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Collaborative Learning in Education : A Bibliometrics Analysis

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Abstract: Currently, more and more teachers decide to follow active teaching methods, leaving behind traditional teaching methods. Among the most used pedagogical methods in the educational field is the collaborative learning. The general objective of the present investigation is to know the performance and academic development of the term "collaborative learning" in the documents collected in the Scopus database. Over the past decade, there has been a significant shift in education towards active teaching methods, with collaborative learning emerging as one of the most widely adopted approaches. This study conducts a bibliometric analysis of publications from the Scopus database between 2014 and 2024, examining the academic development of the term "collaborative learning." The analysis reveals an annual growth rate of 8.84% in publications, indicating a steady increase in interest. The research is highly collaborative, with an average of 3.45 co-authors per article, and 13.79% of the publications involving international co-authorship. The findings demonstrate that collaborative learning enhances critical thinking, creativity, and problem-solving skills, with increasing integration of technology such as e-learning and computer-aided instruction. This study offers a comprehensive overview of the trends and contributions in the field, providing valuable insights for educators and researchers to develop more effective collaborative learning strategies in diverse educational settings.

Keywords: collaborative learning, education, bibliometrics analysis, scopus

Introduction

The rapid advancement of technology and the growing complexity of global challenges have significantly transformed the educational landscape. Traditional classroom settings often prioritize individual learning, leading to limited opportunities for students to develop teamwork skills and engage in shared knowledge construction. Collaborative learning offers an alternative approach that promotes active student participation, cooperation, and collective knowledge creation. Considering the ongoing developments in society and education, collaborative learning has emerged as an essential teaching approach. It involves two or more individuals interacting and sharing resources during specific phases of their learning journey (Keshani et al., 2019). This method has proven to be highly effective in enhancing educational quality by fostering critical thinking, creativity, and problem-solving skills among students. Collaborative learning prioritizes active engagement, interaction, and mutual support among participants and is increasingly implemented in diverse educational environments, from traditional classrooms to online platforms.

Generally, collaborative learning encompasses activities such as group projects [29], teamwork for solving problems (Boulton, 2019), pedagogical discussions (Hirsh & Segolsson, 2019), and collaboration in teams (Schnaubert & Bodemer, 2019). Additionally, some scholars argue that this approach enhances intercultural competence by fostering collaboration among diverse student groups (de Hei et al., 2020). In contrast to

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traditional teaching methods, which often overlook skill development, research (Romeike & Fischer, 2019) demonstrates that collaborative learning facilitates the formation of "buzz groups," thereby strengthening student-centered approaches. This technique also increases student motivation by allowing them to explore shared interests. Collaborative learning, coupled with experiential learning, promotes innovation and the development of creativity, critical thinking, and problem-solving abilities (Tan & Vicente, 2019; Zhang et al., 2022). Moreover, research highlights its effectiveness in improving reading comprehension, with peer collaboration emerging as a powerful tool in analyzing complex texts (Vega et al., 2020).

Creating an optimal learning environment and fostering a positive social climate in the classroom are crucial for students to feel comfortable. Collaborative learning enhances self-regulation, equipping students with additional tools to tackle learning challenges and engage in various instructional scenarios. This approach helps students manage their attitudes and emotions effectively (Järvenoja et al., 2019). Furthermore, collaborative learning offers significant benefits in developing digital competence, particularly through the use of educational technologies (Zheng et al., 2019). It supports socialization and interaction processes, boosts students' satisfaction with their learning experiences, and encourages the adoption of innovative teaching models that put students at the center. Even in environments where Google Docs is commonly used, it remains an effective method (Abdul Rabu & Badlishah, 2020; Jeong et al., 2019; Nam, 2017; Sung et al., 2017). Given its widespread adoption and the ongoing evolution of pedagogical strategies, understanding the trends and impact of collaborative learning is crucial for educators, policymakers, and researchers alike. One of the most effective methods to achieve this understanding is through bibliometric analysis. Bibliometrics, a method that utilizes quantitative tools to analyze scholarly publications, provides a comprehensive overview of research trends, key contributors, influential works, and the overall structure of academic discourse within a specific field.

This study aims to provide a bibliometric analysis of research on collaborative learning in education, focusing on publications indexed in Scopus, one of the largest and most reputable academic databases. By examining key metrics such as citation patterns, authorship networks, and thematic evolution, this research seeks to highlight the intellectual landscape of collaborative learning and identify gaps and opportunities for future research. Through this analysis, we hope to contribute to the development of more effective collaborative learning strategies that can address the evolving needs of the education sector

Materials and Methods

This study employs a bibliometric analysis to explore research trends on collaborative learning in education. The literature on collaborative learning in education was sourced from the Scopus database. For the title search, the Scopus database articles published during 2014-2024 were extracted in Agustus 2024. The search strategy was formulated using the following keywords: "collaborative learning" in AND education.

Table 1. Inclusion and Exclusion Criteria for Publications

Inclusion criteria	Exclusion criteria
Article published on 2014 - 2024	Article published before 2014
Document Type “article”	Conference papper, book chapter, review, editorial, erratum, book, retracted, short survey
Publication Stage “Final”	Article in press
Source Type “Journal”	Proceedings, books, proposals, thesis papers, or other non-journal articles
Open Access	Not open access
Writer in english	Writer in other english

Table 2. PRISMA Diagram for the Systematic Review

Identification	Articles identified through Scopus database search (n= 351)	
Screening	Articles screened from year (n=225)	Not publication year before 2014 (n= 126)
Eligibility	Articles assessed for eligibility (n= 58)	Not document type article (n= 12) Not publication stage final (n= 1) Not source type Journal (n= 8) Not open access (n= 181) Not in english (n= 5)
Included	Articles included in final bibliometrics analysis (n= 58)	

Results and Discussion

Main Information and Annual Scientific Production

The first output needed in collaborative learning research is to identify main information as the main features of the dataset (Ahnert & Krebs, 2021). The dataset on collaborative learning research spans from 2014 to 2024 and includes 58 scientific articles published across 56 different sources. The annual growth rate of publications was 8.84%, reflecting a consistent rise in interest in collaborative learning. A total of 181 authors contributed to these studies, with only two single-authored documents, emphasizing the collaborative nature of this field. On average, each document had 3.45 co-authors, and 13.79% involved international co-authorship, demonstrating global collaboration. The dataset contains 219 unique author keywords, representing diverse subtopics within collaborative learning. With 2,767 references, the studies are well-cited, averaging 24.59 citations per document. The average age of the documents is 4.21 years, indicating that recent publications continue to shape the discourse. Overall, the dataset reflects a vibrant and collaborative research landscape in the field of collaborative learning.

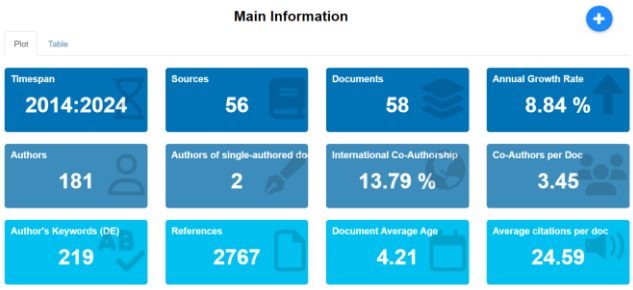

Figure 1. Main Information

Annual Scientific Production

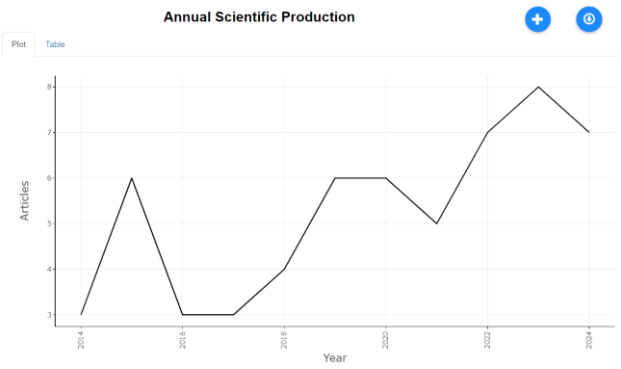

Figure 2. Annual Scientific Production

Figure 4 shows the data on annual scientific production from 2014 to 2024. The number of published articles experienced fluctuations throughout the years. The lowest production was recorded in 2016, with 3 articles published. A noticeable increase occurred in 2015, where 6 articles were published, followed by a significant dip in 2016. After 2016, the scientific output showed a gradual upward trend, peaking in 2023 with 8 articles published. Despite a slight decrease in 2024, where 7 articles were published, the general trend indicates an increasing pattern of scientific output over the years. The graph suggests that scientific production is likely to remain relatively high in the near future, despite the occasional fluctuations observed during the analyzed period.

Most Relevant Sources

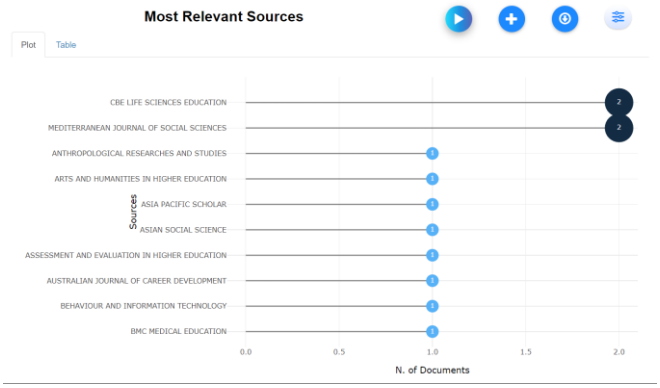

Figure 3. Most Relevant Sources

The chart displays the most relevant sources based on the number of documents published in different journals. The journal "CBE Life Sciences Education" and "Mediterranean Journal of Social Sciences" both have the highest number of relevant articles, with two documents each. Other journals, such as "Anthropological Researches and Studies," "Arts and Humanities in Higher Education," "Asia Pacific Scholar," and others, have contributed one document each. This suggests that the majority of research on the topic analyzed has been distributed across a wide variety of journals, but the "CBE Life Sciences Education" and "Mediterranean Journal of Social Sciences" have the most substantial contributions with a small margin. The chart underscores the diversity of sources contributing to the research in this field, though it also suggests that no single journal overwhelmingly dominates the conversation. The focus of the publications seems to span a variety of disciplines, from social sciences to life sciences and humanities.

World Cloud Analysis

The word cloud analysis on "collaborative learning" highlights key themes. The focus is on collaborative learning itself, emphasizing its role in improving student outcomes. Human-centered approaches and student engagement are central, reflecting how students interact and learn together. The research often explores educational environments like "curriculum" and "teaching," with a significant emphasis on technology integration through terms such as "e-learning" and "computer-aided instruction." Peer collaboration and group dynamics are also important, linking to motivation and engagement. The research spans various disciplines like nursing and health education, and employs theoretical frameworks like metacognition and activity theory to understand learning processes.

Figure 4. World Cloud Analysis

Authors' Production Over Time

Figure 4 illustrates the authors who assumed a dominant role over time based on their publication records. The dominance factor here refers to the calculation of an author's contribution by dividing the number of multi-author papers where the author is listed as the first author by the total number of multi-author articles. From the figure, we can observe certain dominant authors over different time periods. For instance, Waleed Mugahed Al-Rahmi demonstrated notable activity between 2016 and 2020, suggesting a dominant presence in that span. Similarly, Mohd Shahizan Othman and Lizawati MI Yusuf have shown their influence in the same period. Notably, Ana García-Valcárcel has maintained a continuous presence from 2014 to 2022, indicating long-term influence in her field. Other authors, such as Jasperina Brouwer and Rink Hoekstra, exhibited activity mainly between 2016 and 2020. The chart also highlights authors like Sanna Järvelä, Hajo Meijer, and Mahdi Alhaji Musa, who have emerged with consistent contributions from 2018 to 2022, underscoring their importance during this later period.

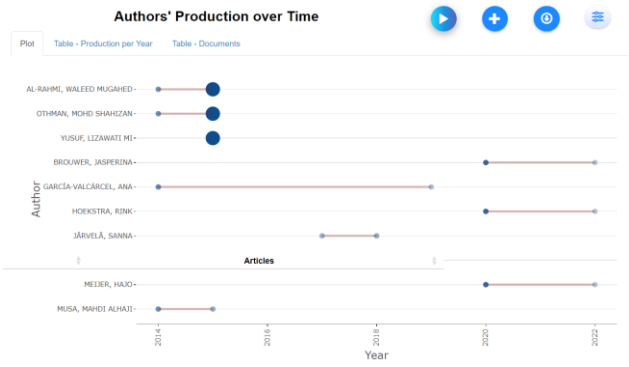

Figure 5. Authors'Production Over Time

Most Relevant Affiliations

When the chart of most relevant affiliations is examined, the most productive institution in the dataset is the University of Oulu, with 13 articles. This is followed by the University of Groningen, which has contributed 8 articles. Abai Kazakh National Pedagogical University and Universidad Autónoma de Baja California both contributed 6 articles each. Indonesia Navy Technology College Bumi Moro and Universitat Ramon Llull each contributed 5 articles. Following them are Utrecht University, Delft University of Technology, Universidad Complutense de Madrid, and Universitat Politècnica de València, each with 4 articles. These institutions represent a diverse geographical spread, demonstrating the global interest and contributions toward the subject under study, with notable participation from universities in Finland, the Netherlands, Kazakhstan, Indonesia, and Spain.

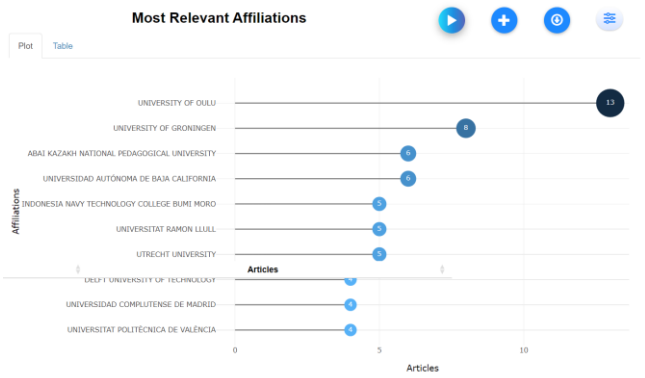

Figure 6. Most Relevant Affiliations

Most Cited Countries

When examining the citation data, the Netherlands leads with a total of 391 citations. This is followed by Korea with 187 citations, and Malaysia with 114 citations. Finland, the United Kingdom, and Spain follow, with 95, 89, and 71 citations, respectively. Norway and Rwanda have lower citation counts, with 18 and 16 citations, while the USA and Morocco are at the bottom, with 13 and 12 citations each. This data reflects the influence of research contributions from these countries, highlighting the significant citation impact of the Netherlands, Korea, and Malaysia. The chart provides an overview of how countries contribute to academic discussions or research fields based on their citation frequency.

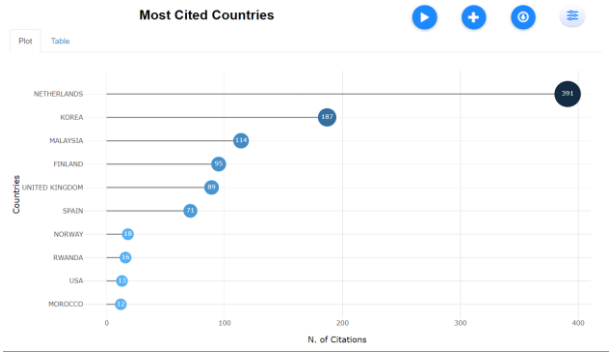

Figure 7. Most Cited Countries

Thematic Map

Themes are keyword groupings whose density and centrality can be used to organize them into a single circle and map them as a two-dimensional image. The thematic map in the figure uses two axes: "Development Level (Density)" on the vertical axis and "Relevance Level (Centrality)" on the horizontal axis. The map groups themes based on these two dimensions. In the upper right quadrant, the themes collaborative learning, people, and students are categorized as motor themes, indicating that these themes are highly relevant and well-developed. These themes are the main drivers in the field being discussed, as they are well-established and important topics. In the lower right quadrant, themes such as education, curriculum, and motivation are categorized as basic themes, meaning that these themes are fundamental to the field, but are not as fully developed or are less specialized than the motor theme. In the bottom left quadrant, themes such as computer-assisted instruction, e-learning, and computer-supported collaborative learning are categorized as emerging or declining themes, indicating that these themes may be emerging or in

decline. They could be in the early stages of development or beginning to lose relevance. Meanwhile, in the top left quadrant, there are no clear themes, indicating that there are no highly specialized or segmented topics in the data. Overall, this thematic map provides insight into the various positions related to education based on their level of development and relevance within the field.

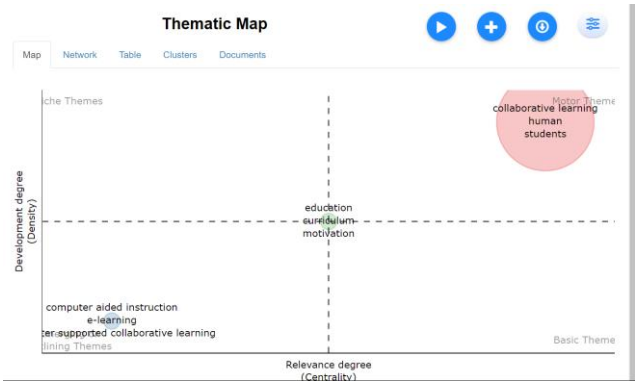

Figure 8. Thematic Map

Co – Occurence Network

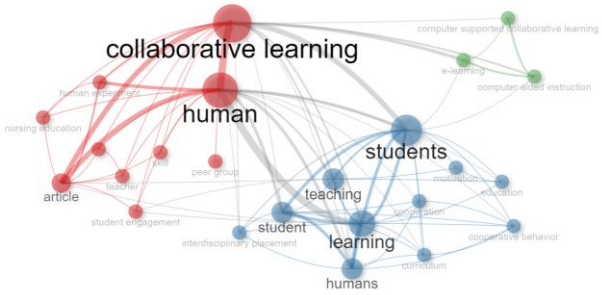

Figure 9. Co – Occurence Networks

The image represents a Co-occurrence Network which shows the connections between keywords (terms) that frequently appear together in various articles or studies. This type of network is typically used in bibliometric analysis to identify concepts that are often discussed together in a specific field. Key interpretations from this network:

Table 2. Co – Occurence Networks

Red Cluster: Collaborative Learning & Human	Collaborative learning and human are central nodes in this cluster, indicating that these concepts often appear together in the studies analyzed. Other closely connected keywords include "nursing education," "article," "skill," "teacher," and "student engagement." This suggests that collaborative learning is commonly applied in the context of nursing education and is closely linked to skill development, teachers, and student engagement.
Blue Cluster: Students & Learning	Students and learning are the central focus of this cluster, showing a strong emphasis on students and the learning process in the related studies. Keywords like "teaching," "student," "cooperation," and "curriculum" are closely related, indicating that these studies frequently discuss the role of teaching, cooperation, and the curriculum in students' learning processes.
Green Cluster: E-learning & Computer-Aided Instruction	This smaller cluster highlights concepts related to educational technology, such as "e-learning" and "computer-aided instruction," as well as "computer-supported collaborative learning." It suggests that the use of technology in education, particularly to support collaborative learning, is also a significant focus in these studies. Overall, this co-occurrence network reflects the interplay between collaborative learning, the role of humans, students, and the use of technology in education, particularly in the context of nursing education, skill development, and student engagement.

Discussion

Based on the bibliometric analysis of collaborative learning in education from the provided document, here's the discussion based on the results. The bibliometric analysis examined 58 articles published between 2014 and 2024 on collaborative learning in education. The study revealed several significant trends. The annual growth rate of publications related to collaborative learning was 8.84%. The number of publications fluctuated but generally trended upwards, peaking in 2023. This increase indicates a sustained interest in the topic, with a high potential for future growth. Research

in this area is notably collaborative, with an average of 3.45 co-authors per document and only two single-authored papers. Additionally, 13.79% of the articles involved international co-authorship, reflecting the global interest in this pedagogical approach. The word cloud analysis highlighted that collaborative learning is often linked to student engagement, technology integration (e.g., e-learning, computer-aided instruction), and peer collaboration. This diversity suggests that the application of collaborative learning spans various educational contexts and disciplines. The documents analyzed were well-cited, with an average of 24.59 citations per article, indicating the relevance of the research in this field. Countries like the Netherlands, Korea, and Malaysia showed significant citation impacts, with the Netherlands leading the field. The University of Oulu in Finland was the most productive institution with 13 articles, followed by other institutions across Europe and Asia. This geographic diversity underlines the global reach of collaborative learning research. The co-occurrence network revealed three main clusters—collaborative learning in human-centered education (especially nursing), student-focused learning processes, and technology-enhanced learning (e-learning and computer-aided instruction). This reflects the convergence of traditional pedagogical practices with modern technology.

Conclusions

In conclusion, the bibliometric analysis provides valuable insights into the current trends and future directions of collaborative learning research. The steady growth in publications, strong global collaboration, and focus on technology integration highlight the critical role collaborative learning plays in modern education. However, there remain gaps in the full realization of its potential, especially concerning emerging educational technologies and practical applications in diverse settings.

The results suggest several opportunities for future research. Further exploration of technology's role in enhancing collaborative learning, particularly in virtual and e-learning environments. More in-depth research into the application of collaborative learning in underrepresented educational contexts (e.g., rural or underserved regions). Interdisciplinary approaches to collaborative learning, particularly in STEM fields, to bridge gaps between theory and practical implementation.

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