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The role of teaching models in developing critical thinking skills: A bibliometric analysis

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ABSTRACT

This study investigates the impact of innovative teaching models on the development of critical thinking skills among Ecuadorian students, emphasizing the need for further research and development within Ecuador's educational landscape. A two-phase bibliometric analysis was conducted. The first phase involved a global literature review on teaching models and critical thinking while the second phase focused on Ecuadorian publications. Data collection and analysis were performed using RStudio and VOSviewer following a systematic four-step process: defining search terms, selecting databases, downloading data and analyzing the results. The global analysis revealed a significant increase in publications since 2018 showing that intentional teaching strategies significantly enhance critical thinking skills. In Ecuador, research on this topic is still in its early stages, accounting for only 0.67% of global output. Although Ecuadorian studies indicate promising educational initiatives, they have not yet gained substantial recognition or citations within the academic community. Innovative teaching models play a crucial role in fostering critical thinking skills. However, research in Ecuador remains underrepresented. Enhancing teacher training programs and incorporating advanced didactic methodologies is essential to improve the quality of education in Ecuador and prepare students to address future challenges.

Contribution/Originality: This study offers a unique contribution by exploring the impact of innovative teaching models on the development of critical thinking skills among Ecuadorian students, an under-researched area in the context of this country. Through a two-phase bibliometric analysis, the study reveals Ecuador's limited participation in global scientific production on this topic, representing only 0.67% of the worldwide total. Furthermore, this research highlights the importance of intentional didactic strategies in improving critical thinking skills, both globally and locally. This investigation identifies a gap in the Ecuadorian literature. It emphasizes the need to strengthen teacher training and the application of advanced pedagogical methodologies, thus providing a novel perspective for educational development in Ecuador.

1. INTRODUCTION

Critical thinking skills development is vital in modern education to handle the complex issues of the twenty-first century (López et al., 2023. According to Gao (2024) innovative teaching models have become essential tools for developing these talents allowing students to gain information and critical competencies for evaluation, analysis, and idea production.

Although research on creative teaching methods and critical thinking has grown dramatically worldwide since 2018, Ecuadorian studies are still few making up only 0.67% of the world's production and receiving little acknowledgement from the academic community. This emphasizes how urgently Ecuador's research and educational initiatives need strengthening.

The purpose of this study is to investigate and validate the value of creative teaching approaches in fostering critical thinking abilities in the Ecuadorian setting (Wagner, 2022). We want to show the beneficial effects of these approaches on student learning through a bibliometric analysis of previous studies and fresh empirical findings.

Our research questions are as follows:

1. How well do creative teaching approaches foster critical thinking abilities in Ecuadorian students?

2. What are the main obstacles to putting these approaches into practice in Ecuadorian schools?

The potential for this study to close the gap between theory and practice in Ecuadorian education is what makes it significant. We hope to help provide high-quality education that sufficiently prepares students for future difficulties by emphasizing the necessity of strong teacher training in cutting-edge didactic technology and methodologies (García-Delgado, Rodríguez-Cano, Delgado-Benito, & Di Giusto-Valle, 2023).

We will use MEDLINE, a thorough bibliographic database of biomedical and life sciences information as part of our literature study. The US National Library of Medicine maintains MEDLINE which contains bibliographic data for articles from scholarly publications in a variety of subjects, such as psychology and education (Lu, 2011).

2. METHODOLOGY

There were two distinct phases to the bibliometric investigation of how instructional approaches affected the growth of critical thinking abilities. An extensive assessment of the topic's global literature was part of the first step. A more targeted strategy was utilized in the second stage where Ecuadorian materials were examined to address the particular circumstances. For data analysis, programs like VOSviewer (version 1.6.19) and RStudio (version 4.3.3) were used.

The methodology follows four key steps (Herrera-Franco, Montalván-Burbano, Mora-Frank, & Bravo-Montero, 2021):

1. Definition of terms and search equation.
2. Selection of databases, initial search, and inclusion or exclusion of documents.
3. Data download.
4. Analysis of results.

2.1. Definition of Terms and Search Equation

A carefully developed search equation was created incorporating key terms such as models, methods, and strategies about skills, capacity, and critical thinking as well as terms related to development, promotion, and fostering. The resulting equation is as follows:

TITLE-ABS-KEY (teaching models or teaching methods or teaching strategies and critical thinking skills or critical thinking or critical capacity and development or promotion or fostering).

This formulation allows for a broad exploration of the topic, covering multiple dimensions related to teaching and critical thinking. This method ensures a rigorous and comprehensive bibliometric analysis, providing a strong foundation for education research.

2.2. Selection of Databases, Initial Search, and Inclusion or Exclusion of Documents

Scopus was chosen as the primary database for this study due to its relevance and reliability in academic research (Liu, 2020; Vengadesh, Chinna, & Aravindaraj, 2023). Scopus is recognized for offering precise and comprehensive data making it an essential resource for high-quality academic research.

A document search was conducted on May 14, 2024, yielding a total of 630 documents. The following four criteria were applied for inclusion and exclusion:

1. Excluding documents published in 2024 as it is the current year.
2. Including all subject areas.
3. Selecting specific types of documents, i.e., articles, conference papers, reviews, book chapters, and notes.
4. Including documents in all available languages.

After applying these criteria, 589 documents were selected for analysis.

2.3. Data Download

The results were downloaded in comma-separated values (CSV) format containing bibliographic information such as author names, document titles, year of publication, journal names, number of citations, document types, original document languages and affiliations, among other data.

2.4. Analysis of Results

The 41 years of documents gathered from Scopus (see Figure 1) were analyzed using VOS viewer (version 1.6.19) and RStudio (version 4.3.3) softwares because of its adaptability and capacity to produce sophisticated visualizations which are critical for examining patterns and trends in intricate datasets. RStudio was selected due to its adaptability and the sophisticated statistical methods which are essential for carrying out a thorough analysis (Ariel de Lima et al., 2022; Moraga & Baker, 2022).

The scientific literature's networks of terms and collaborations were visualized and examined using a VOS viewer. To find new patterns and connections in bibliometric datasets, this tool focuses on network visualization and locating connected data clusters. This method offers a distinctive viewpoint on the distribution and interconnection of study results and is especially useful for analyzing relationships among authors, institutions, and nations (Bacci, Bertaccini, & Petrucci, 2023; HabibAgahi, Kermani, & Maghsoudi, 2022; Ullah et al., 2022).

3. RESULTS

3.1. Global Literature Review

The initial publication, released in 1982 examines the significance of curriculum content and pedagogical approaches in social sciences at the university level. It challenges the conventional practice of teaching concepts, theories, and historical context disconnected from current issues. The article contends that prevalent instructional methods, particularly lectures fail to cultivate students' critical thinking and independent reasoning skills. In its conclusion, the paper acknowledges potential political obstacles to implementing educational reforms, noting that such changes might encounter opposition from entrenched academic and institutional power structures (Leftwich, 1982). Although this article was the first to be published, its global impact has been limited as evidenced by the fact that it has only received six citations. Publications derived from the study have varied over the years. Until 2017, there was a fluctuation in the number of publications with years of increase or decrease. However, in 2018, there was an upward trend in the number of annual documents reaching 97 by 2023 (see Figure 1).

Between 1982 and 2017, the average annual number of publications was 7.25 documents. However, in the following six years until 2023, this average increased significantly to 55.83 documents per year. Among these, Intentional Teaching for the Promotion of Higher-Order Thinking Skills: A Case of Critical Thinking (Miri, David, & Uri, 2007) recorded a notable impact with 292 citations. This longitudinal case study aimed to investigate how

teaching focused on developing higher-order thinking skills affected students' critical thinking in the context of science. Through a pre- and post-experimental design, secondary school students were divided into three groups which are as follows: an experimental group (n = 57) that received teaching strategies designed to improve these skills and two control groups, one of science (n = 41) and one unrelated to science (n = 79) that received traditional teaching. The results obtained through critical thinking assessment tools revealed significant improvements in critical thinking components and aspects such as disposition towards this type of thinking, including truth-seeking, open-mindedness, self-confidence, and maturity compared to the control groups. These findings suggest that the intentional and persistent practice of higher-order thinking strategies by teachers can lead to significant development of critical thinking capabilities in students. Among these, the 10 most impactful articles (highest number of citations), another notable study by Cant and Cooper (2017) with 278 citations focused on the use of simulation-based learning in undergraduate nursing education. The authors concluded that the implementation of simulation led to significant improvements in students' knowledge acquisition, psychomotor development, and self-efficacy. They also observed marked student satisfaction with this pedagogical approach accompanied by improvements in confidence and critical thinking. Another highly cited study (n = 254) indicated that for education to foster students' critical competence, it must provide them with the opportunity in the classroom and school to observe, imitate, and practice critical agency and reflect on it. Learning contexts should be chosen so that students can make sense of and develop a sense of responsibility for the quality of the practice in question (Ten Dam & Volman, 2004). Simulation can be used in practical settings to promote and validate nurses' clinical judgment and competence (Decker, Sportsman, Puetz, & Billings, 2008). Other studies indicate that using case studies in teaching helps nursing teachers develop critical thinking skills essential for health professionals (Popil, 2011). When WebQuest was used in real situations, students could acquire more knowledge and experience. In the learning experiment activity, students achieved different learning tasks and expressed their own opinions and perspectives which could foster their critical thinking skills (Chang, Chen, & Hsu, 2011).
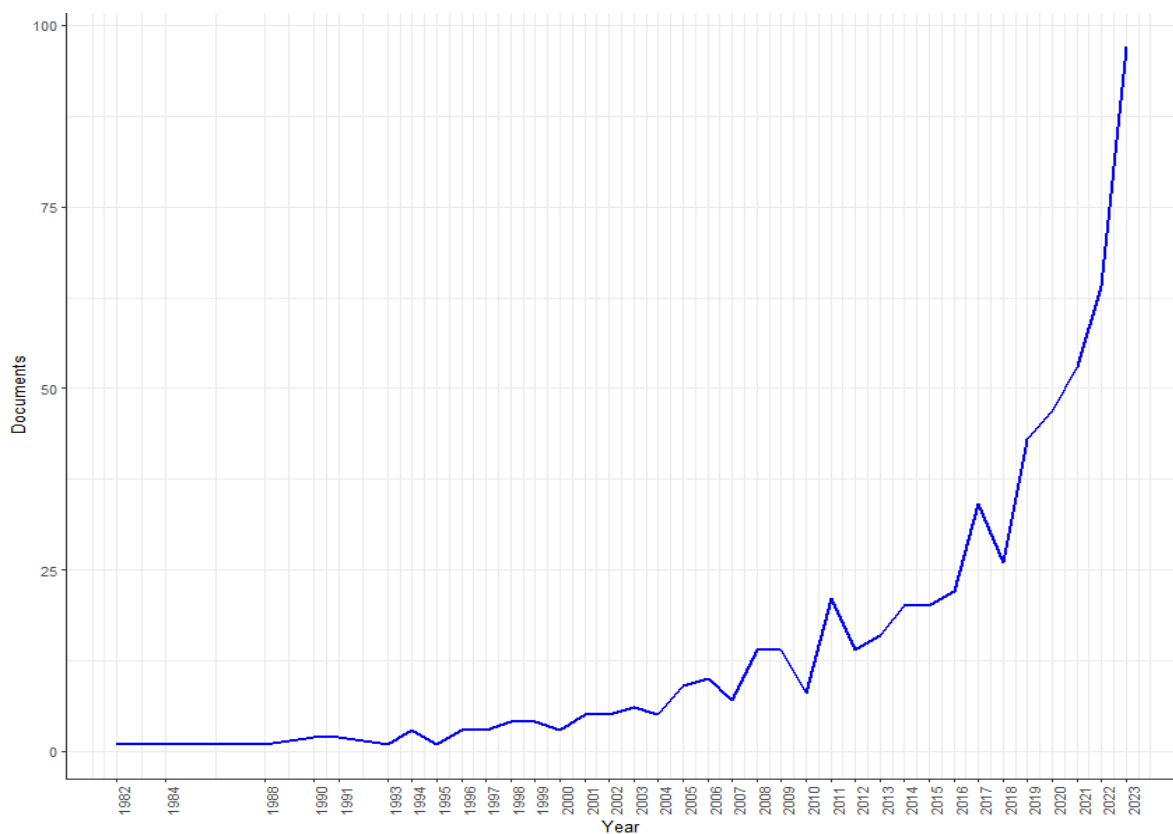

Figure 1. Annual scientific production: 1982-2023.

Furthermore, in 2019, the most cited article between 2018 and 2023 was published with 96 citations. It addresses the growing use of escape rooms and escape games in educational settings as tools for active game-based learning. To address this lack of empirical evidence, a systematic review of 68 studies published between 2009 and April 2019 was presented, analyzing various aspects such as the educational context, target audience, game design, team size and obtained results. This review highlights the advantages and challenges of educational escape rooms emphasizing their positive impact on student motivation and the development of soft skills such as teamwork, creativity, decision-making, leadership, communication and critical thinking. Although its instructional design is complex and time-consuming, once developed, escape rooms can continue to be applied in subsequent years offering new perspectives and effective recommendations for the successful integration of escape rooms into teaching strategies (Fotaris & Mastoras, 2019).

The first study on self-medication in the user population revealed a considerable number of documents published in the United States (327 documents) followed by China (217 documents), Brazil (105 documents), Spain (86 documents), and Australia (56 documents) among other countries (see Figure 2). A study conducted in the United States aimed to provide a concise introduction to critical thinking, its definition and disposition to think critically as well as active learning strategies to foster this type of thinking. Database searches such as MEDLINE and the Educational Resources Information Center (ERIC) were conducted from 1933 to 2002 focusing on literature related to critical thinking and various pedagogical techniques for its promotion. The synthesis of data revealed that the development of critical thinking has been a prominent topic in recent education with a variety of instructional methods used to promote active thinking in the classroom such as case studies, discussions, written exercises, questioning techniques, and debates. The following three main methods stand out: questioning, written exercises, discussions, and debates. In conclusion, a definition of critical thinking, a disposition to think critically, and various teaching strategies were presented. Although these strategies may not be suitable for all subjects or classes, they can be adapted and used to foster critical thinking and student participation (Walker, 2003). In China, this study examines the similarities and differences between undergraduate nursing programs on different continents. An international research team used a modified Delphi process and nominal group techniques to qualitatively analyze the curricular documents. They focused on key areas such as objectives, content, methods, and evaluation. They identified key issues such as critical thinking and personal development in objectives but not necessarily in curriculum progression and differences in Western and Asian perspectives on personal autonomy. Additionally, they observed a higher valuation of sciences over humanities, a predominance of lectures and practices as teaching methods and mostly summative evaluations. These findings are relevant to the development of credit transfer schemes and international exchange highlighting areas of attention when designing such schemes (French et al., 1996).
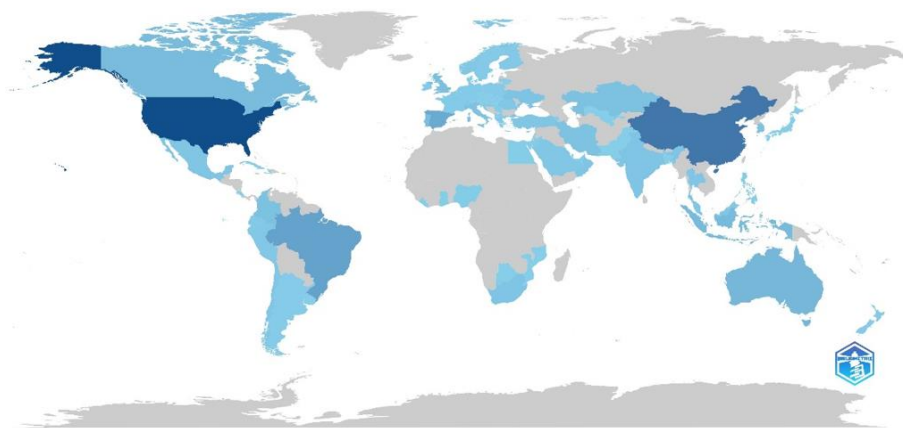
Country scientific production

Figure 2. Scientific production by country (1936-2023).

International collaborations and the longevity of publications are shown in Figure 3. The United States is the country with the most extensive research history on the topic and is also the main contributor in terms of document quantity. China, the second largest contributor has been relatively recent in this field of study. The United States participates in international collaborations with China, Australia, and Spain. Spain also collaborated with the United States and Brazil in their research. On the other hand, Brazil collaborates with Mexico in addition to maintaining collaboration with Spain. The remaining countries (n=82) showed limited collaboration in their publications on teaching models for developing critical thinking skills, not exceeding two collaborations with other countries on any occasion.
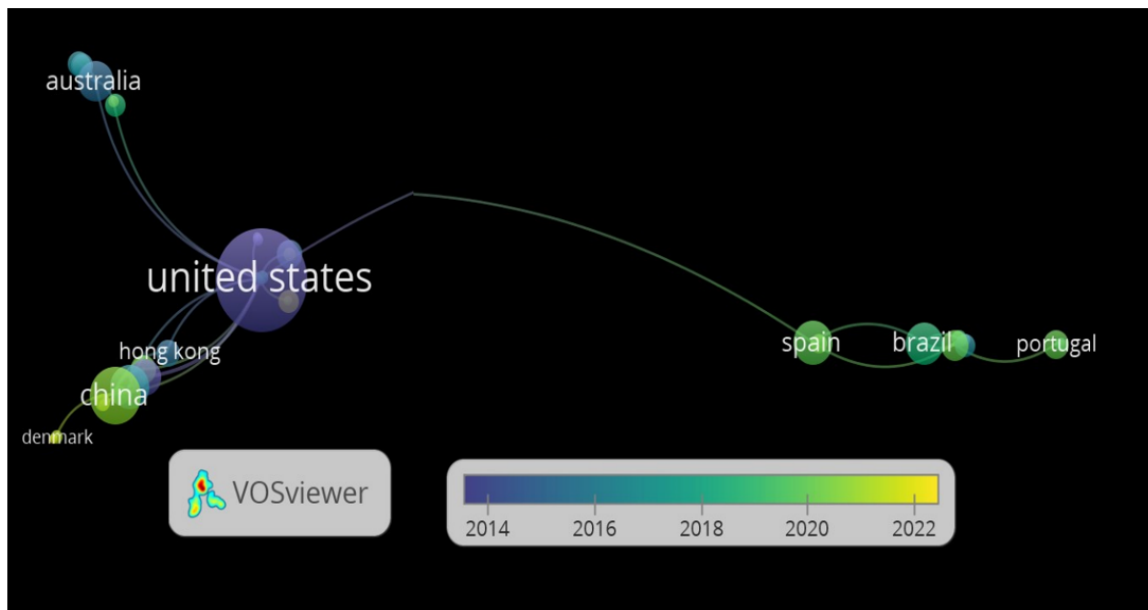

Figure 3. Collaborations between countries.

3.2. Document Types

Scientific production was distributed across six document categories as shown in Figure 4. Journal articles occupied the top spot representing 70.3% of the total documents. These articles are highly reliable because of their peer review process before publication (Dai, Inoue, Reisert, & Inui, 2018; Fernández-Isabel, Barriuso, Cabezas, de Diego, & Pinheiro, 2020). Conference papers ranked second, accounting for 16.3% of the total papers. The remaining documents accounted for 13.4% of all documents.
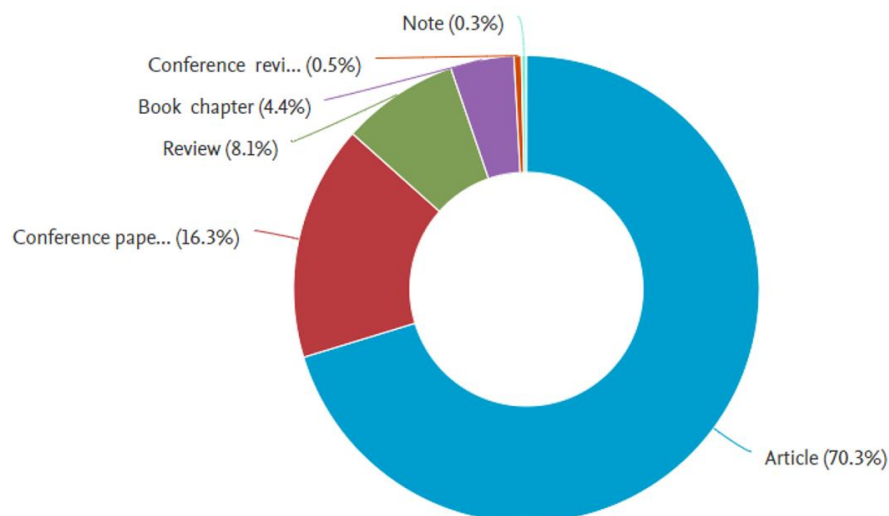

Figure 4. Document types.

3.3. Thematic Areas

Twenty-five thematic areas contributing to the study were identified with five leading contributors as shown in Figure 5. The social sciences ranked first (37.9%) followed by nursing (12.9%), computer sciences (9.5%), engineering (7.7%), and medicine (6.7%). The remaining 25.3% encompassed the other thematic areas.
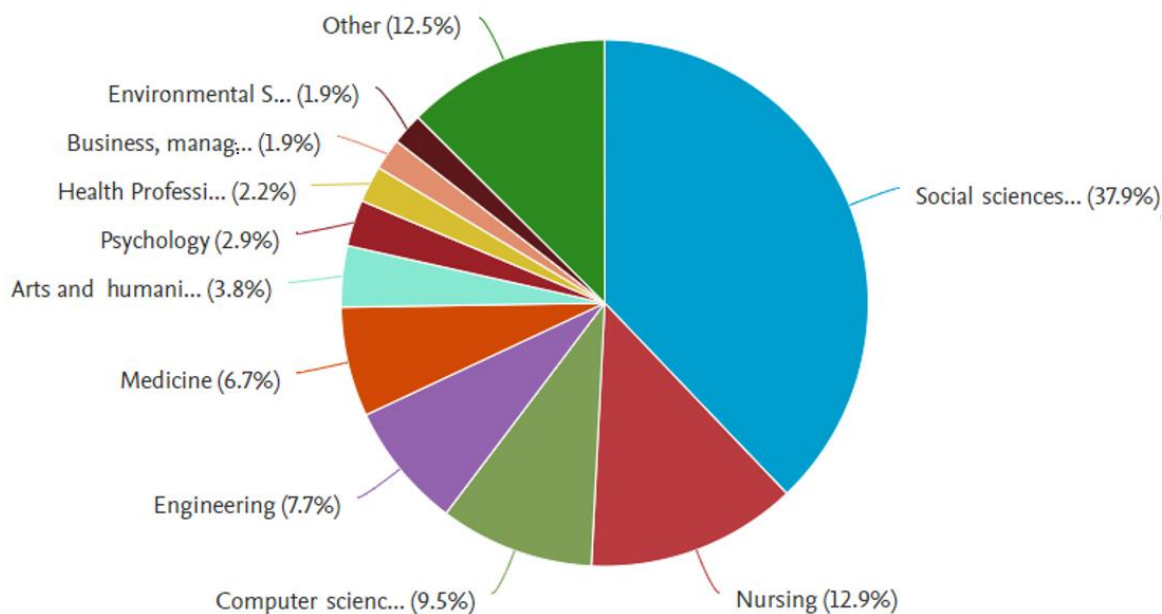

Figure 5. Main thematic areas.

Table 1 lists the top five authors in the three most relevant thematic areas regarding the impact of teaching models on the development of critical thinking skills.

Table 1. Top 5 authors in the three main thematic areas.

No	Thematic areas	Authors	Affiliation	Country	Documents
1	Social sciences	Albytova N.	L.N. Gumilyov Eurasian National University	Kazakhstan	2
		Bekbayeva Z.S.	Saken Seifullin Kazakh Agricultural Technical University	Kazakhstan	2
		Callister L.C.	Brigham Young University	USA	2
		Caratozzolo P.	Monterrey technology	Mexico	2
		Carter A.G.	Griffith health	Australia	2
2	Nursing	Carter A.G.	Griffith health	Australia	3
		Cogo A.L.P.	Federal University of Rio Grande do Sul	Brazil	3
		Creedy D.K.	Griffith health	Australia	3
		Santos V.E.P.	Federal University of Rio Grande do Sul	Brazil	3
		Sidebotham M.	Griffith Health	Australia	3
3	Computer sciences	Ku N.	National Tsing Hua University	Taiwan	2
		Lam K.F.T.	National Tsing Hua University	Taiwan	2
		Vun Y.S.	National Tsing Hua University	Taiwan	2
		Wang T.H.	National Tsing Hua University	Taiwan	2
		Acelajado M.J.	De La Salle University	Philippines	1

- Research in social sciences was the thematic area with the most contributions with 372 registered documents. The first document in 1982 was the oldest showing fluctuations until 2020. Over the last three years, the number of publications has increased. In this area, the most cited document (n=292) was by Miri, David, B.-C., and Uri, Z. The results obtained through critical thinking assessment tools in the study revealed

significant improvements in critical thinking components and aspects, such as disposition towards this type of thinking, including truth-seeking, open-mindedness, self-confidence, and maturity, compared to the control groups (Miri et al., 2007). Another study with a significant impact (n=278 citations) in this area observed marked student satisfaction with this pedagogical approach accompanied by improvements in confidence and critical thinking. Another highly cited study (n=254) indicated that for education to foster students' critical competence, it must provide them with opportunities in the classroom and school to observe, imitate, and practice critical agency and reflect on it (Cant & Cooper, 2017). Other studies have highlighted the importance of critical thinking and teamwork skills in the healthcare field (Hrynchak & Batty, 2012). Google Earth has significant potential to enhance geography teaching and develop various skills in students. Its usefulness in pre-university settings is illustrated by a lesson plan based on South Carolina aimed at seventh-grade students. This plan not only increases students' geographical awareness but also develops critical thinking, analysis, and research skills supporting various educational standards (Patterson, 2007).

- Nursing was the second most common thematic area in this study contributing a total of 127 documents. Since its first contribution in 1991, the total number of documents has fluctuated peaking by 2021. Pond, Bradshaw, and Turner (1991) encouraged nursing teachers to teach students to think critically because of the high-level thinking skills required in the complex healthcare system. A systematic review of 17 studies illustrated that the definitions and concepts of critical thinking can change over time, highlighting the need to clarify teachers' perspectives on this topic. It is also necessary to evaluate the effectiveness of new strategies mentioned in several studies such as art-based experiences, questioning, intercultural nursing experiences, and tutoring. Teachers and faculty can develop more effective strategies to improve these skills in students and prepare them for future clinical practice with a better understanding of critical thinking in nursing education (Chan, 2013). Another study demonstrated that the flipped classroom positively impacted nursing students' disposition towards critical thinking and recommended that future studies evaluate the effects of the flipped classroom on other educational outcomes (Dehghanzadeh & Jafaraghaee, 2018). Other studies have analyzed strategies used to promote critical thinking in university nursing education (Carvalho et al., 2017) project-based learning methodology (Chan, 2012), and evidence-based practice to improve critical thinking (Callister, Matsumura, Lookinland, Mangum, & Loucks, 2005).

- Computer sciences emerged as the third most prominent thematic area in the analyzed corpus contributing 93 documents. Although its initial impact was modest from 1998 onwards, contributions in this thematic area gradually increased until 2023 reaching 22 documents. In this area, a study with a significant impact (n=126 citations) integrated WebQuest with mobile learning for environmental education (Chang et al., 2011). The use of escape rooms for learning is also notable (Fotaris & Mastoras, 2019). In a study examining the impact of a blended learning environment on students' critical thinking and knowledge transformation, the findings indicated that the proposed approach was effective in enhancing these skills. Students were also satisfied with the courses and teaching methods within the learning environment which significantly boosted their motivation to learn (Jou, Lin, & Wu, 2016). Additionally, the effects of robotics programming education on computational thinking skills have been explored (Jou et al., 2016) with the sustainable development of psychological education in students' learning concepts in physical education, leveraging machine learning and the Internet of Things (Zong, Lipowski, Liu, Qiao, & Bo, 2022).
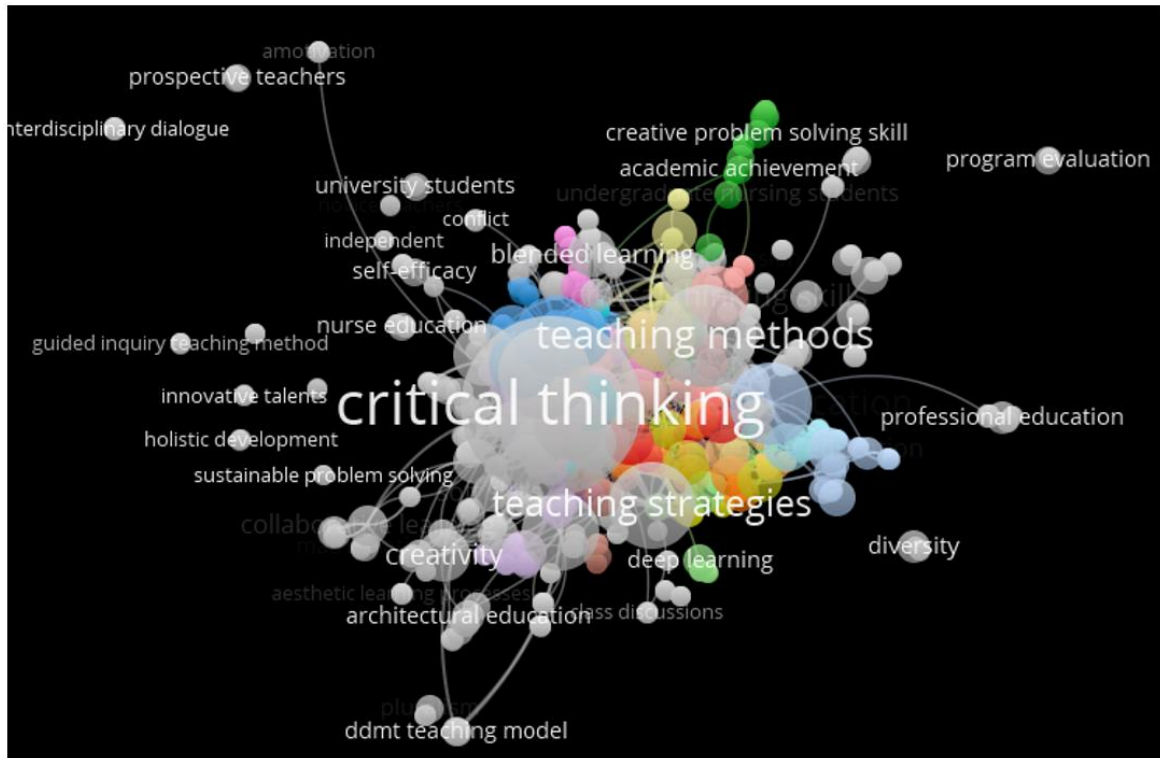
Figure 6. Co-occurrences of authors' keywords.

3.4. Intellectual Structure of Scientific Production

An analysis of keyword co-occurrence is necessary to investigate the intellectual framework of the research field. This process involved creating a network of the most frequently used terms (authors' keywords) in the relevant literature (Battikh, Bodolica, & Wood, 2022). In generating this network, 1483 authors' keywords were identified (see Figure 6). As expected, the most frequently occurring keyword was critical thinking (n = 149 occurrences) followed by teaching methods (n = 41 occurrences). Teaching strategies and higher education are in third and fourth places with 25 and 21 occurrences respectively.

The three most important clusters are detailed in Table 2.

Table 2. Cluster of authors' keywords.

No.	Cluster name	Main authors' keywords
1	Teaching strategies and critical thinking evaluation in science and education.	Case study, concept map, critical thinking disposition, epistemological representations, HEIs, critical thinking test, integrated natural science, Jordan, lecture, nodes, perioperative education, projects, randomized-controlled-trial, reading and writing skills, study strategy, teaching and learning
2	Educational strategies and evaluation of interventions in education and nursing.	Abilities, critical education, educational intervention, journal writing, lectures, measures, midwifery, nursing, pre-registration, randomized controlled trial, reflection, review, scales, secondary school students, simulated enterprises, solving problems, storytelling and strategy

Cluster 1, titled "Teaching Strategies and Critical Thinking Evaluation in Science and Education" consists of 17 keywords. This group focuses on various methods, tools, and educational practices aimed at fostering and assessing critical thinking among students in science and education fields. It encompasses several important elements: teaching strategies (Pond et al., 1991) evaluations of critical thinking (Miri et al., 2007) educational interventions (Hrynchak & Batty, 2012) and educational contexts (Zong et al., 2022).

Cluster 2, "Educational Strategies and Evaluation of Interventions in Education and Nursing" involves a set of approaches and pedagogical methods aimed at cultivating and measuring critical thinking, especially within education and nursing. It highlights various components including educational strategies (Lin, Lu, Chung, & Yang, 2010) intervention evaluations (Carter, Creedy, & Sidebotham, 2015) applications in education (Walker, 2003), nursing (Huang, Chen, Yeh, & Chung, 2012) and educational and professional settings (Christodoulakis, Kritsotakis, & Tsiligianni, 2022).

3.5. Contribution of Ecuadorian Institutions

In the Ecuadorian context, research on the role of teaching models in fostering critical thinking skills accounts for only 0.67% of global academic output. The first documents in this field were published in 2023. Ecuadorian institutions that have contributed to one document each include universities such as the Universidad Estatal de Milagro (UNEMI), Pontificia Universidad Católica del Ecuador (PUCE), Universidad Técnica Particular de Loja (UTPL), Universidad Politécnica Salesiana de Quito, and Universidad Nacional de Chimborazo. To date, none of these documents has received citations, and four documents have been identified.

People have the right to quality education that promotes reading comprehension and the development of critical thinking. In Ecuador, it is necessary to implement educational strategies and programs to foster these skills. This research focuses on the relationship between reading comprehension and critical thinking in secondary school students of both genders, aged 12 to 16, from five schools in different regions of the country. Using a quantitative, retrospective, and correlational approach, student surveys revealed that teachers actively promote reading and implement educational strategies and teaching methods to develop critical thinking, recognizing its importance for future professional performance (Medranda-Morales, Palacios Mieles, & Villalba Guevara, 2023).

A study evaluated the impact of real teaching experience in the preparation of future teachers using a mixed-method approach. Teachers taught children and adapted online lesson environments in two teacher training courses. Through three phases and pre- and post-surveys, motivation, preparation, familiarity with teaching methods, and classroom management skills were assessed. The results showed significant improvements in these aspects, highlighting the importance of practical experience and constructivist approaches. The study suggests that training programs should bridge the gap between theory and practice, fostering comprehensive skills in future teachers (Riera et al., 2023).

An Ecuadorian study analyzes the skills of chemistry and mathematics teachers to identify the didactic potential of info-communication products in upper elementary and high school education. A qualitative evaluation was carried out in the following three phases: before program design (needs assessment), during development (process evaluation), and at the end of the training (results and impact evaluation). Using an inductive-deductive process and MAXQDA12 software, the data were coded and analyzed. The results emphasized the importance of using problem-based experimental activities and avoiding mere memorization of content. Teachers showed a positive attitude towards the didactic use of info-communication products which are more engaging than traditional methodologies. The conclusions highlight the need to train teachers in the educational use of these resources as they facilitate the development of critical thinking and improve learning (Riofrío & Pinduisaca, 2023).

Becerra, Reyes, Marín, and Vargas (2023) also examine the role of university professors in today's society, focusing on didactic decisions that develop professional, social and technological skills. Scientific production on didactic models mediated by Information and Communication Technologies (ICT) in higher education was identified through a systematic review of 89 high-impact journal articles. The results show the effort of teachers to implement ICT-based models although they demonstrate limited proficiency in didactic and technological skills. From a pragmatic perspective, the study addresses the challenges faced by teachers in reformulating their practices in a transhumanist world and within the new ecology of knowledge, noting that diverse sociocultural contexts facilitate transformation and problem-solving in the classroom.

4. DISCUSSION

The results of this study reflect the evolution and relevance of teaching models in developing critical thinking skills globally and in the Ecuadorian context. According to a survey of the international literature, there has been a noticeable increase in publications on this topic since 2018. Miri et al. (2007) highlight the significance of intentional teaching strategies to improve higher-order thinking abilities. This increase in scholarly output suggests a growing understanding and acceptance of the need for teaching methods that foster critical thinking (Kinoshita, 2022).

On the other hand, Ecuadorian research is still scarce accounting for only 0.67% of worldwide publications. This demonstrates a notable deficiency in the nation's scholarly output and emphasizes the pressing need for additional study and development. Although Ecuadorian universities have started to submit research in their early phases of integration and acceptance within the international academic community, it is reflected in the fact that they have not yet received citations.

Specific studies from Ecuador show teachers' efforts to implement didactic strategies that promote critical thinking (Riera et al., 2023) such as using info-communication products in the teaching of chemical and mathematical sciences (Riofrío & Pinduisaca, 2023). These studies highlight teachers' positive attitudes towards using new technologies and experimental methods which are more attractive than traditional methodologies. However, the need for more robust and continuous training for teachers to effectively use these resources has been identified.

Globally, various thematic areas including the social sciences, nursing, and computer sciences have explored and demonstrated the benefits of innovative teaching models. The application of tools such as simulations (Cant & Cooper, 2017) case studies (Walker, 2003) and blended learning environments have significantly improved students' critical thinking skills in different disciplines. These approaches not only enhance academic competencies but also build confidence and a disposition towards active learning and critical thinking.

5. CONCLUSION

This study confirms the importance of innovative teaching models for developing students' critical thinking skills. Ecuador's meager participation in the global surge in scientific output on this subject highlights the necessity of stepping up its research and teaching initiatives. Although the preliminary study carried out by Ecuadorian universities is a step in the right direction, it still needs more acknowledgment and citation in the scholarly literature. To close the gap between theory and practice and guarantee high-quality education that equips students for future problems, it is imperative to keep encouraging and supporting teacher training through the use of cutting-edge technologies and didactic approaches.

5.1. Implications of the Study

The study provides insightful information on how creative teaching approaches affect critical thinking abilities both internationally and in Ecuador. Important ramifications are as follows:

Teachers: Use deliberate techniques that go beyond conventional approaches such as case studies and simulation-based learning to improve critical thinking. For implementation to be successful, ongoing professional growth is essential.

Policymakers should prioritize research funding and encourage creative instructional strategies to address Ecuador's weak research presence. Give educational institutions the tools they need to incorporate cutting-edge teaching techniques.

Researchers: Examine Ecuador's underdeveloped areas of critical thinking and creative teaching approaches. Investigate implementation challenges and long-term effects empirically in diverse educational contexts.

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Educational Institutions: Promote cutting-edge didactic technologies and pedagogical approaches to close the theory-practice gap. Create transnational alliances to boost cooperation and raise awareness of Ecuadorian research around the world.

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