Virtual Education: Advantages And Disadvantages For Latin America

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Abstract

A documentary review was carried out on the production and publication of research papers concerning the study of the variable Virtual education advantages and disadvantages for Latin America. 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 2016-2021 in Latin American countries, achieving the identification of 119 publications. The information provided by the said platform was organized through tables and figures categorizing the information by Year of Publication, Country of Origin, Area of Knowledge, authors and Type of Publication. Once these characteristics were described, the position of different authors regarding the proposed topic was referenced by employing a qualitative analysis. Among the main findings of this research, it is found that Mexico, with 31 publications, is the Latin American country with the highest production. Computer science is the area of knowledge that made the greatest contribution to the construction of bibliographic material referring to the study of virtual education, and its advantages and disadvantages. This area of study had 58 published documents, and the author with the greatest number of publications is Morales-Menendez with 3 documents registered in Scopus and the type of publication that was most used during the period indicated above was the journal article, which represents 53% of the total scientific production.

Keywords: virtual education, advantages, disadvantages

1. Introduction

Virtual education is an educational modality in which information and communication technologies are used where students and teachers can interact without the need to be in a face-to-face space. This is thanks to the innovations that have been made in recent years in technology in society, being the industry 4.0 which determines the use of new technologies in most processes facilitating access to these, so education can not be the exception to be responsible for training people to be integral professionals who have an active role in social transformation. This educational model has advantages and disadvantages in its application. Among the advantages are accessibility, flexibility and autonomous learning; with virtual education, it is possible to access the teaching and learning processes from anywhere where digital tools are available, so it is also flexible to access at any time anywhere in the world, thus having the possibility of knowing a large number of sources of information. With this modality, autonomous learning is encouraged through educational platforms, since having access to a large amount of information, students develop competencies that allow them to evaluate the quality of this information from a critical perspective depending on the knowledge necessary for their training process.

On the other hand, this modality also has certain disadvantages in its application, such

as digital gaps in Latin American countries, concentration difficulties and lack of socialization. Due to the inequality characteristic of Latin American societies, there are digital gaps in the most vulnerable populations, far from the municipal capitals, characteristically rural that prevent this population from accessing education as a fundamental right. This was evidenced to a greater extent in early 2020 when, as a result of the pandemic declared by COVID-19, this model was implemented to continue with the pedagogical processes, so that an accelerated transition from the traditional model was made which highlighted the shortcomings of connectivity in the Latin American continent. There are also problems such as lack of concentration and the difficulty of strengthening social skills. This occurs because there is no differentiation between the place of study and home, causing a lack of concentration in the hours of study that make the day much longer and less productive, so it is one of the points to improve in the implementation of this educational model as it is the future of pedagogical processes. In this way, it is also necessary to implement teaching methodologies according to the needs of this new model.

Thanks to the above, it can be said that virtual education is the step to follow in educational innovation as a way of defining education, allowing access to it from anywhere at any time, and having access to a large amount of information that facilitates autonomous education and the construction of their knowledge. Therefore, it is important to know in terms of bibliographic resources, the current state of research related to Virtual education advantages and disadvantages for Latin America, so it is proposed a bibliometric analysis of the scientific production registered in the Scopus database during the period 2016-2021 that allows answering the question: How has been the production and publication of research papers related to the study of the variable Virtual education advantages and disadvantages for Latin America during the period 2016-2021?

2. General objective

To analyze from a bibliometric and bibliographic perspective, the production of high-impact research papers on the variable Virtual education advantages and disadvantages for Latin America during the period 2016-2021.

3. Methodology

A quantitative analysis of the information provided by Scopus is made under a bibliometric approach to the scientific production regarding virtual education and its advantages and disadvantages for Latin America. Also, from a qualitative perspective, examples of some research papers published in the area of the study mentioned above are analyzed from a bibliographic approach to describe the position of different authors on the proposed topic.

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

3.1 Methodological design

| PHASE	DESCRIPTION	CLASSIFICATION
PHASE 1 DATA COLLECTION	Data was collected using the Scopus web page search tool, through which a total of 119 publications were identified.	Papers published whose study variables are related to Virtual education advantages and disadvantages for Latin America. Research papers were published during the period 2016-2021. invited 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 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. Authors Type of publication
PHASE 3 DRAFTING OF CONCLUSIONS AND FINAL DOCUMENT	After the analysis carried out in the previous phase, we proceed to the drafting of the conclusions and the preparation of the final document	

Table 1. Methodological design.
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.
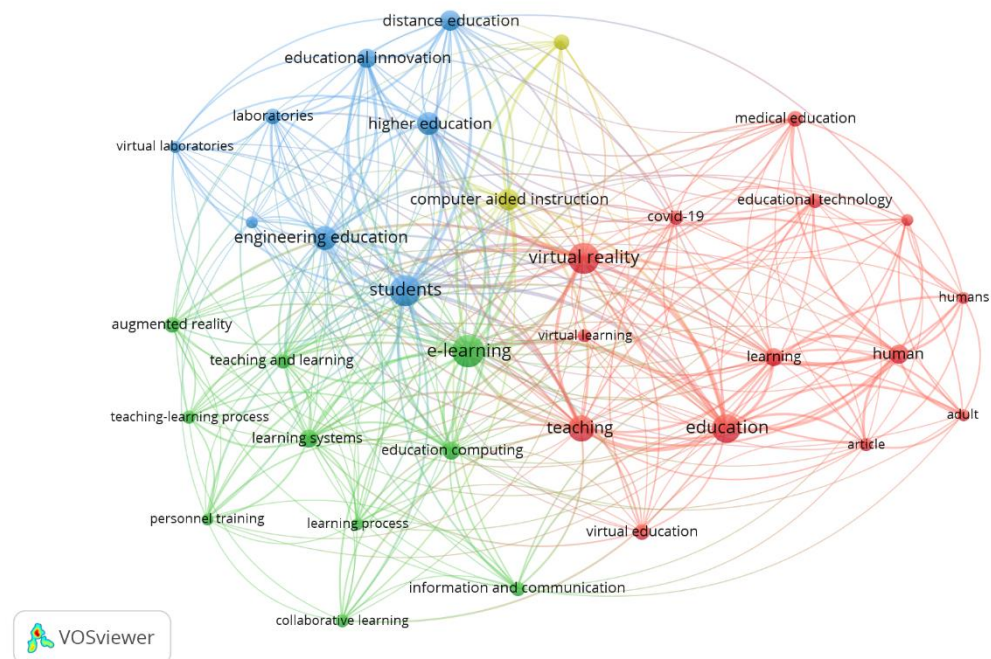
Figure 1. Co-occurrence of words
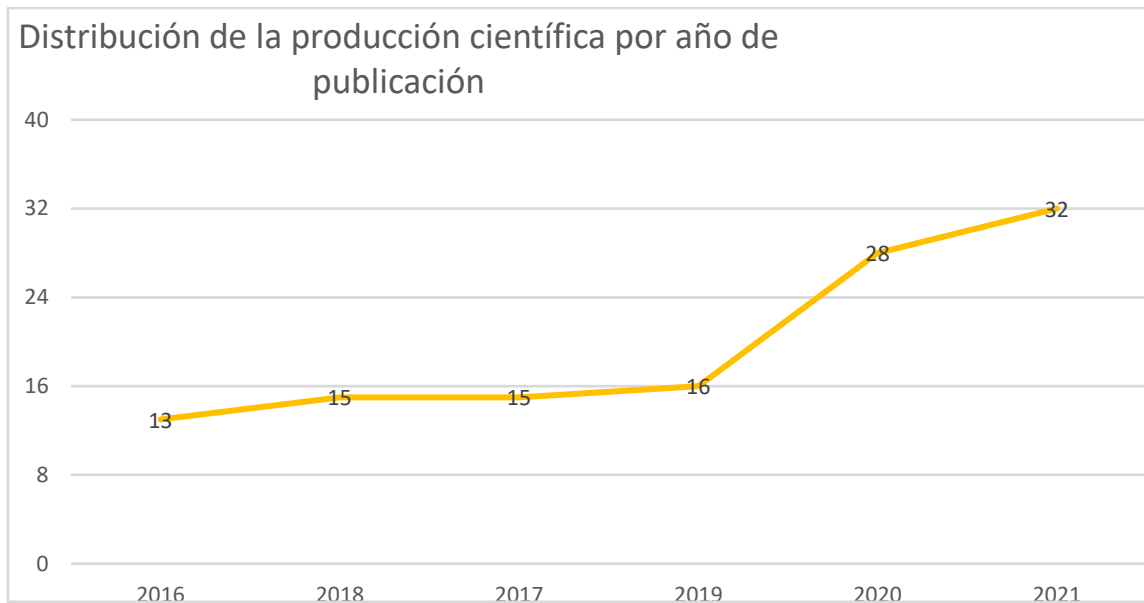**Source**: Own elaboration (2022); based on data provided by Scopus.

As shown in Figure 1, the most used keywords are virtual learning, education and virtual reality, which refer to the platforms used in virtual education, which is the educational model mediated by information and communication technologies that allow education to be accessible, allowing access anywhere and at any time to a large amount of relevant information for the training process, being necessary the training of educational actors to carry out this educational model satisfactorily in the use of platforms and educational tools. In this figure, there are keywords such as students, teaching-learning, information and communication and distance education, which shed light on the need for the educational actors to have the necessary skills to develop in the virtual world. The students should develop study methods that are following what is requested of them as a result of the pedagogical process, and the teachers have to implement methodologies that meet the needs that are created with this new educational model at a distance so that

there is no physical contact between students and teachers, which can present difficulties in the training process.

Finally, there are keywords such as laboratory, higher education and learning systems, which are one of the disadvantages of virtual education in Latin America today, since in some professional careers the experimental component is of vital importance in academic training, so it is necessary to adapt these practices in virtual environments that allow having the same results as in the classroom, taking into account the diversity of forms of learning so that all students have the same level of development of the necessary competencies.

4. 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 the period from 2016 to 2021.

Figure 2. Distribution of scientific production by year of publication.
Source: Own elaboration (2022); based on data provided by Scopus.

2021 is the year with the highest number of publications related to the variables under study with 32 publications, among which is the one entitled "Professional development of mathematics teachers in virtual environments: Advantages, theoretical approaches and future lines of research" (Aguayo, 2021). This document presents a bibliographic review that synthesizes what progress has been made in this area of research during the last decade identifying the reasons why virtual environments favor the training of teachers in mathematics highlighting the supply and demand regarding these skills, identifying the issues that have not been fully identified and that prevent the development of an impartial position on the application of information and communication technologies in the training of professional teachers with integrity.

In second place is 2020 with 28 documents within which is the title "Virtual University Education is an Environment without Losing its Essence in Teaching and Learning Spaces" (Acero et al., 2020). This document has as its main objective to know the impact of the use of virtual classrooms in university higher education through a study conducted on engineering students of the National University of the Altiplano where it was determined that students do not use virtual platforms to the fullest, since these were not adapted to their needs and conditions, thus causing a low educational performance that can be solved with the correct use of platforms and tools to access relevant information in their information process, all this to meet the educational objectives set out in the traditional educational model, but with the use of ICT.

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.
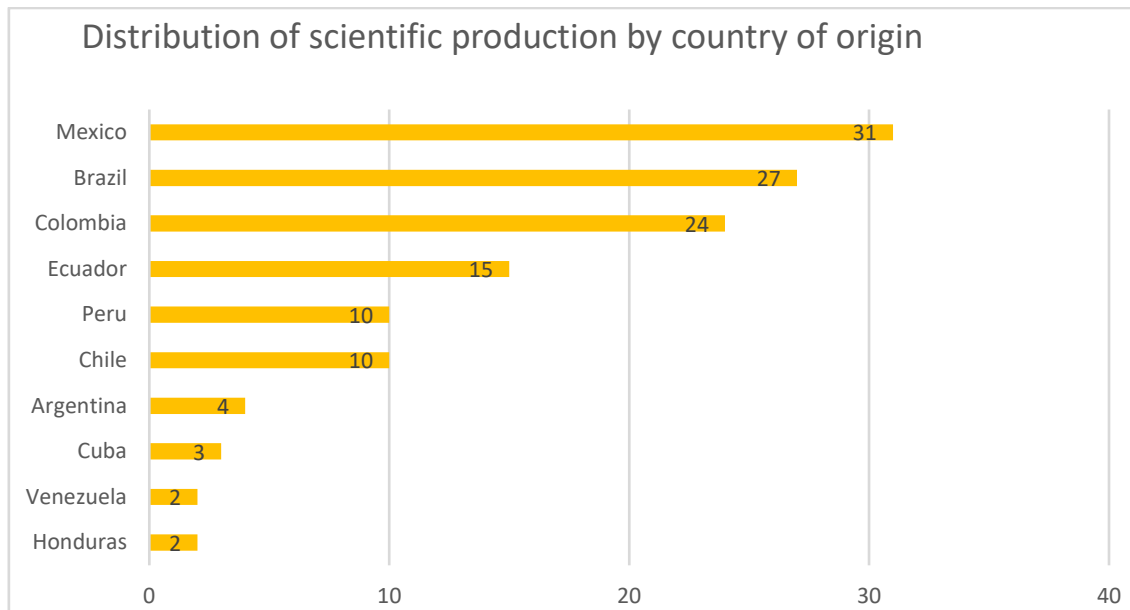
Figure 3. Distribution of scientific production by country of origin.
Source: Own elaboration (2022); based on data provided by Scopus.

Mexico is the Latin American country with the highest volume of scientific production related to the Advantages and Disadvantages of Virtual Education during the period 2016-2021 presenting 31 papers, within which is the paper entitled "Virtual reality vs traditional education: Is there any advantage in the teaching of human neuroanatomy?" (Lopez et al., 2021). This document has as its main objective to analyze if there is any advantage in teaching with virtual reality vs. traditional education taking into account that medical classes in the traditional education system are characterized by being magisterial and difficult to understand, so virtual platforms and augmented reality can help to make this knowledge more understandable. Therefore, a study was conducted with 120 students of neuroanatomy which was divided into two groups. In the first group, the traditional methodology was applied and in the second one the experimental methodology, giving the result that the students who used the experimental methodology presented a better performance in the identification of structures and the description of the functional implications.

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.
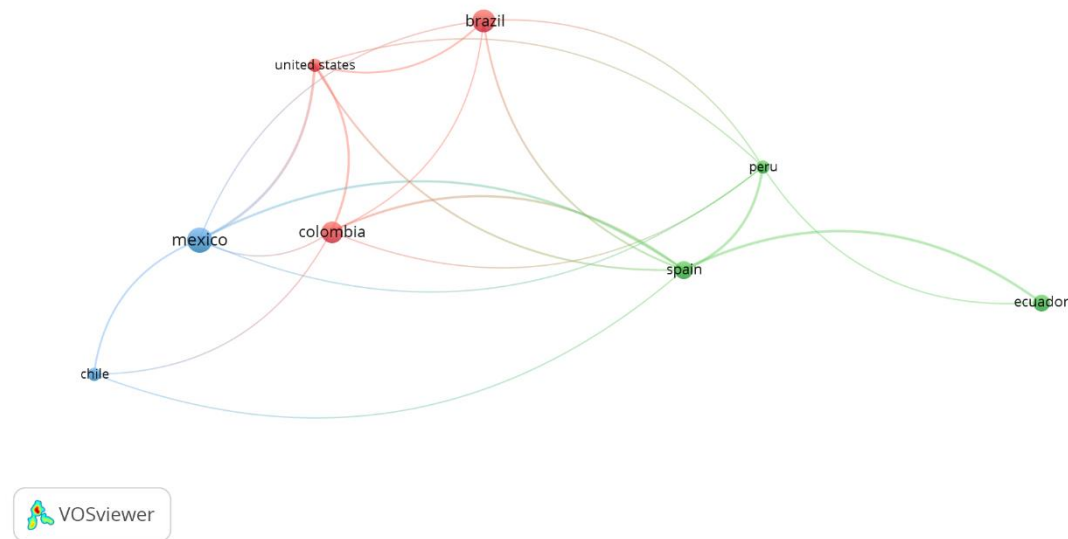
Figure 4. Co-citations between countries.
Source: Own elaboration (2022); based on data provided by Scopus

As mentioned above, Mexico is the country with the largest number of bibliographic records related to the variables under study, with documents in collaboration with countries such as the United States and Chile, demonstrating the interest of countries that do not belong to Latin America in how virtual education performs in the region, taking into account that since 2020 this educational model was implemented to continue with the pedagogical processes due to the pandemic declared as a result of COVID 19, so it is necessary to determine the strengths and weaknesses that are generated in the application of this new model. In second place is Brazil with 27 documents, some of which are co-authored with Colombia, Spain and Peru, carrying out comparative studies to determine how these models are used in each country depending on specific factors specific to the territory. Among these documents is the title "Teacher training for emergency distance education in 2020: the experience of the School of Medicine of Ribeirão Preto of the University of São Paulo (FMRP-USP)" (Carmona & Bollela,

2021). This document seeks to answer the question: how to use the resources of distance education based on little or no previous experience? Taking into account that there were no technical skills necessary to carry out the activities in a remote way and having difficulties in the evaluation of students, the Teacher Training Center for Teaching (CDDE) of the FMRP-USP evaluates the needs of teachers and proposes a training focused on good teaching practices for teaching and evaluation of students. Therefore, courses were offered from the most basic technical skills to the most advanced ones, such as the use of augmented reality, and 3D technology, among others.

4.4 Distribution of scientific production by area of knowledge

Figure 5 shows how the production of scientific publications is distributed according to the area of knowledge through which the different research methodologies are executed.
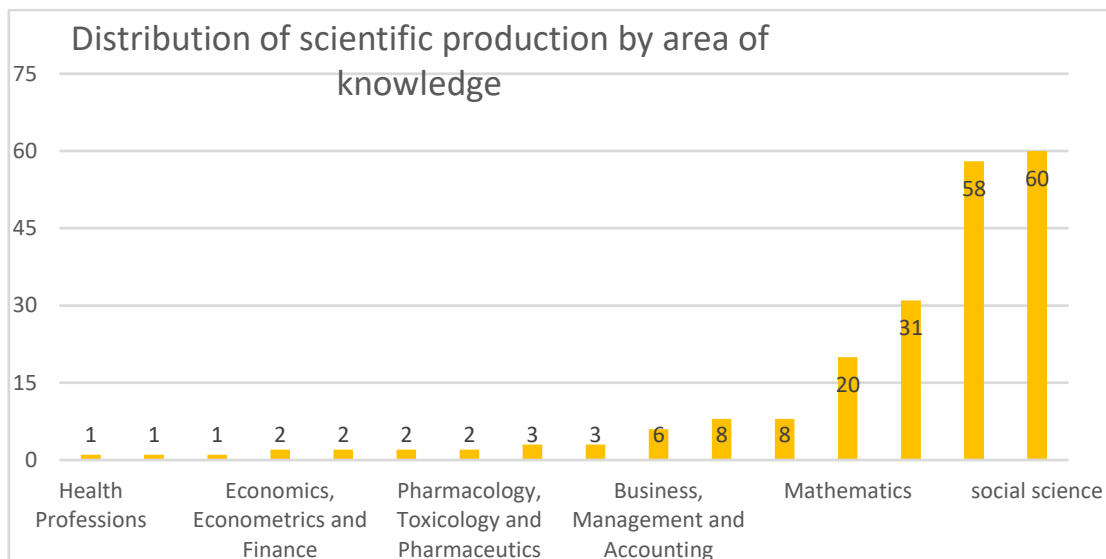
Figure 5. Distribution of scientific production by area of knowledge.
Source: Own elaboration (2022); based on data provided by Scopus.

Social sciences are the area of knowledge with the largest number of contributions through the theories that are framed in it, in the search for new knowledge about the Advantages and Disadvantages of virtual Education in Latin America presenting 60 documents, within which is "Virtual and real experiments: A proposal for teaching electricity in high school" (dos Santos & Dickman, 2019). This document compiles information on the development and implementation of a guide of activities for teachers of Secondary Education consisting of strategies for teaching topics in electricity using real and virtual laboratories using 4 strategies with a different approach where it was found that the experimental approach has a significant advantage over the lectures so it should be taken as a transcendent component in virtual education with the uses of tools and platforms that promote its development.

In second place is computer science, with 58 documents, among which is "The inverted classroom or flipped classroom: Didactic intervention in an emergency virtual education" (Andrés & Mendoza, 2021). This document presents an experience of didactic intervention, which was implemented to face what the new virtual scenario, caused by the health emergency, imposes on the continuity of the educational process. So, this strategy was applied in the civil law class in the period 2020-2 and at the end of the course satisfaction surveys were conducted on students in the application of this educational methodology mediated by ICT.

4.5 Distribution of scientific production by author.

Figure 6 shows how the production of scientific publications is distributed according to the publications of the authors with the highest number of registered documents.
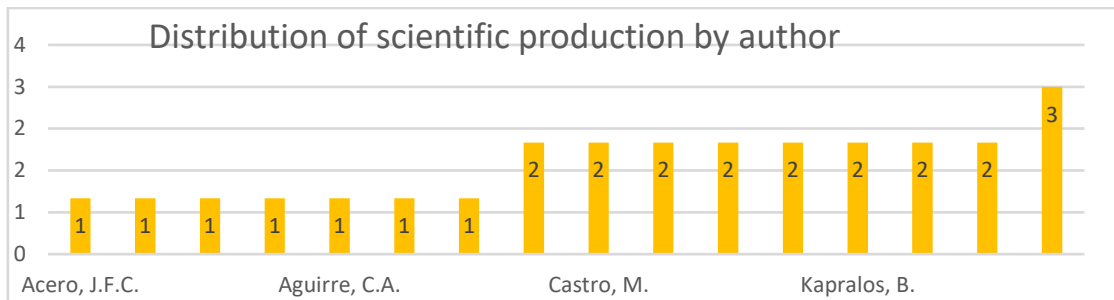
**Figure 6.** Distribution of scientific production by author.
Source: Own elaboration (2022); based on data provided by Scopus.

The author with the greatest contribution to research to the variables under study during the period 2016-2021 is Morales-Menendez, Rubén with 3 documents, within which is the title "Technologies for the future of learning: State of the art" (Hernandez-de-Menendez et al., 2020). This document presents publications that talk about the current state of technologies that are transforming engineering education, specifically, virtual and augmented reality, 3D printing, drones, the Internet of things, robots, artificial intelligence, holograms, wearable devices, virtual laboratories and blockchain since as future professionals, they must acquire the necessary competencies for the working world since these skills will be demanded in the labor forces of the future. Therefore, a guide is provided on the use of this technology in the training of professional engineers to develop technical skills that facilitate the teaching and learning processes.

In second place are Alves, G.R., Castro, M., Contreras Bravo, L.E., De Domenico, E.B.L., García-Peñalvo, F.J., Kapralos, B., Lima, N. and Tarazona Bermudez, G.M. with 2 papers each, within the papers of Alves, Gustavo R. This document compiles the contribution of a group of experts in the VISIR (Virtual Instrument Systems in Reality) remote laboratory, on recent advances, initiatives, federation, limitations and future, carrying out a SWOT analysis that managed to determine the need for new technical developments that take advantage of collaborative work from a feedback system that allows the use of VISIR in other emerging countries.

4.6 Type of publication
Figure 7 shows how the bibliographic production is distributed according to the type of publication chosen by the authors.

Type of publication

Review
5%

Book Chapter
2%

Survey
1%

Article
53%

Conference Paper
39%
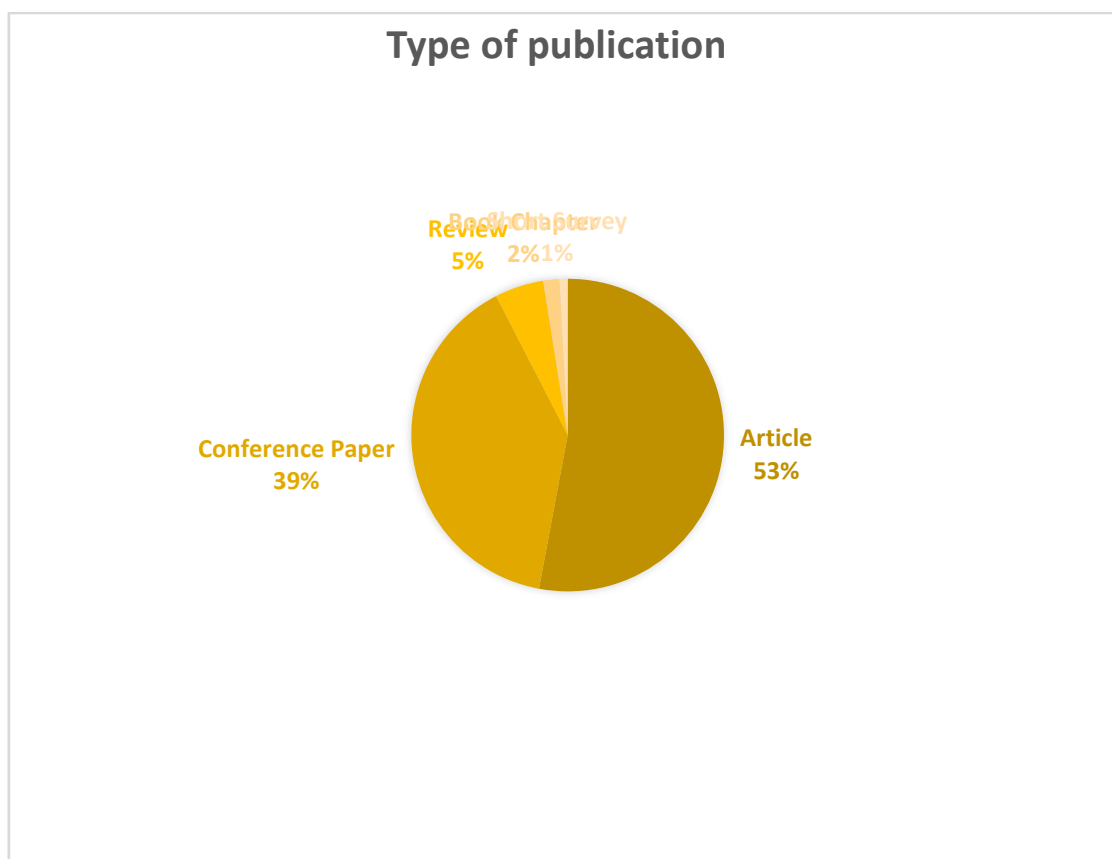
Figure 7. Type of publication
Source: Own elaboration (2022); based on data provided by Scopus.

As shown in Figure 7, within the different types of publications, 53% of the total number of documents identified through Phase 1 of the Methodological Design, correspond to Journal Articles, among which is the one entitled "Hybrid learning generated from Higher Education Institutions in Mexico" (De Jesús, Jorge, & Nisan, 2021), which analyzes the hybrid learning developed by the Autonomous University of Tamaulipas-Mexico with students of Bachelor's Degree in Communication Sciences in the year 2020, All this taking into account that this model was applied after being in a 100% virtual education, so that despite the mandatory virtual classes, students maintain their grades and take advantage of the technologies thanks to the digital skills with which the educational actors had despite the short time of adaptation of this educational model due to the health emergency.

In second place are the conference proceedings which represent 39% of the documents registered in this study. Within

these documents is the paper entitled "Work in Progress: Inverted classroom as a pedagogical model in virtual education in networked courses with Moodle Learning Management System versus COVID 19" (Vilchez-Sandoval et al., 2021). This document has as its main objective to identify good practices that help to enhance the advantages of distance learning taking into account that this model is the future of the educational system at the international level. Therefore, the inverted classroom strategy with the Moodle Learning Management System platform was used as an alternative for the virtual teaching of the communication networks course, allowing to identify the shortcomings in the virtual model concerning the traditional model and to implement improvements in these platforms.

5. Conclusions
Thanks to the bibliometric analysis proposed in this research, it can be determined that Mexico is the Latin American country with the largest number of bibliographic records

in the Scopus database during the period between 2016 and 2021 with a total of 32 documents. The scientific production related to the study of Virtual Education advantages and disadvantages for Latin America, has presented an important growth during the period previously indicated, going from 13 publications in 2016 to 32 units in 2021, that is, it was possible to increase the creation of bibliographic records in a period of 5 years, which indicates the importance that virtual education currently represents at all educational levels, being the alternative used to continue with the teaching and learning processes during the pandemic since the beginning of 2020, identifying the strengths and difficulties in its application.

The educational system in recent decades has made a series of innovations that allow it to be in line with social evolution, which has had a technological transformation in most of its processes, changing the way to interact and facilitate everyday tasks. Virtual education is that mediated by information and communication technologies allowing access from anywhere at any time, having certain advantages in its application such as accessibility and flexibility, in addition to the development of new skills requested by the labor market, being this modality the future of the education system. Even so, in Latin America, there are certain difficulties such as digital gaps, being a region characterized by inequality in its public policies, and lack of connectivity in certain populations that prevent students from accessing this service because they do not have internet connection or the necessary digital tools to enter an educational or videoconferencing platform, concentration problems as it is a new environment where there is no difference between study time and family time, which also affects socialization among peers. All of the above allows this article to conclude, highlighting the importance of knowing the theory or bibliographic resources that seek to awaken the interest of educational actors to know about the advantages and disadvantages of implementing this model being the future of education to be in line with the industry 4.0 and technological innovation. That is why the need for studies such as the one presented in this document is highlighted, which make a tour of those texts that address the aforementioned topic, to give the reader a broad view of the current situation of the literature on virtual education advantages and disadvantages for Latin America.

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