

Formative research in Latin American higher education: Curriculum and scientific production

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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 variable Formative research in Latin American higher education. The purpose of the bibliometric analysis proposed in this document is to know the main characteristics of the volume of publications registered in Scopus database during the period 2015-2020 in Latin American countries, achieving the identification of 81 publications. The information provided by this 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 are described, a qualitative analysis of the position of different authors on the proposed topic is referred to. Among the main findings of this research, it is found that Brazil, with 35 publications, is 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 formative research in Latin American higher education was social sciences with 57 published documents, and the type of publication that was most used during the period mentioned above was the journal article, which represents 78% of the total scientific production.

Keywords: Formative Research, Higher Education.

I. INTRODUCTION

Formative research is the set of curricular and institutional management processes developed by the university to guarantee the achievement of research competencies, which will be part of the competencies that the university graduate will need to face the demands of the labor market and the academic community (Restrepo, 2003). Thus, formative research helps both to strengthen research skills in quality professional education and to provide tools and improve the graduate's curriculum, thus helping

him/her to play an active role in social transformation in the exercise of the knowledge learned in the academy.

Formative research is of great importance both in the adoption of knowledge and in the application of this knowledge depending on the social context and the difficulties they present, so it is presented as an excellent alternative to promote research culture in higher education students by turning it into an experimental process and not purely of scientific production that in most cases causes some rejection in the

student community by using rigid methodologies for its exercise.

In many Latin American universities, formative research has been adopted as a mechanism to impart knowledge in scientific research and apply it to problems related to the career they are studying for the construction of knowledge and for them to be critical of the information they are offered. Therefore, it is important to know in terms of bibliographic resources, the current state of research related to Formative research in Latin American higher education, so a bibliometric analysis of the scientific production registered in Scopus database during the period 2015-2020 is proposed to answer the question: How has been the production and publication of research papers related to the study of the variable Formative research in Latin American higher education during the period 2015-2020?

2. General Objective

To analyze from a bibliometric and bibliographic perspective, the production of high impact research papers on the variable Management Accounting for Decision Making in Latin American organizations during the period 2015-2020.

3. Methodology

Quantitative analysis of the information provided by Scopus under a bibliometric approach on the scientific production related to formative research in Latin American higher education is carried out. Also, from a qualitative perspective, examples of some research works 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 using the tool provided by Scopus and the parameters listed in Table 1 are established.

3.1 Methodological design

Table 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 81 publications were identified.	Published papers whose study variables are related to formative research in Latin American higher education. Research papers published during the period 2015-2020. 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 made by means of graphs, figures and tables based on data provided by	Word Co-occurrence. Year of publication Country of origin of the publication. Area of knowledge. Type of publication

		Scopus.	
PHASE 3	DRAFTING OF CONCLUSIONS AND FINAL DOCUMENT	After the analysis carried out in the previous phase, the conclusions are drawn up and the final document is prepared.	

Source: Own elaboration (2021)

4. Results

4.1 Co-occurrence of words

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

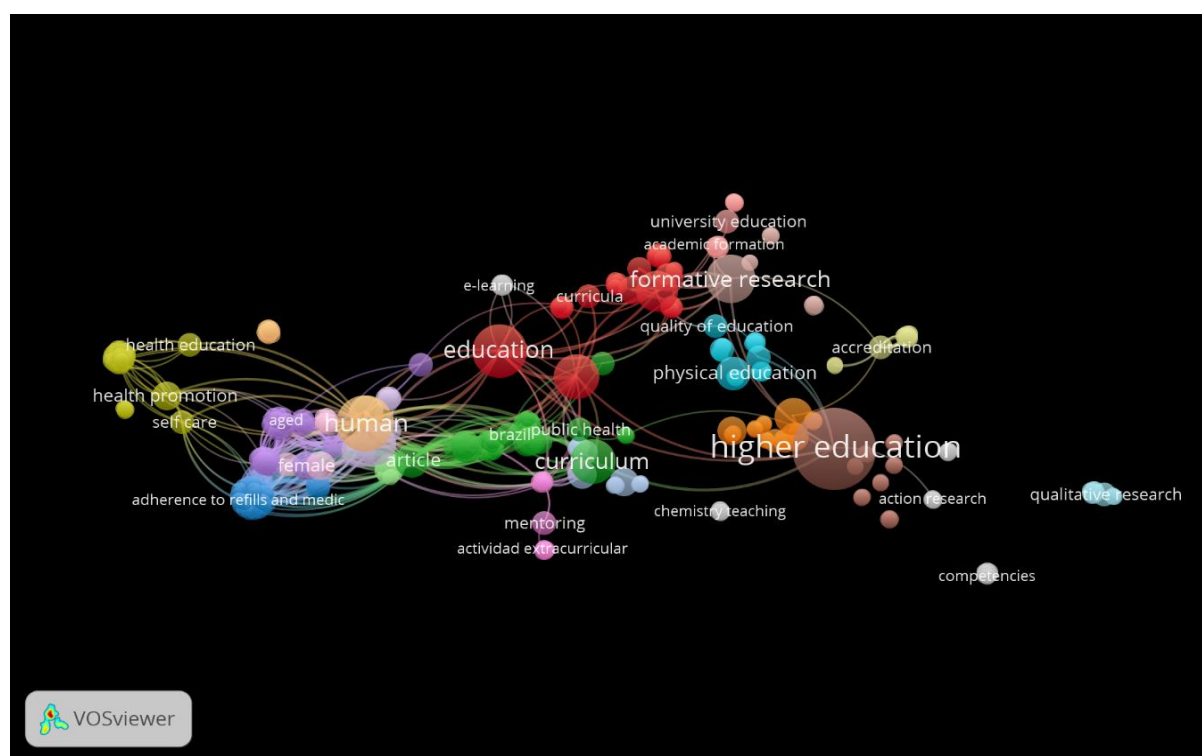


Figure 1. Co-occurrence of words

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

As shown in Figure 1, the most used keyword is higher education, which is directly related to the variables under study by referring to university education and quality in academic training, related to other keywords such as teaching, quality in research, accreditation and academic achievements, which are results of

the implementation of formative research, the second most used keyword, in professional learning, providing skills to solve problems that arise in society depending on its context, giving the student a permanent training applied to their reality and the needs that arise from this. Formative research is related to other keywords

such as research skills, mentoring, extracurricular activity, active learning, exploratory research and argued reality, which refer to how formative research is encouraged in higher education institutions, generally taught in groups that do not belong to the curriculum and that provide students with the tools to identify social problems and how the information learned is applied to solve them, generating critical professionals who incorporate research as a tool to develop their being in society and give an application to the knowledge learned in the academy.

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 2015 to 2020.

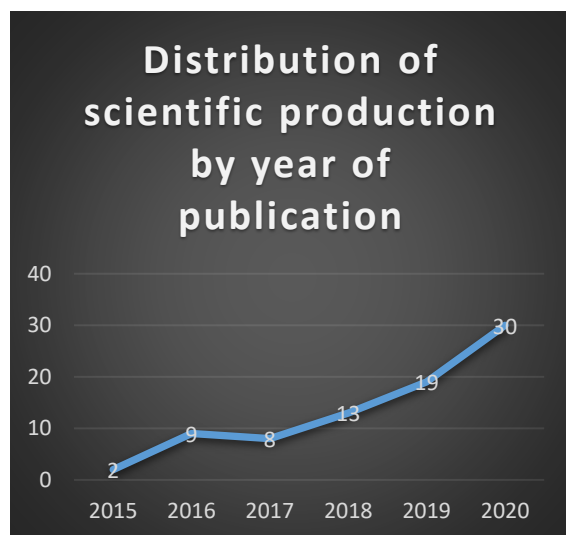


Figure 2. *Distribution of scientific production by year of publication.*

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

As shown in Figure 2, 2020 was the year that recorded the highest number of publications in the period under study related to Formative research in Latin American higher education with a total of 30 documents within which is "Formative research as a pedagogical strategy: Case study industrial engineering of the I. U Pascual Bravo" (Arenas et al., 2020). This

article presents the characterization of the process of formative research in the industrial engineering program of the I. U Pascual Bravo, and proposes formative research as an improvement in academic processes by increasing meaningful learning and promoting research culture, thus helping reduce the separation between the academy and society and avoiding the implementation of transmissionist methodologies and accumulation of data without application to social problems.

The second year with the highest number of publications is 2019 with a total of 19, within which is "Characterization of formative research projects of virtual programs of the Politécnico Gran colombiano" (Cortés et al., 2019). The main objective of this study is to identify relevant methodological and contextual aspects of the scientific initiation projects in the virtual programs in journalism and communication offered by the Politécnico Gran colombiano. This study showed as a result that 52% of the research is in collaboration with students from different regions thus being able to identify social micro problems providing them with a vision of a macro problem, so it concludes the continuous analysis of tutors that help the development of communicative skills in research.

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.

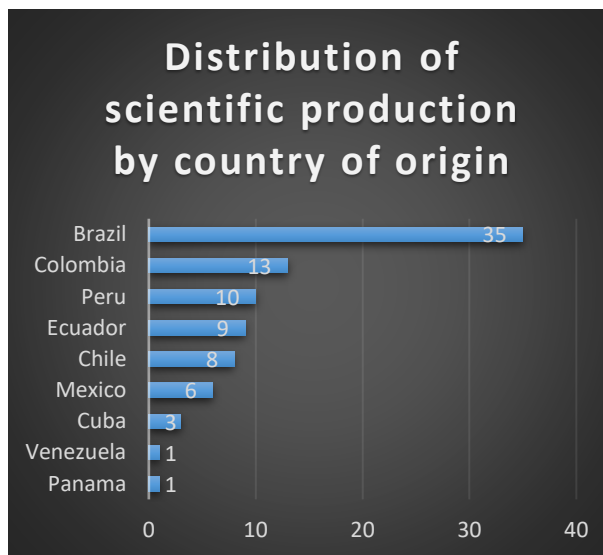


Figure 3. *Distribution of scientific production by country of origin.*

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

The Latin American country with the highest number of publications registered in the period 2015-2020 is Brazil with a total of 35 documents, followed by Colombia with 13 publications related to the variables under study within which is "Formative research: Elements and proposal for a didactic from the classroom; beyond a trend" (Flórez et al., 2018). In this research, they present a didactic proposal called

Dicriarte, a didactic focused on the application of its formative research in the classroom in order to create an environment with participatory awareness and transcendence for the student. It highlights that the university, as an active entity in higher education, has the great responsibility to make these people useful to society and their environment, beyond conceiving a finished product, but closer to a Subject with human and integral formation, protagonist of the processes of development and social transformation, so implementing formative research helps to provide students with research skills.

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.

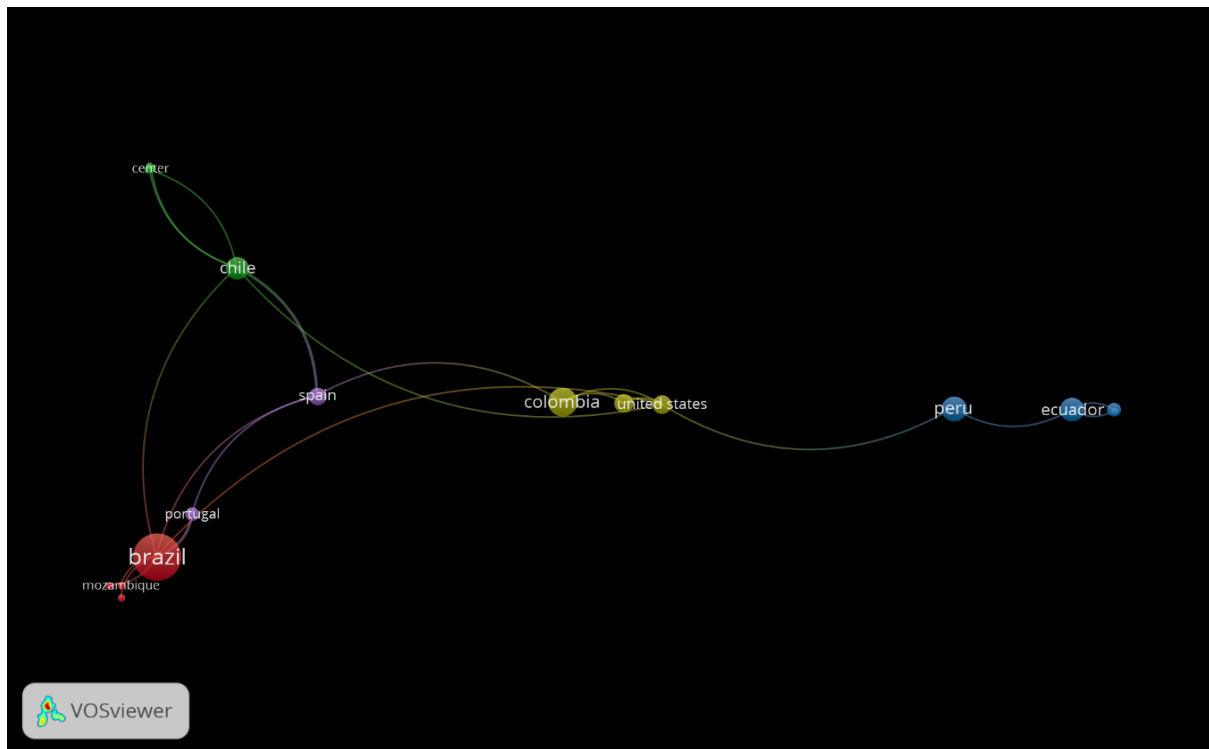


Figure 4. *Country of origin of the publications.*

Source: Own elaboration

In Figure 4, and as mentioned above, Brazil is the country with the highest number of publications with authors affiliated to institutions mainly from Mozambique, the United Kingdom and Portugal, which shows that not only Latin American authors participate in the study of the proposed variables; Colombia is in second place with co-authorship with the United States and Spain. Peru is in third place with 10 publications registered in Scopus about formative research in Latin American higher education in collaboration mainly with the United States and Cuba, among which is identified "Perception of nursing students about formative research in undergraduate" (Rivas-Díaz et al., 2020). The main objective of this study is to identify the perception of nursing students about formative research in the career, having formative research as a transversal axis of nursing curricula, its importance lies in the need to form research and knowledge construction seedbeds since in today's society, the quality of higher education is directly related to the practice of research. Therefore, this study concludes that although there is a favorable

perception of forve research in nursing students, new teaching strategies should be established to improve its implementation as a fundamental part of the teaching-learning process.

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.

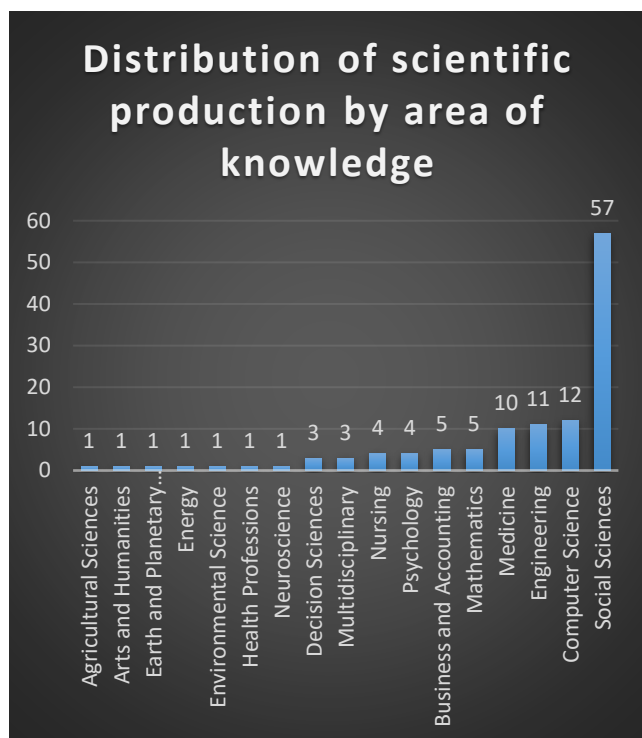


Figure 5. *Distribution of scientific production by country of origin.*

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

Social sciences is the area of knowledge with the greatest contribution to the variables under study with a total of 57 registered documents, among which is "Formative research in the development of reading and writing skills and its impact on the development of indexed publications by engineering students" (Rojas et al., 2020). This research proposes formative research as a proposal for the progressive development of research skills in undergraduate students. To this end, the undergraduate curriculum of the University of Sciences and Humanities (Lima, Peru) includes the formative research program, which is divided into three stages: basic, intermediate and advanced. In the basic stage, basic research skills such as curiosity, critical attitude, writing, argumentation and systematization of information are developed. In the intermediate stage, skills such as field work and demonstration are developed. The advanced stage works on the student's research skills developed in the second stage. The objective of these three stages is to generate high impact research projects, carried out by students in

their last semester, that maintain international research standards, being the product of these stages: indexed papers and theses.

In second place is computer science with 12 registered publications, followed by medicine and engineering with 12 and 11 publications respectively, mathematics and business with 5 publications each. In the business knowledge area is "Research policies in higher education: Imaginaries instituted in a public university in Norte de Santander, Colombia" (Vergara et al., 2018). This study has as its main objective to understand the institutional discourses on research present in educational policies in a Colombian public university, reaching the conclusion that formative research is a fundamental process for academic programs and the training of their students and how research is shaped as a priority for Colombian universities.

4.5 Type of publication

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

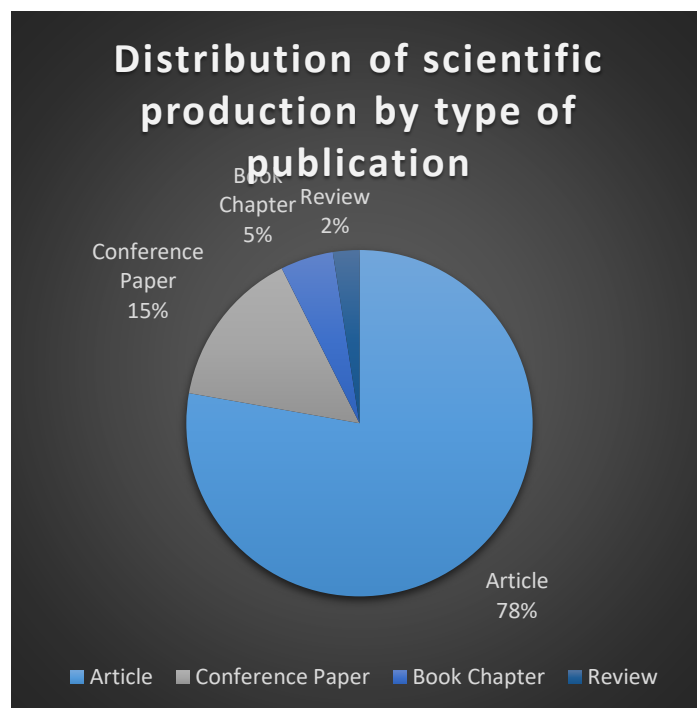


Figure 6. *Type of publication*

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

Within the different types of publications, 78% of the total number of documents identified through Phase 1 of the Methodological Design, correspond to Journal Articles, among which is the one entitled "Program " Classroom seedbeds" in the development of research skills of the students of Librarianship of the Universidad Nacional Mayor de San Marcos" (Alfaro-Mendives & Estrada-Cuzcano, 2019). This study determines the development of research skills as the tools that allow the university student to develop all the capabilities to generate knowledge and solve practical problems identified in the different disciplines. From a formative point of view, the research was carried out with 32 students, where it was possible to conclude that the application of the " Classroom seedbed program" had a significant effect on the development of the research skills of the students of the Librarianship career of the National University of San Marcos.

In second place are the conference proceedings with 15% of the registered publications related to Formative research in Latin American higher education within which is the paper entitled "On the impact of the insertion of international researchers in the research skills of local engineering faculty and students" (Llulluy-Nunez & Vilchez-Sandoval, 2020). This article shows the strategies taken at a university in the city of Lima to include professionals with research experience abroad who can add to the development of the research skills of local engineering faculty teachers and their students, thus bringing also a necessary improvement for obtaining their bachelor's degrees. This resulted in improvements in academic work, the incorporation of students of the last cycles in research projects in execution with competitive scholarships as well as their participation in international congresses, thus improving their employability and the graduate's curriculum. In third place is the book chapter with 5% and in fourth place are the reviews with 2% of the total number of publications.

5. Conclusions

Thanks to the bibliometric analysis proposed in this research, it can be determined that Brazil is the Latin American country with the largest number of bibliographic records in Scopus database during the period between 2015 and 2020 with a total of 35 documents. The scientific production related to the study of Formative Research in Latin American higher education, has presented a significant growth during the period previously indicated, going from 2 publications in 2015 to 30 units in 2020, showing an increasing trend since 2017 in the creation of bibliographic records in a period of 3 years, which indicates the importance that Formative Research in higher education in Latin America has in the learning of future professionals as an integrative tool of knowledge learned in the academy.

Formative research, in addition to providing quality higher education, fosters the habit of research as the main tool to put into practice the knowledge that was previously obtained through didactic and pedagogical methodologies, which is why most universities use research as a requirement to obtain a professional degree, since it shows that the knowledge was processed and adopted to the social context and how the professional performs in the solution of problems related to his or her career. All the above allows this article to conclude, highlighting the importance of knowing the theory or bibliographic resources that seek to determine the role of formative research in the adoption of research tools that help to obtain a quality higher education in Latin America for the graduation of professionals committed to social transformation through the exercise of the scientific method. That is why it is necessary to highlight the need for studies such as the one presented in this document, which make 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 formative research and its influence on the quality of Latin American higher education.

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