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Disruptive Methodologies for developing Critical Thinking and Financial Decision Making in Latin American university students

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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 Disruptive Methodologies focused on the development of Critical Thinking and Financial Decision Making in Latin American university students. The purpose of the bibliometric analysis proposed in this paper, 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 171 publications. The information provided by said platform was organized by means of tables and figures categorizing the information by Year of Publication, Country of Origin, Area of Knowledge and Type of Publication. Once these characteristics were described, a qualitative analysis was used to refer to the position of different authors on the proposed topic. Among the main findings of this research, it is found that Brazil, with 63 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 Disruptive Methodologies focused on the development of Critical Thinking and Financial Decision Making in Latin American university students was Social Sciences with 104 published documents, and the Type of Publication that was most used during the period indicated above was the Journal Article, representing 68% of the total scientific production.

Keywords: Disruptive Methodologies, Critical Thinking, Decision Making.

1. INTRODUCTION

T The academic scenario worldwide currently requires the training of students with critical thinking skills that support decision-making in any aspect of their lives, whether professional, social, family, among others. To this end, universities have developed disruptive methodologies that allow the consolidation of this quality or ability, however, in countries like Colombia there is still evidence of the use of traditional constructivist methodologies taken from the French model implemented centuries ago, which was a reference in education (Blanco & Ortiz, 2018), which consisted of repetition, memory and resolution of known problems, while for today, the ideal training is based on the resolution of unknown problems, which develops in the student the decision making based on critical thinking (Meller, 2018) supported by strategies such as

the use of Information and Communication Technologies (ICT) which have been incorporated in the different pedagogical strategies as a support tool for the teaching-learning process that allows certain autonomy in the student, confronting them with the development of activities designed by teachers where critical thinking is encouraged in everyday situations such as conflict resolution, mathematical problems, among others, which has yielded positive results in this purpose (Ojeda & Steffens, 2016).

The importance of critical thinking skills in decision making lies not only in the teaching-learning process, but also in the development of the professional life of the graduates, in relevant aspects such as labor and financial. In the latter, it is vital to recognize the autonomy that students have developed thanks to training based on the promotion of skills that allow them to take a clear and forceful position in the face of unknown situations, all through academic exercises and financial education programs, understood as a tool that can support the training processes in the different areas of knowledge, generating an impact on society (Avendaño, Rueda, & Velasco, 2021). However, studies show that in the university field, financial education is an area that requires further development and strengthening not only in Latin America but also in the United States and countries of the European Community (Garay, 2016). Therefore, "financial literacy" has become an institutional challenge not only for educational institutions but also for governmental actors. Therefore, the study of the bibliographic production regarding financial decision making, supported by the development of skills derived from critical thinking acquired in the university environment, represents an important aspect for the development of academic strategies that allow the creation of good financial habits in students from their formative process. For this reason, the objective of this research is to answer the question: How has been the production and publication of research papers on the study of disruptive methodologies focused on the development of critical thinking and financial decision making in Latin American university students 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 Disruptive Methodologies focused on the development of Critical Thinking and Financial Decision Making in Latin American university students during the period 2015-2020.

3. Methodology

Quantitative analysis of the information provided by Scopus is performed under a bibliometric approach on the scientific production regarding Disruptive Methodologies focused on the development of Critical Thinking and Financial Decision Making in university students in Latin America. Likewise, it is analyzed from a qualitative perspective, examples of some research works published in the area of study mentioned above, 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

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 171 publications were identified.	Published papers whose study variables are related to Disruptive Methodologies focused on the development of Critical

			Thinking and Financial Decision Making in university students in Latin America. 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 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, we proceed to the drafting of the conclusions and the preparation of the final document.	

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.

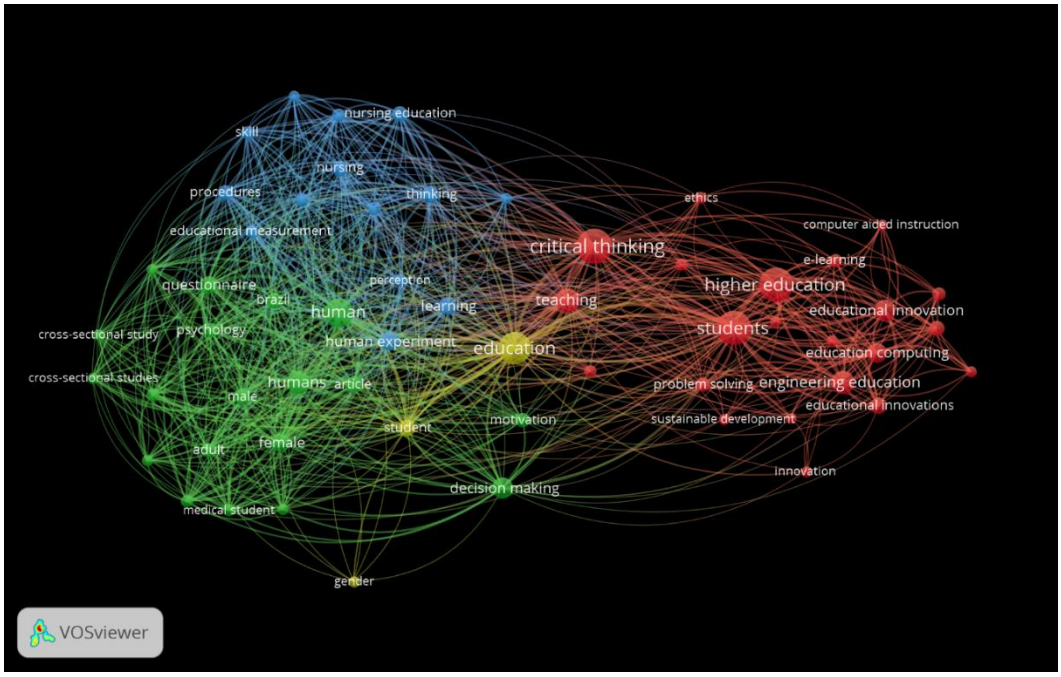

Figure 1. *Co-occurrence of words*

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

As a central axis in the studies identified through the execution of Phase 1 of the methodological design proposed for this research, the word Education is found, directly related to studies in Decision Making, Higher Education, Critical Thinking, Motivation, among others, which confirm the relevance of the material identified for the development of this article and the fulfillment of the objective set for it. Similarly, studies were identified that are based on the development of methodologies focused on the use of technological tools as a strategy for the promotion of critical thinking skills through activities that confront students with everyday situations. Words such as Online Learning, Innovation, Computer Education, are part of the key words that frame the above premise. Likewise, the studies identified through the search parameters in Scopus, allow observing how Decision Making was an important aspect in the execution of research projects, focusing such variable to studies in Psychology, Human Behavior, Consumer Behavior, Financial Education, being these last two, some of the main aspects to take into account when designing methodologies that support the development of critical thinking in financial decision making in Latin American university students.

4.2 Distribution of scientific production by year of publication.

Figure 2 shows how the scientific production is distributed according to the year of publication, taking into account that the period from 2015 to 2020 is taken.

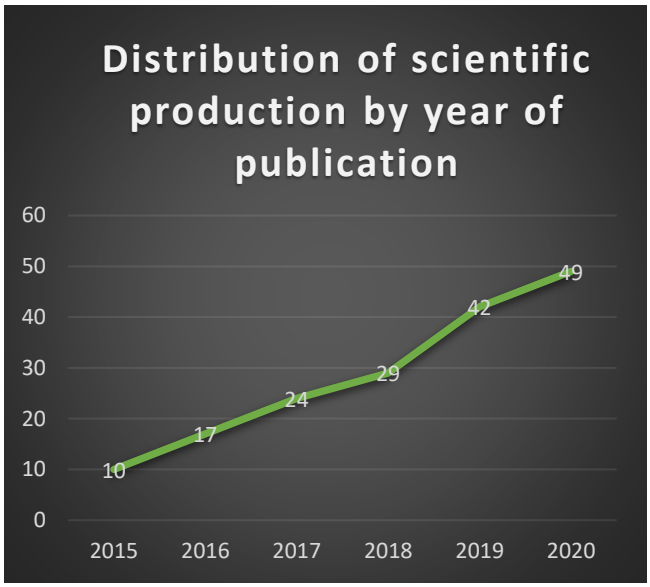

Figure 2. *Distribution of scientific production by year of publication.*

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

The production and publication of scientific articles referring to the study of Disruptive Methodologies for the development of skills based on Critical Thinking in Decision Making of Latin American university students, is characterized by a remarkable growth in its volume during the period analyzed. In 2015, a total of 10 documents were submitted to Scopus, and in 2020 a total of 49 publications were counted, among which the article entitled "Influence of the level of educational advancement and gender on financial decision making: an approach from prospect theory" stands out. (de Guevara, Paredones, Varas, & Mejía, 2020) whose objective was to study the influence of aspects such as educational level and gender on financial decision-making. To this end, the researchers analyzed data collected from 600 students of a Colombian university. The information was processed using: 1) the independence test 2; 2) the non-parametric Kruskal-Wallis test; and 3) the non-parametric Mann-Whitney test. Among the results obtained, it was determined that women have greater risk aversion and that the level of education does not influence financial decisions.

The second year with the highest number of records in Scopus was 2019, a period in which a total of 42 documents were published, among which is the article entitled "Theoretical and methodological proposal on the development of critical thinking through mathematical modeling in engineering education" (Gutiérrez & Gallegos, 2019). whose purpose was to develop disciplinary and transversal skills such as critical thinking, through didactic methodologies based on mathematical foundations. The article developed a proposal that allowed the updating of teaching models in the area of mathematics for engineering students, based on previous studies that in turn proposed an experimental model within the classroom that brought as a consequence for the student, the development of skills not only in the area of knowledge but in capacities such as critical thinking by exposing the student to solve mathematical problems that apply to everyday life, confronting the disciplinary knowledge with the human component that determines the decision making in specific situations.

For 2017, a total of 24 publications were registered within which the article entitled "Problem solving in financial mathematics for the treatment of financial education issues in high school" was found (Da Cunha & Laudares, 2017). which started from a thesis and took the objective of creating methodologies for financial education through problem solving by means of theoretical bases in mathematics applied to decision making in finance, involving socioeconomic aspects that would educate the student in financial decision making, so useful for their student and professional performance.

The above, framed in a set of innovative practical methodologies aimed at generating new knowledge based on current teaching models that seek to develop social skills in students, understanding that the human component should never be separated from academic training regardless of the area of knowledge in which such training is specialized. The study was carried out based on the information provided by students who developed five activities with financial-based problems and decision making, seeking to measure the capacity for critical thinking through financial calculations, confronting the students with situations of supposed investments or savings. The results obtained by this study showed that students develop greater decision-making capacity through evaluations that confront them with everyday situations by applying mathematical models derived from financial concepts, which undoubtedly implies a growth both professionally and personally, contributing to an approach to reality from the teaching-learning process itself.

4.3 Distribution of scientific production by country of origin.

Figure 3 shows how scientific production is distributed according to the country of origin.

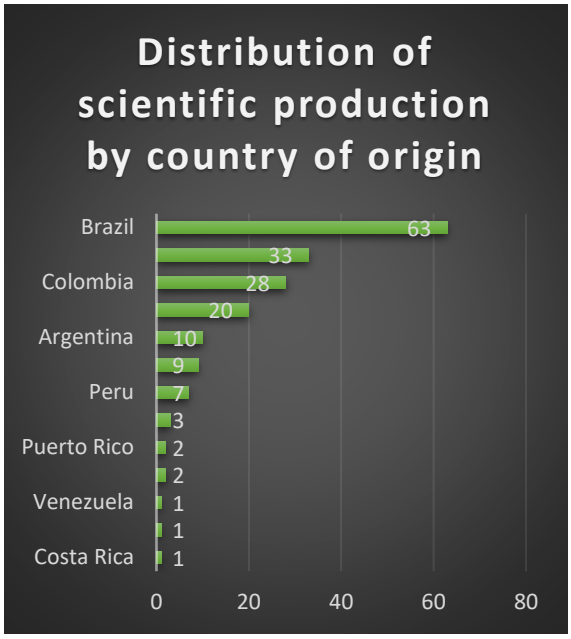

Figure 3. *Distribution of scientific production by country of origin.*

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

Brazil is the Latin American country with the highest number of publications registered in the Scopus database according to the search parameters established and related in Phase 1 of the methodological design. The total number of publications that said country registered, was 63 documents during the period 2015-2020, among which is the article entitled "Contributions of mathematical research for the teaching of financial education and economics" (Franzoni & Quartieri, 2020). which aimed to analyze how research tasks can contribute to the teaching of financial education and economics, highlighting as a result, the importance of research within any training process, since it actively contributes to the generation of new knowledge applied to reality from social, economic, cultural aspects, among others. The study concludes by highlighting the relevance of research in problem solving, stimulating creativity and self-management of students, which determine important aspects in the development of critical thinking as a support for decision making.

At this point, it is worth noting 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.

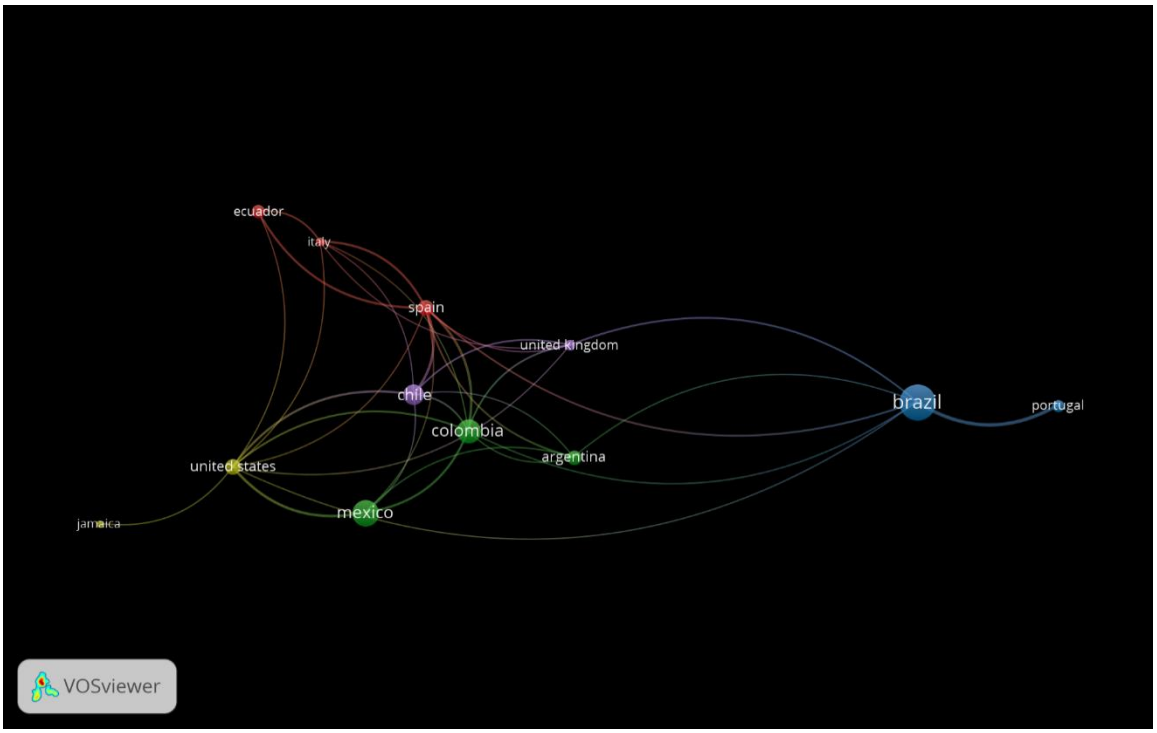

Figure 4. *Co-citations between countries.*

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

Brazil, as mentioned above, is the country with the highest number of publications registered in Scopus database during the period 2015-2020, in addition to this it is the country that most frequently conducts research with authors affiliated to institutions of different nationalities, such as Portugal, with which they share an important proximity in terms of research projects related to the topic proposed in this article. Mexico and Colombia occupy the second and third place among Latin American countries with the highest scientific production related to the study of disruptive methodologies for the development of critical thinking in support of financial decision making by higher education students, registering a total of 33 and 28 papers, respectively. Likewise, together with Argentina, they constitute a group of countries that have developed joint research. From authors affiliated to Colombian institutions, articles such as "A new educational thermodynamic software to promote critical thinking in young engineering students" (Di Biasi, Valencia, & Obregon, 2019). whose objective was to present the application of a new thermodynamic educational software called MOLECULARDISORDER, based on graphic interfaces to promote critical thinking in young engineering students, through the application of energy and entropy balance in different systems.

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.

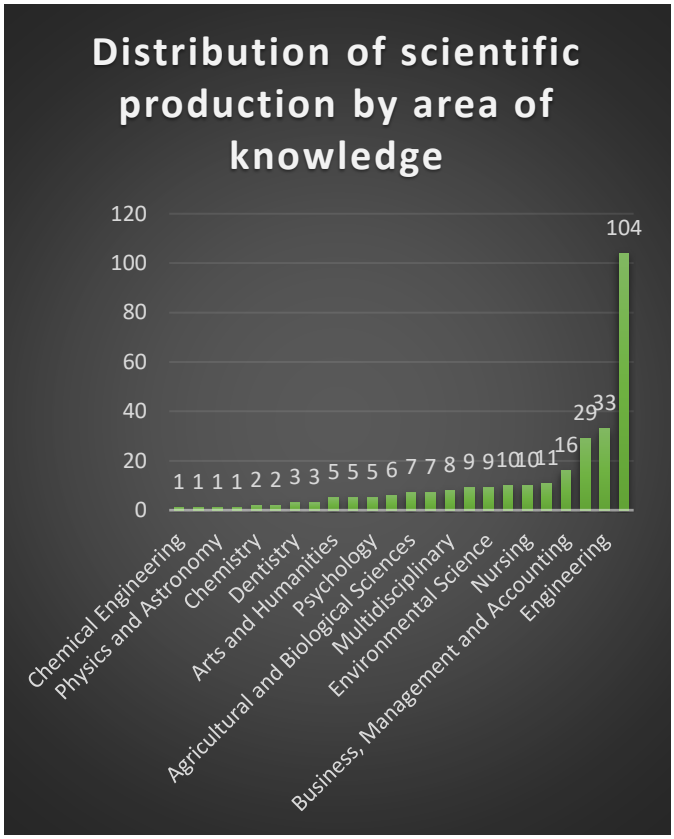

Figure 5. *Distribution of scientific production by area of knowledge.*

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

The area of knowledge with the highest number of publications registered in Scopus was Social Sciences with a total of 104 documents within which is the article entitled "Intraindividual and interindividual approaches in critical thinking programs" (Cornejo & Mujica, 2017). whose objective was to offer an ontological classification based on the theoretical review, analyzing goals that define critical thinking as a human praxis, considering two approaches: intrapersonal process, seeing it as a process of information refinement; and as an interpersonal process in which thinking is interactive in nature and culturally situated. To this end, a documentary review was carried out with the purpose of analyzing the academic programs used in higher education, relating them directly to the social approaches contemplated in the objective of the research. In this way, the study managed to determine that the development of critical thinking in students is a complex process that derives from social praxis more than the same individual will and that all decision making will always be influenced by the behavior of the environment, therefore the importance of socializing strategies that pursue the development of critical thinking as support for decision making whatever the area of application, should be carried out regardless of the area of knowledge in which the individual directs his academic training.

Engineering ranks second with 33 papers published in journals indexed in Scopus database. Computer Science and Business are in third and fourth place with 29 and 16 publications, respectively. In the latter area, there are articles such as "Presence of critical thinking in higher education students of the Colombian Caribbean Coast", (Steffens, Ojeda, Martínez, Hernández, & Moronta, 2019). whose objective was to explain the presence of critical thinking in higher education students of the Colombian Caribbean Coast, through the application of a questionnaire with five response options, they were able to conclude that through the different dimensions of critical thinking, students can reach better results in the performance of academic activities that reflect problems of the social environment, through possible solutions.

4.5 Type of publication

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

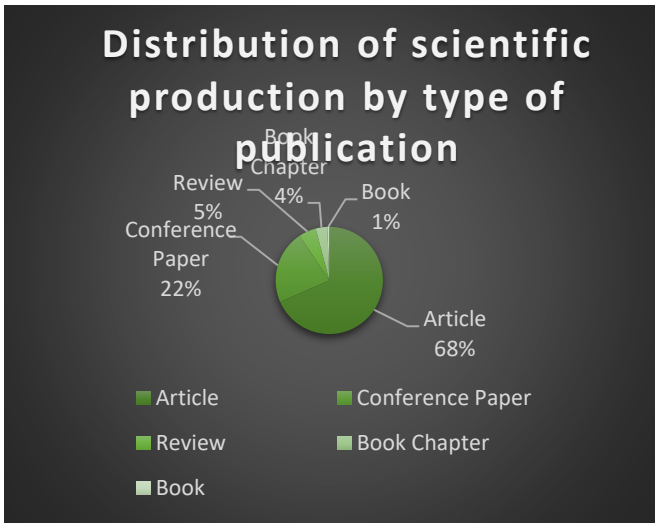

Figure 6. *Type of publication*

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

68% of the publications identified through the execution of Phase 1 of the methodological design proposed for this paper, correspond to Journal Articles, in second place, Conference Articles with 22% of the total production, within these is the one entitled “Fostering specific critical thinking dispositions for student engagement in engineering” (Caratozzolo, Alvarez-Delgado, & Hosseini, 2019). whose purpose was to analyze different methods for fostering specific critical thinking dispositions in engineering students that could enhance students' intellectual engagement. To achieve that goal, the study incorporates two activities within students' academic engagements, dialogue seminars and online discussion forums. The results show that these tools are of great help in generating critical thinking skills as they encourage group participation by individually establishing criteria related to the topic presented.

Reviews occupy the third place with 5% of the total production identified in Scopus, within these is the one entitled “Supporting decision-making processes on blended learning in higher education: literature review and good practices” (Galvis, 2018) whose purpose is to support decision making in higher education institutions regarding the application of blended learning methodologies as a complement to other traditional methodologies. The review proposes the analysis of the bibliography focused on this methodology and its applicability to the teaching-learning processes.

5. Conclusion

Thanks to the bibliometric analysis proposed for this article, it was possible to establish that within the scientific production identified in the Scopus database, the Latin American country with the largest number of publications was Brazil with a total of 63 publications, which allows inferring that of the community mentioned above, this country has developed the most theories with the purpose of fostering critical thinking skills within the student community in their professional training process, thus supporting decision-making among them. It should be noted that an important focus that institutions have given to their teaching-learning processes is financial education, which, as the object of this research, is a vital aspect in the decision-making process of students who face situations proposed by teachers, similar to those experienced in the social environment. This is undoubtedly a fundamental skill regardless of the area of knowledge in which the student specializes, since the human component can never be separated from professional development, taking into account that they play a specific role in society.

The above is also based on the identification of the main area of knowledge that exposes topics related to the development of disruptive methodologies for the generation of critical thinking in support of financial decision making in university students, which was Social Sciences, with a total of 104 documents based on theories framed in aspects related to this area, since the analysis of the behavior of the different social actors, the demonstration of leadership, professionalism, humanity, among other vital components in society, lie not only in the academic training in a knowledge but in the individual's ability to present arguments in different daily situations. However, it should be noted that within the areas in which students are academically trained, those related to engineering, such as mathematics through its models, have made a great contribution to the creation of methodologies aimed at measuring the ability of critical thinking in students, through the development of pedagogical activities which face the resolution of problems created in the classroom in order to stimulate in them, a trial in decision making, situations in which they will be involved once they manage to enter the working life.

Likewise, the contribution that several universities are making to the fulfillment of the initially stated objective is highlighted, through their interest in including in their academic programs, topics related to financial education as a support for decision making within the student community, highlighting the

importance of saving and identifying investment opportunities. Therefore, this study concludes by highlighting the importance of knowing the current state of the published bibliography on the creation of disruptive methodologies for the development of critical thinking in support of financial decision making by higher education students, constituting a fundamental source of information for the generation of new knowledge through future research that will allow devising strategies that contribute to the fulfillment of this objective.

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