



## INNOVATIVE EDUCATIONAL SCENARIOS AND THEIR IMPACT ON STUDENTS: INVERTED CLASSROOM AS A DIDACTIC STRATEGY

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### Abstract

A bibliometric review was carried out on the production and publication of research papers related to the study of the variable Development of the inverted classroom strategy in Latin America. The purpose of the analysis proposed in this paper is to know the main characteristics of the volume of publications registered in Scopus database during the period 2017-2021 in Latin American countries, achieving the identification of 45 publications. The information provided by said platform was organized by means of 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 by means of a qualitative analysis. Among the main findings of this research, it is found that Colombia, with 26 publications, was the Latin American country with the highest production. The area of knowledge that made the greatest contribution to the construction of bibliographic material referring to the study of the development of the inverted classroom strategy was Social Sciences with 25 published documents, and the type of publication that was most used during the above-mentioned period was the journal article, which represented 69% of the total scientific production.

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## **1. Introduction**

The inverted classroom is an educational strategy that has been implemented in Latin America in recent years in order to improve the quality of education provided, which means the transfer of responsibilities to students making them participants in the formation of their knowledge allowing them to investigate in independent hours and enter the classroom with prior knowledge on a topic, to leave space for reasoning and discussing the information found. This strategy helps to make the classes not so cathedraic, but to turn them into a space for discussion that allows better assimilation of knowledge, allowing teachers to become a guide and not the only reference of knowledge, so that students having access to more information from different sources can build new concepts that they can assimilate more easily. With the use of the inverted classroom, students focus more on the discussion of a topic, since theoretical research is done beforehand, so it is also important for teachers to monitor what the students have researched.

This methodology helps the student to assume a more active role in the classroom. the Inverted Classroom model establishes an organization and planning between the activities to be performed outside the classroom, i.e., the research of the topic and inside the classroom the active participation of the student in debates (Fidalgo-Blanco et al., 2020) in order to reach a common concept free of half-truths, always having the support from the teacher in this process, but without being the main actor of this strategy.

It has been demonstrated that the flipped classroom improves the comprehension and retention of the subjects taught, which leads to an improvement in performance and a reduction in the failure rate, helping to develop competencies and increase student satisfaction by fully understanding a subject and obtaining feedback on points that may be perceived as erroneous, and for the teacher by being able to teach students based on the comprehension of concepts. Therefore, it is important to know in terms of bibliographic resources, the current state of research on the development of the flipped classroom strategy and the perception of students about this model, so a bibliometric analysis of the scientific production registered in Scopus database during the period 2017-2021 is proposed to answer the question: How has been the production and publication of research papers related to the study of the variable development of the flipped classroom strategy and how it is perceived by students in Latin America during the period 2017-2021?

## **2. General Objective**

To analyze from a bibliometric and bibliographic perspective, the production of high impact research papers on the variable Development of the flipped classroom strategy in Latin American institutions during the period 2017-2021.

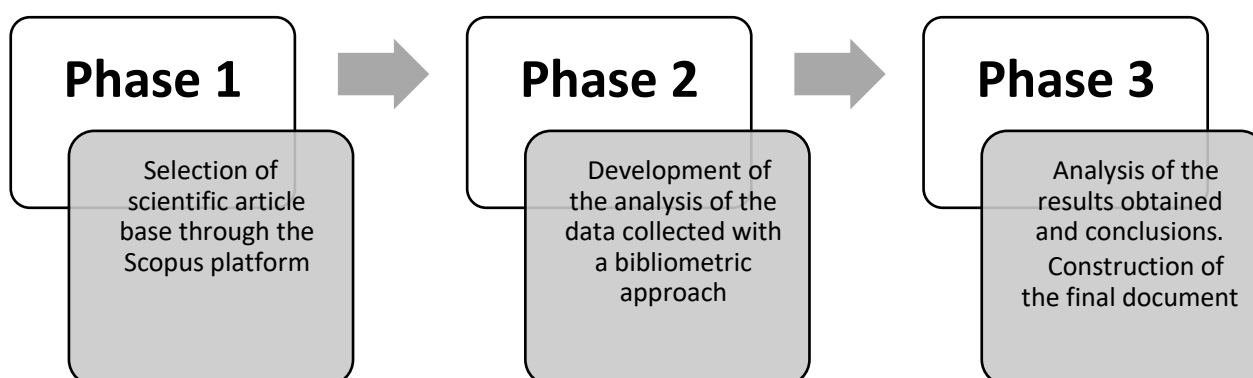
### 3. Methodology

Quantitative analysis of the information provided by Scopus is performed under a bibliometric approach on the scientific production regarding the development of the inverted classroom strategy. 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 search is performed through the tool provided by Scopus and the parameters referenced in Table 1 are established.

#### 3.1 Methodological design

Figure 1. Methodological design.



Source: Own elaboration (2022)

The present research was developed through the completion of the three phases listed in Figure 1.

##### 3.1.1 Phase 1: Database selection

The first phase consists of the selection of articles or research papers that will be part of the analysis that will help to solve the research question and fulfill the objective. The search filters for the selection of the material to be analyzed are the following.

- ✓ Research papers (articles, conference papers, books, book chapters, among others) whose variable of study is Inverted Classroom, Education, Students.
- ✓ Research papers published within the period 2016-2021.
- ✓ Research papers published in Latin American countries.

The application of Phase 1 resulted in a total of 45 documents that will be classified for further analysis as indicated in Phase 2.

### **3.1.2 Phase 2: Bibliometric analysis**

Once the 45 articles resulting from the application of phase 1 were identified, they were classified using the *Analyze Search Results* tool offered by Scopus as part of its mechanisms for analyzing information. This classification consists of analyzing the information from different study groups, for example, authors, country of origin of the publication, year of publication and area of knowledge to which the research work belongs.

Once the information is organized by means of figures and/or tables, the study proceeds to its analysis from the bibliometric approach, which would also allow to analyze through examples, citing some articles, the position of the authors regarding quality management in the educational sector.

### **3.1.3 Phase 3: Conclusions and construction of the final document**

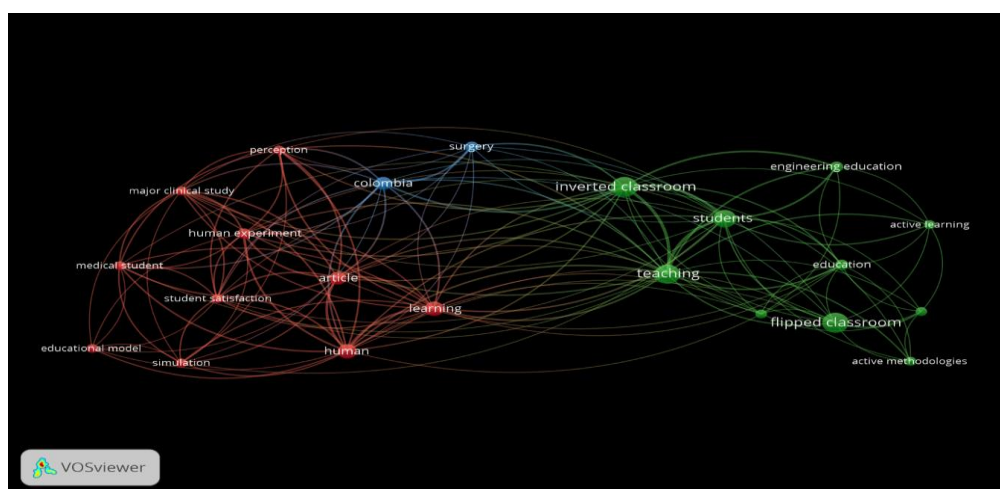
After classifying the information as indicated in phase 2, the study proceeds to the analysis of the results from a bibliographic approach for the construction of the conclusions through the discussion of results, ending this research with the writing of the final document.

## **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.** *Word co-occurrence*



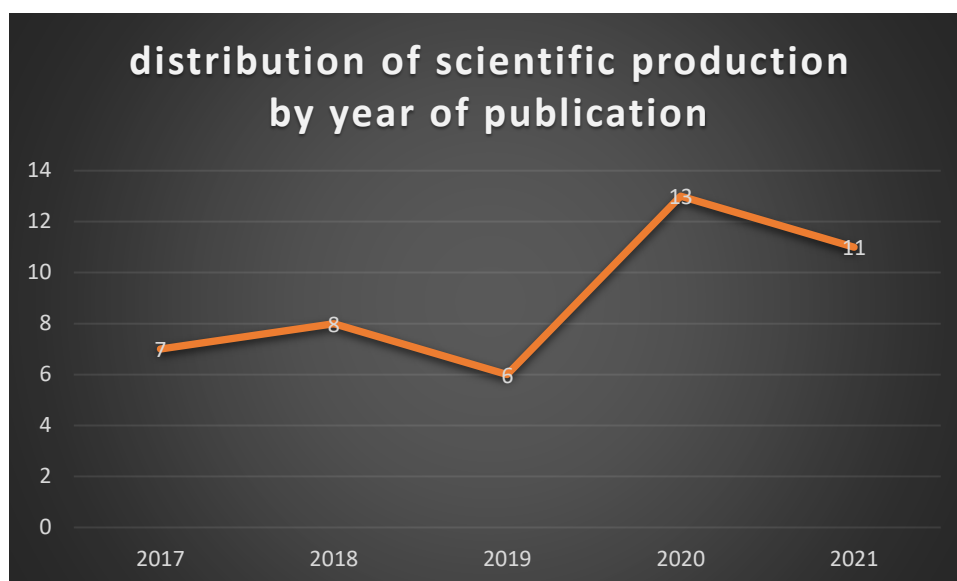
**Source:** Own elaboration (2022); based on data provided by Scopus.

As shown in Figure 1, the key word most used in the research related to the variables under study is inverted classroom, which is the educational model designed with the purpose of involving students in the construction of their knowledge, allowing them the autonomy to select the knowledge that seems most relevant and beneficial for their development. Secondly, teaching, students and education provide references to the target group of this study, since the analysis of the scientific literature work on how students perceive the use of this educational model in their pedagogical processes. Active methodologies and learning give light to the new educational innovations as the inverted classroom is a way to optimize and improve the educational quality allowing students to take a more active role in the apprehension of knowledge, turning the teacher into a guide and not the source of knowledge, which helps students to develop a critical stance towards the information to which they are exposed, thus assimilating the relevant knowledge for their training according to the social context in which they develop.

#### 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 the period from 2017 to 2021.

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



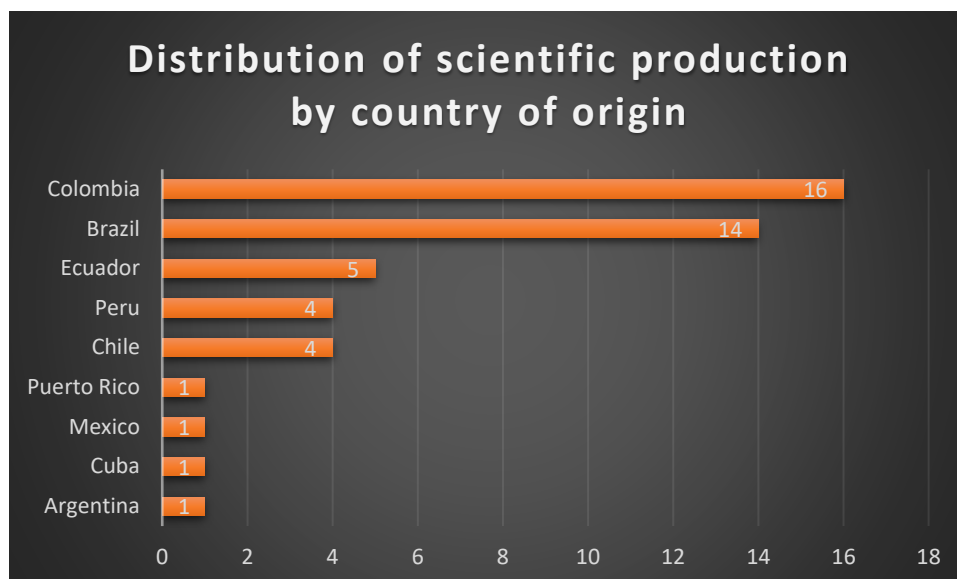
**Source:** Own elaboration (2022); based on data provided by Scopus.

2020 is the country with the highest number of publications related to the variables under study with 13 documents, within which is “*Legal education and innovation: The inverted classroom as a viable methodology*” (Sanchez et al., 2020). This document presents a literature review for studying the possibilities of innovation in the teaching-learning process in the career of Law, specifically through the method called *inverted classroom*, which seeks to reformulate the pedagogical projects in universities in order to improve the educational quality of higher education. Therefore, it was concluded that these new models can make learning more attractive, favoring the ability to understand the content and bringing benefits to those involved in these pedagogical processes accompanied by the teacher's feedback, as a guide and not the only way to obtain knowledge.

In second place is 2021, which has 11 documents registered in Scopus within which is “*Inverted classroom in a virtual platform for the development of competencies. Case study: Applied research course*” (Hidalgo et al., 2021). This document has as its main objective to apply the Inverted Classroom model through a Moodle virtual platform for the development of research competencies so 46 participants graduated from the professional career of Communication Sciences were analyzed in order to determine the efficiency of the application of this model. The results show significant differences in the average grades of the students, obtained before and after using the Inverted Classroom model, where better results are obtained in the competencies referred to the elaboration of the theoretical framework and approach of the study.

#### 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.

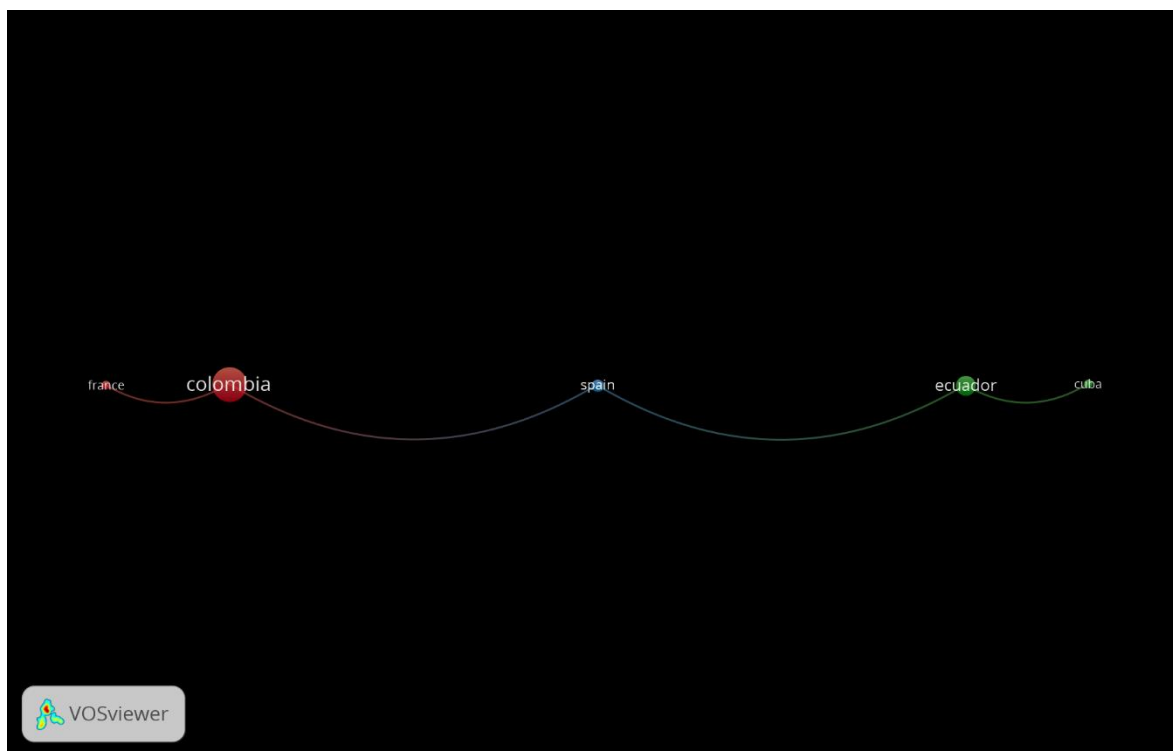
**Figure 3.** *Distribution of scientific production by country of origin.*

**Source:** Own elaboration (2022); based on data provided by Scopus.

Colombia is the Latin American country with the greatest contribution in publications related to the development of the inverted classroom and how students perceive it, with 16 documents registered in Scopus. Like the one entitled “*Learning to learn in the Extended Inverted Classroom: an evaluation on the effects of interactive teaching on knowledge and cognitive regulation of medical students*” (Domínguez et al., 2021). This document has as main objective to analyze students' perceptions on knowledge and cognitive regulation during a surgical course using inverted classroom. In this study 158 students were analyzed before and after implementing the extended classroom, which showed that it has positive effects on students' abilities to know their own learning and to use skills. Therefore, it is concluded that the Inverted Classroom has positive effects on Meta cognitive skills for students and the need for further research on this topic is raised.

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 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 work from different countries.

**Figure 4.** *Co-citations between countries.*



**Source:** Own elaboration (2022); based on data provided by Scopus}

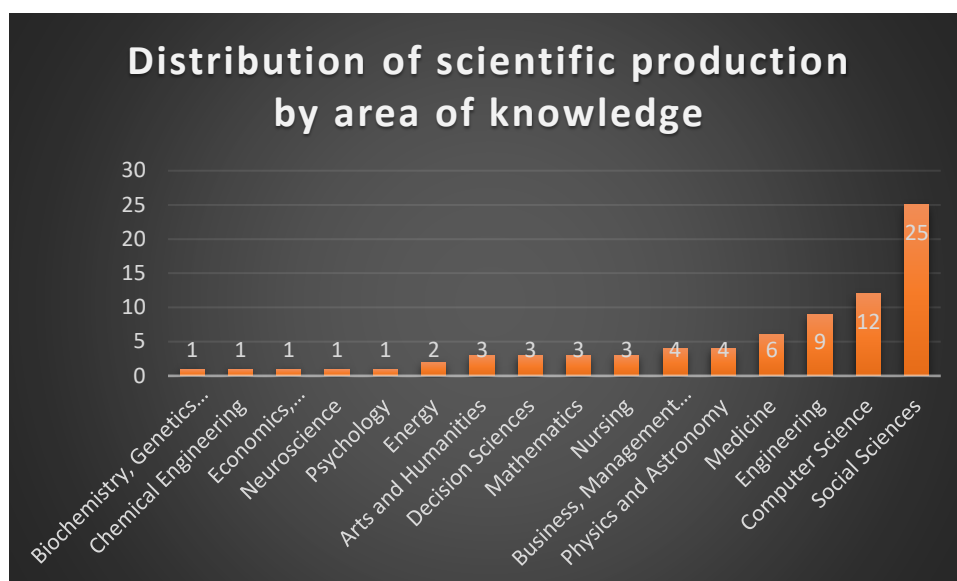
As mentioned above, Colombia is the Latin American country with the largest number of publications related to the variables under study, having papers in collaboration with authors from France and Spain, which demonstrates the importance of research on how the flipped classroom model is developed in Latin America. In second place is Brazil which has 14 publications registered in Scopus. Within these documents is “*Blended learning: a study of learning experiences in an inverted classroom model*” (De Almeida et al., 2020). This document analyzes the hybrid teaching model used by UNA, IES of the Ânima Group, in the discipline of Entrepreneurship, in two classes from the perspective of a learning experience, on the online platform. It is conducted in 2020 where the remote emergency model was implemented to continue with the classes and for which it was necessary the implementation of new educational strategies, one of those was the inverted classroom so it was concluded that these formative assessment methodologies help to improve student participation in the hybrid model of education.

#### 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.*





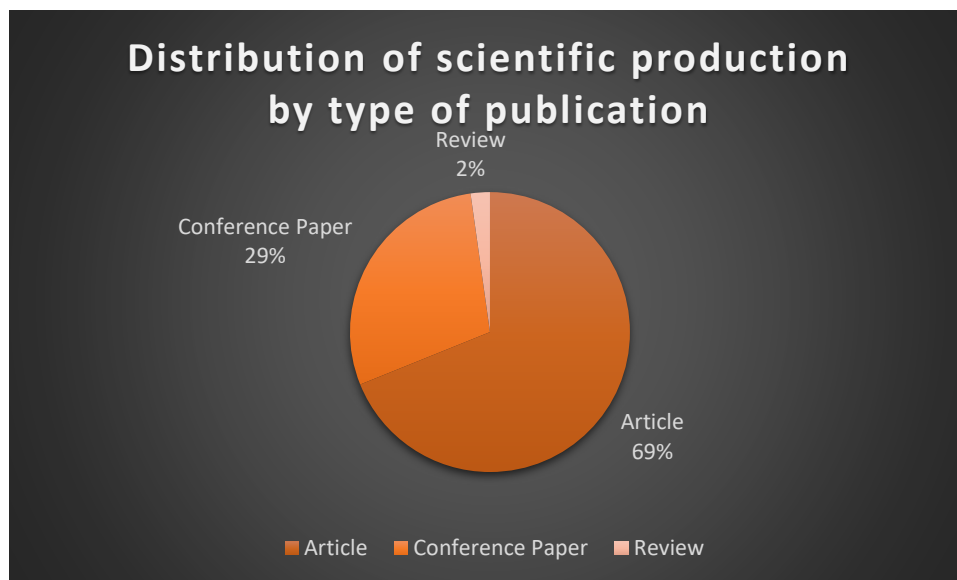
**Source:** Own elaboration (2022); based on data provided by Scopus.

Social Sciences is the area of knowledge with the largest number of contributions through the theories that are framed in it, in the search for new knowledge on the development of the Inverted Classroom strategy and the perception of students on this methodology with 25 documents within which is “*Considerations on inverted classroom and gamification in the area of social sciences*” (Ordoñez et al., 2021). This document aims to analyze the active methodologies conducive to the teaching of Social Sciences in General Basic Education using the inverted classroom and gamification as strategies. Therefore, a bibliographic review was carried out and it was concluded that these strategies mobilize cognitive structures towards the acquisition of new knowledge, incorporating it quickly and lastingly, which translates into long-lasting learning (Medina Romero et al, 2021).

In second place are the computer sciences where 12 documents were written following the guidelines of the topics related to that area. Within these publications is the document entitled “*Didactic intervention in an emergency virtual education*” (Andres & Mendoza, 2021). This document studies the application of the inverted classroom model or inverted classroom in the subject of Introduction to Civil Law, during the second semester of the year 2020. Taking into account the change of educational model from a traditional classroom to an emergency remote one by means of ICT, it was necessary to implement new strategies that motivated students to be an active part of the class, and for this reason, this strategy was implemented and finally a satisfaction survey was conducted to students in order to know the effectiveness of this project.

#### 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 (2022); based on data provided by Scopus.

As shown in Figure 6, within the different types of publications, 69% of the total number of documents identified through Phase 1 of the Methodological Design, correspond to Journal Articles, among which is the one entitled “*Perception of students on the implementation of the inverted classroom model in the practice component in critical care*” (Rodríguez et al., 2020). This document aims to know the perceptions of students on the implementation of the inverted classroom model in the nursing practice component in critical care, so a study was conducted with 70 nursing students in their practices, which resulted that the inverted classroom as an educational strategy allowed students to focus on gaps in specific knowledge competencies for patient care in the context of critical care and to develop human skills and competencies.

In second place are the conference proceedings which represent 29% of the total number of documents identified in this study, within these documents we can find “*Inverted classroom: A systematic review of the literature*” (Albornoz-Acosta et al., 2020). This document analyzes the implementation of the inverted classroom in the education of working students and non-working students, so as a population to which the research is directed were undergraduate students selecting 176 first year mining engineering students and metallurgical engineering students, through this study it was possible to determine that the inverted classroom represents improvements in academic performance of both non-working students and working students.

## 5. Conclusions

Thanks to the bibliometric analysis proposed in this research, it can be determined that Colombia is the Latin American country with the highest number of bibliographic records in Scopus database during the period between 2017 and 2022 with a total of 16 documents. The scientific production related to the study of the development of the inverted classroom strategy, has presented an important growth during the previously mentioned period, going from 7 publications in 2017 to 11 units in 2021 having the highest number of publications in 2020 with 13 documents, i.e., it was possible to increase the creation of bibliographic records in a period of 4 years and it is considered necessary more creation of scientific literature related to this topic, which indicates the importance the new educational strategies represent for the innovation of the educational model seeking that more and more the student is involved in the learning processes helping him/her to develop skills in less time.

The inverted classroom is a pedagogical strategy that allows the student to adopt an active role in the construction of knowledge, so that the theoretical part of learning is done by the students, which allows them to arrive at the classroom trained to discuss the topic and determine the usefulness of that knowledge in their training. This strategy proposes the teacher as a mediator or guide and not as a source of knowledge, being the student responsible for the construction of his own knowledge. This methodology is very helpful because starting from the point where the student has already investigated the given topic, in the classroom, the formative evaluation can be taken since it is a space for solving problems and doubts in order to fully understand a topic. All of the above allows this article to conclude, highlighting the importance of analyzing the new educational strategies implemented in order to achieve better efficiency in the pedagogical processes and therefore better results. It is for this reason that the need for studies such as the one presented in this document is highlighted, which present a tour of those texts that address the aforementioned topic, in order to give the reader a broad view of the current situation of the literature on the development of the flipped classroom strategy and the perception of students in Latin America.

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