by Scopus.

As a central topic of the research identified through the execution of Phase 1 of the methodological design, the term Covid-19 was found to lead the main set of publications related to variables such as University Education, Mental Health, Pandemic, among others, which confirms the relevance of the research works analyzed, with the theme proposed in this article. Similarly, the studies related to Covid-19 also show the development of different topics such as Online Learning, Distance Learning, Virtual Reality, Mooc, Digital Competences, among others, which demonstrate how research has developed topics related to virtual teaching methodologies, their advantages, and disadvantages, their applicability, and efficiency, their impact on society in times of pandemic, which undoubtedly has been one of the central issues in the national agenda of many countries around the world, since it is about the fulfillment of one of the Fundamental Rights and that is mandatory for the state, to ensure access to education. Therefore, it is worth mentioning the works on Innovation, Virtual Teaching, Augmented Reality, Video calls, which is the central theme of research identified in Scopus, contributed to the design of strategies by the Educational Management to give continuity to the training processes without exposing the physical integrity of

students, educators, and administrative staff. The physical conditions of the territory (mountain relief and altitude), and the sociodemographic and economic dynamics, the cultural particularity and the access to the technological infrastructure of the territories, have influenced access to a digital education with a level of accessibility

This, added to the multiple challenges to which education was exposed in response to the ordinance of the governmental actors through the health authorities that sought such preventive isolation and social distancing to reduce the high rates of contagion and death due to Covid-19 infection, among which was even found, One of the problems of greatest impact was the gap of social inequality, by imposing virtual mechanisms for teaching without taking into account that many social sectors did not have access to technological tools and internet connectivity, so governments sought subsidy programs so that low-income families could have the aforementioned elements.

4.2 Distribution of scientific production by year of publication.

Figure 2 shows how scientific production is distributed according to the year of publication, taking into account the period from 2020 to 2021.

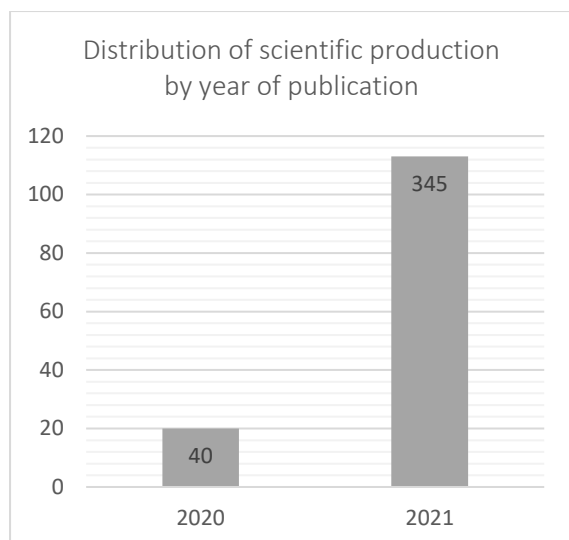


Figure 2. *Distribution of scientific production by year of publication.*

Source: Own elaboration; based on data provided by Scopus.

The annual distribution of scientific production shows how the execution of research projects that are published in high-impact journals indexed in the Scopus database, starts in 2020 with a total of 40 publications and ends in 2021 with 345 documents. The above takes into account that these were periods of 12 complete months each so that the volume of research would give closed data if it is taken into account that the Covid-19 variable was started when 2019 was already elapsed.

It is important to note that the objective of studies related to education in times of pandemic seeks to measure the impact that the virtualization of content has on the stakeholders around it, such as teachers, students, parents, and government actors, among others. Of the articles analyzed in the group of publications carried out in 2019 that pursues information such as the above, the one entitled “Impact of virtual education in times of pandemic at the University of North Lima” stood out (Gomero-Fanny, et al., 2020), which was a conference article whose objective was to analyze the impact of the use of technological tools in university higher education in the university environment of the city of Lima, Peru. The study evidenced a high percentage of

adaptation on the part of teachers and students to the use of technological tools to give continuity to the academic calendar, despite not having a clear knowledge of the use of such didactic material by virtual means, to which each of the aforementioned groups went, generating great adaptability and skills necessary to make correct and efficient use of the platforms designed for educational purposes. In this way, the article concludes by stating that although the generalized uncertainty among students and teachers due to the sudden and mandatory change in the methodology that went from face-to-face to virtuality, ended up potentiating the strengths in communication even when the remote sessions were presumed to lack interest or motivation due to the lack of knowledge in the operation of technological tools such as digital devices, virtual platforms, among other resources.

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.

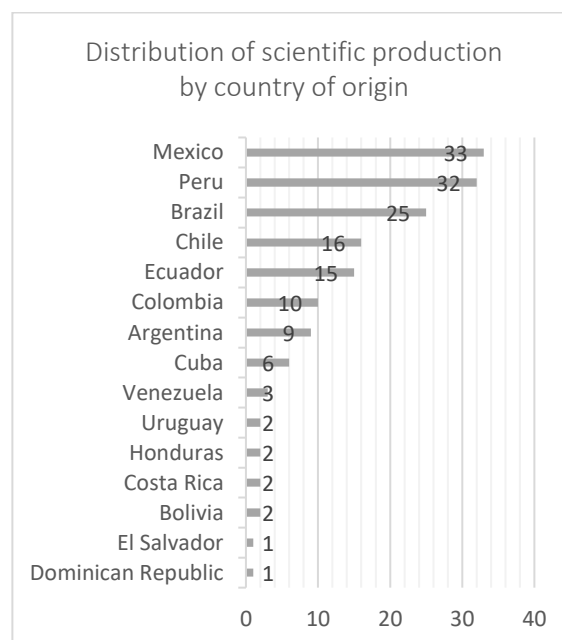


Figure 3. *Distribution of scientific production by country of origin.*

Source: Own elaboration; based on data provided by Scopus.

Within the volume of publications identified through the execution of Phase 1 of the Methodological Design proposed for the development of this research, it is important to know that the total scientific production is distributed according to the country of origin of the institutions through which the research papers were published, to visualize the research level of each of them. Taking into account that, for this article, publications from Latin American countries were taken, it was established that Mexico, a country belonging to this community, presented the largest number of publications during the period 2020-2021 related to the study of the Digitization of academic content during the Covid-19 pandemic, with a total of 33 documents registered in Scopus. It was followed by Peru with a total of 32, and Brazil and Chile in third and fourth place with 25 and 16 publications respectively.

Ecuador was in fourth place with a total of 15 documents, including the one entitled “Digital andragogical competencies of Ecuadorian higher education teachers during the COVID-19 pandemic” (Mendoza et al., 2021), whose objective was to determine the virtual andragogical competencies of Ecuadorian university education during the COVID-19 pandemic. The results helped to strengthen the digital competencies of teachers, establishing four fundamental aspects such as “knowing how to be” which refers to training and continuous training in Information and Communication Technologies (ICT), “knowing” which indicates the knowledge of teachers to be trained by programs designed by the educational management in their respective institutions. Then “Knowing how to live together” suggests the methodologies needed to develop effective and critical communication to build new knowledge through two-way information. Finally, “Knowing how to do” involves the application of all the knowledge acquired through continuous education and training, with the correct and effective methodology for each training process within the remote or virtual environment, whether asynchronous or synchronous.

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 both public and private institutions, and these institutions can be from the same country or 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 work from different countries.

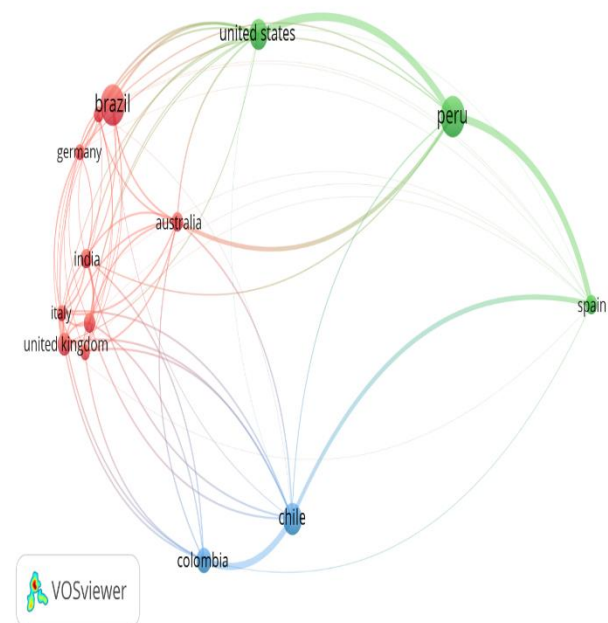


Figure 4. *Co-citations between countries.*

Source: Own elaboration; based on data provided by Scopus.

Figure 4 shows how international collaboration has been in the development and execution of research methodologies in the search for the generation of new knowledge. The level of international co-authorship of researchers affiliated with Peruvian institutions stands out, which presents research with Spain and the United States. Brazil, on the other hand, registers participation with authors from Germany, Australia, India, Italy, and the United Kingdom.

A clear example of international participation in the execution of research projects from which scientific publications are derived is the article presented by Colombia, which ranked sixth with a total of 10 publications, entitled “Digital competence, role stress, and commitment: towards positive mental health in Latin American teachers” (Deroncele-Acosta, et al., 2021), which had the participation of authors affiliated to institutions in Peru, Brazil, and Ecuador, and whose purpose was to evaluate the level of role stress (ambiguity, conflict, and overload), engagement (vigor, dedication, and absorption) and digital competencies of 300 teachers from six Latin American countries: Peru, Colombia, Chile, Brazil, Mexico and Ecuador, by identifying a great emotional burden in the face of the abrupt change in methodology and the submission to the use of technological devices to carry out their function as trainers, this allowed shortening the notion of time and distance in access to education, which has been taking place in a progressive, considering the characteristics of the territory, the existing human capital and the availability of the internet, which allows for better conditions of access to education. It is vital to identify these levels of stress because, given the pressure received by the teaching staff, it is common to find situations in which their mental health is affected. For this reason, the study developed a tool to measure adherence to the teaching-learning processes, taking into account factors such as motivation and skills in the use of technological resources.

4.4 Distribution of scientific production by area of knowledge

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

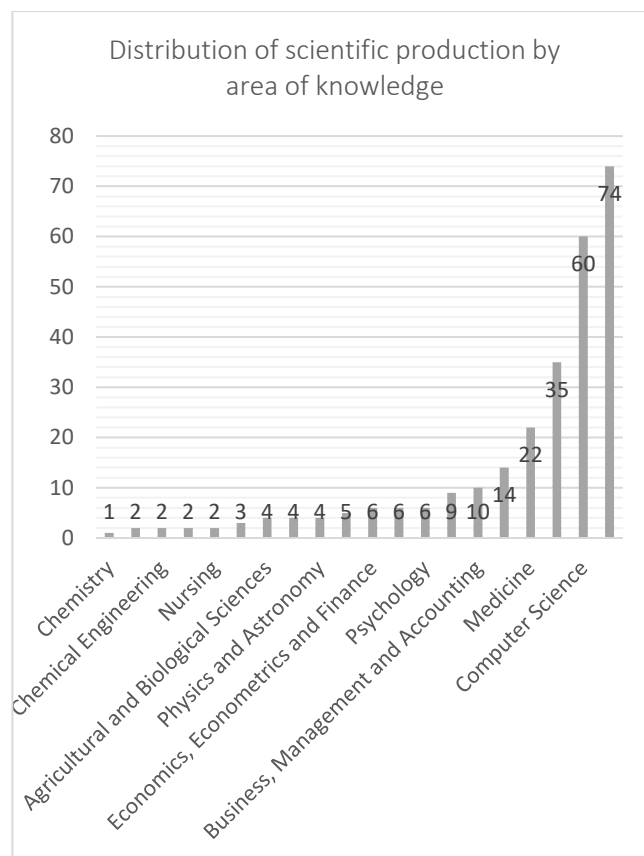


Figure 5. *Distribution of scientific production by area of knowledge.*

Source: Own elaboration; based on data provided by Scopus.

Due to the nature of the study and the subject matter addressed in this article, the area of Social Sciences is identified as the most influential in the execution of the research identified through Scopus. A total of 74 publications were developed from the social study and its implication in the community. Within this group of research, the article entitled “Virtual education in times of COVID-19: Perceptions of university students” stands out (Avendaño, Luna, & Rueda, 2021), whose objective was to describe the perceptions of a group of undergraduate students regarding virtual education in times of COVID-19.

The above, as a reliable measure of the quality perceived by the students within their formative process, but also as an important instrument to know the level of adaptation of this group, to the new learning methodologies based on the

use of technological tools during the Covid-19 pandemic. The study carried out a 31-item Likert-type questionnaire to sample 608 students enrolled in the faculty of business sciences of a public university in the city of Cúcuta (Colombia), obtaining, as a result, a generalized favorable perception among students, highlighting the part of these, the work of teachers recognizing their effort to maintain the rhythm of the academic calendar.

Continuing with the interpretation of Figure 5, it is possible to identify that the area of Computer Science is located in second place with 60 documents, understanding that the use of technological tools for educational purposes requires theoretical bases in the operation and adaptation of digital media and the design of virtual programs requires such training based on the knowledge of programming and generation of audiovisual content.

4.5 Type of publication

Figure 6 shows how the bibliographic production is distributed according to the type of publication chosen by the authors.

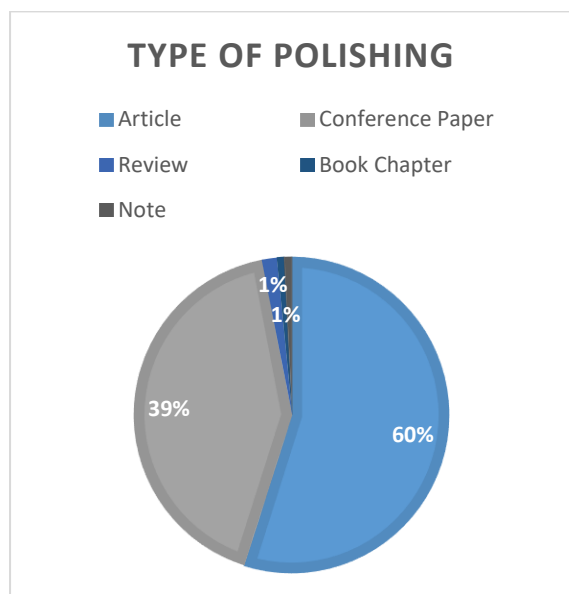


Figure 6. *Type of publication*

Source: Own elaboration; based on data provided by Scopus.

It is evidenced by Figure 6 that 60% of the research works identified through the execution of Phase 1 of the Methodological Design

proposed for the development of the present research, correspond to Journal Articles, followed by Conference Articles with 39% and Reviews in third place with 1%. Within this last group of research, the review entitled “Online classes in the context of higher education in times of pandemic” was found (Machado, Soso, & Kampff, 2020), whose objective is to analyze what multilateral organizations, international associations, and other institutions of reference for education say about strategies for the reorganization of Higher Education, in the local (Brazilian) and global (global) context, in the face of the coronavirus pandemic.

The organizations analyzed were: the International Association of Universities (IAU), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the International Institute for Higher Education in Latin America and the Caribbean (IESALC), the Organization for Economic Cooperation and Development (OECD), the World Bank, the Ministry of Education (MEC), and the Coordination for the Improvement of Higher Education Personnel (CAPES), among others. In line with what has been stated, the territorial impact of covid 19 in the educational sector emphasizes the need to design strategies and methodologies for access to digital education. This impact from the territorial point of view must take into account the availability of resources, access to infrastructure and equipment, personnel that provides the educational service according to the geographical area, whether rural or urban where the educational institution is located, as well as the constant capacity building in human capital. The OECD's 2020 report on economic prospects for LAC states that a digital transformation will be the main engine for economic recovery after the crisis caused by COVID-19.

The article emphasizes the importance of giving continuity to the pedagogical processes, among which are: the development of inclusive and equitable pedagogical projects, the training of teachers to work on virtual platforms and support for students to involve them, the availability of a technological infrastructure

according to the physical conditions of the territory and reduce the feeling of isolation.

5. Conclusions

Thanks to the bibliometric review carried out in this article, it was possible to establish that within the distribution of the volume of scientific production identified under the search parameters established in the methodology for the Scopus tool, the countries with the highest number of published documents were Mexico, Peru, and Brazil with 33, 32 and 25 documents respectively. The above allows inferring that within the search for the generation of new knowledge from the experience lived by the educational sector, questions arise that involve the design of effective methodologies to give continuity to the academic training process even in times like the one the whole world went through due to Covid-19, which forced a large number of activities to be suspended to avoid an increase in the number of contagions and deaths due to the same disease.

In this way, educational institutions were forced to use existing technological tools to continue the academic calendar; however, many obstacles were identified not only in the three countries mentioned above but throughout the Latin American community, among which it was found that the gap of social inequality was even more noticeable. The impact generated by this problem urged state institutions to design measures and programs in partnership with the same educational institutions to help this group of citizens so that they could have access to education even in times of pandemics. In the case of Peru, the influence of the Andes as part of the configuration of the Andean territorial system has influenced and represented over time a great challenge for physical connectivity, which has forced to rethink the implementation of new technological tools. and taking into account the notion of distance and time in accessibility to digital education.

In this way, it is possible to generate a diagnosis of the Latin American situation regarding the effect that the Digitization of

academic content during the Covid-19 pandemic, which among the student community turned out to be favorable, according to the position of different authors mentioned in this document, which concludes that students mainly from urban areas have been more receptive to change even when they also faced difficulties in carrying out correct learning, such as constant interruptions in the internet service, difficulty in separating tasks of the home during the time allocated to virtual classes, on the other hand, in rural areas this access to digitization faces challenges in order to have the technological infrastructure and overcome the influence of physical conditions to have connectivity and access to digital education. According to the works cited, it is possible to affirm that the process of adaptation to the use of technological tools to attend their classes synchronously in urban areas has turned out to be more effective, since it is possible to affirm that this methodology will continue to be a trend that students could follow. implementing in post-pandemic times. On the other hand, in general, the teachers presented, in certain cases, high levels of stress due to the work overload to which they were subjected, since many of them not only had to continue carrying out their usual work, but were also assigned the task of digitizing all that academic content and adapt it to the tools proposed by educational management in their institutions.

This supposes an unprecedented challenge in the exercise of the functions of the teachers, however, the training and continuous formation of the same in the knowledge of the technological tools managed to generate trust within the body of teachers, which triggered a rapid adaptation to the new methodologies as manifested by the authors within the investigations that have been cited in this document. Finally, it concludes by highlighting the importance of generating new knowledge through the execution of documentary reviews such as the one proposed in this article, since in this way it is possible to collect all the current information regarding a specific topic, becoming a source fundamental for the design of new and better strategies of digital methodologies for teaching in Latin American

higher education considering the sociodemographic, cultural context and the economic dynamics and the geographical characteristics of the territories (altitude, type of ecosystem, natural region, among others) .

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