

# Collaborative Learning in Higher Education: Bibliometrics Analysis

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## ABSTRACT

The importance of collaborative learning in higher education cannot be overlooked, as it plays a crucial role in enhancing student engagement, academic achievement, and collaborative skills. Based on existing literature, collaborative learning has increasingly been recognized as an effective pedagogical approach in higher education contexts. This study conducts a comprehensive bibliometric analysis to examine the development, structure, and research trends of collaborative learning in higher education over the period 2014–2023. The dataset was retrieved from the Scopus database and consists of peer-reviewed publications focusing on collaborative learning within higher education settings. The bibliometric analysis reveals several key findings, including a steady growth in publication output, with a significant increase observed after 2020 and the highest number of publications recorded in 2023. The results also indicate that research productivity is concentrated among a limited number of prolific authors and institutions, while the majority of authors contributed only a single publication. In addition, a small number of highly cited articles exert substantial influence on the field, particularly those published in high-impact educational technology journals. The dominance of Social Sciences and Computer Science as subject areas highlights the interdisciplinary nature of collaborative learning research, emphasizing both pedagogical and technological perspectives. Overall, this study provides a comprehensive overview of the scientific landscape of collaborative learning in higher education, maps its intellectual structure, and offers insights into future research directions in this field.

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## I. Introduction

Collaborative learning is a learning approach that emphasizes the active involvement of students through interaction, discussion, and cooperation in achieving learning objectives together [1]. This approach encourages students to exchange ideas, build collective understanding, and develop critical and reflective thinking skills [2]. In the context of higher education, collaborative learning is seen as an effective pedagogical strategy because it creates a student-centered learning environment and supports meaningful learning.

Along with the development of digital technology, the implementation of collaborative

learning in higher education continues to grow and transform [3], [4]. The integration of technology, particularly digital platforms and social media, has expanded the space for student collaboration, enabling academic interaction without the constraints of time and space. The use of technology in collaborative learning not only increases student participation and engagement, but also contributes to improved academic performance and the development of 21st-century skills relevant to global demands [5].

Previous studies have revealed the advantages of collaborative learning. In study of [6] states that collaborative learning plays a significant role in improving student learning outcomes in higher education. [7] also show that through collaborative activities, students can develop communication and teamwork skills more effectively. in addition, [8] found that collaborative learning also contributes to improving students' problem-solving abilities and developing their social skills. [9] also emphasize that the collaborative learning approach encourages active student participation in the learning process, thereby creating a more interactive and inclusive classroom atmosphere.

Previous studies have also demonstrated the benefits of collaborative learning in problem solving. [10] identify collaborative learning as an important approach in developing collaborative problem-solving skills in higher education. [11] explains that collaborative learning strategies enable students to build conceptual understanding together through group discussion and reflection. [12] report that the application of collaborative learning can reduce students' academic anxiety due to the social support within the learning group. [13] show that structured collaborative activities can strengthen students' ability to work collectively and take responsibility for shared tasks. [14] highlight that although effective, collaborative learning still faces challenges in the form of uneven group workloads and the complexity of coordination between members.

[15] conducted a bibliometric analysis of Game-Based Collaborative Learning (GBCL) research from 2000 to 2019, mapping publication trends and research topic focus in the field of collaborative learning. [16] conducted a bibliometric study on the use of digital platforms such as WeChat and Tencent Meeting in supporting collaborative learning and student social presence. [17] emphasized that bibliometric analysis is effective in identifying the most influential authors, institutions, and articles in a field of research. [18] showed that the integration of technology in collaborative learning is a dominant theme in higher education research. [19] recommended the development of a blended learning-based collaborative learning model as the next direction for research to improve student engagement and learning experiences.

Although research on collaborative learning in higher education has grown rapidly, bibliometric studies that comprehensively map trends in collaborative learning research in higher education over the past decade remain limited. Previous bibliometric studies have tended to focus on specific subtopics, longer but outdated time frames, or specific technological contexts. Therefore, a bibliometric analysis is needed that systematically examines the development, patterns of collaboration, contributions of authors and institutions, and research focus on collaborative learning in higher education for the period 2014–2023. This analysis is expected to provide an up-to-date and comprehensive overview of the evolution of research in this field.

This study aims to analyze the bibliometric development of collaborative learning research in higher education during the period 2014–2023. Specifically, this study aims to identify publication trends, the most influential authors and institutions, patterns of collaboration between researchers, the distribution of scientific fields, and changes in the focus of collaborative learning research in higher education over the last ten years.

## II. Method

This study uses a bibliometric analysis approach to map the development of research on collaborative learning in higher education, a method commonly used to quantitatively analyze the intellectual structure, trends, and contributions of research in a scientific field [20], [21], [22]. The data sources were obtained from the Scopus and Google Scholar databases, which were selected due to their broad coverage, high indexing quality, and reputation as one of the largest

bibliographic databases for international scientific publications [23]. Data was collected from 2014 to 2023 to provide an up-to-date overview of research trends over the past decade.

The search strategy was designed systematically using a combination of relevant keywords and structured Boolean logic to minimize irrelevant results. The search query used was “collaborative learning” and “higher education” or ‘university’ or “college.” The research methodology flow used in this study is summarized in Figure 1.

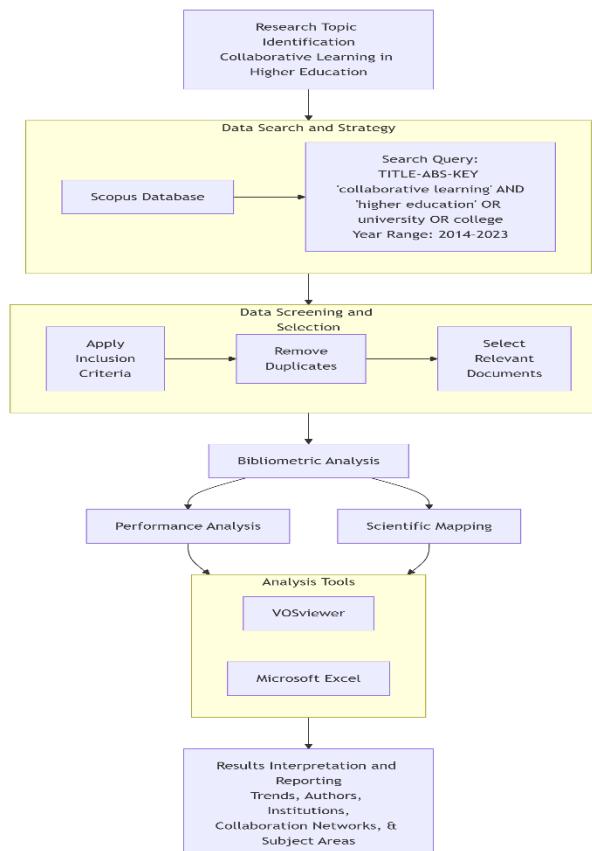


Figure 1. Bibliometric Research Methodology

The inclusion criteria in this study include:

- (1) documents discussing collaborative learning in the context of higher education,
- (2) publications published between 2014 and 2023,
- (3) document types in the form of journal articles, conference proceedings, and review articles
- (4) publications written in English to maintain consistency and comparability of bibliometric analysis.

The data selection process was carried out in several stages, namely the removal of irrelevant documents, checking for duplication, and filtering based on the suitability of the topic to the research focus. This procedure is in line with standard practices in bibliometric studies to improve the validity and reliability of the analysis data [24]. After the data filtering and cleaning process, a number of documents were obtained that met the criteria for further analysis.

Bibliometric analysis was performed using VOSviewer software to visualize author collaboration networks, institutional affiliations, and keyword correlations, and Microsoft Excel for descriptive statistical analysis such as annual publication trends, author productivity, and scientific field distribution [23]. The analysis conducted includes performance analysis to identify the most influential authors, institutions, and articles, as well as scientific mapping to explore

collaboration patterns and the intellectual structure of collaborative learning research in higher education [25].

The research methodology flow includes the stages of data identification, document screening, data cleaning, bibliometric analysis, and visualization of results. This methodological framework enables systematic mapping of research trends, academic contributions, and developments in the focus of collaborative learning studies in higher education during the period analyzed.

### III. Results

#### Publication Growth Trend

The initial output of this bibliometric analysis is the identification of the main characteristics of the dataset, which provides an overview of the general structure and scope of research on collaborative learning in higher education. The dataset covers publications from 2014 to 2023, reflecting scholarly work disseminated through reputable international databases. Overall, the results indicate a steady increase in scientific output over the analyzed period, suggesting a growing academic interest in collaborative learning as an important pedagogical approach in higher education. The publications involved contributions from a substantial number of authors, the majority of whom collaborated in multi-authored works, highlighting the inherently collaborative nature of research in this field. In addition, the presence of international co-authorship illustrates the global dimension of collaborative learning research. A wide range of author keywords was identified, indicating the diversity of themes and research focuses related to collaborative learning in higher education.

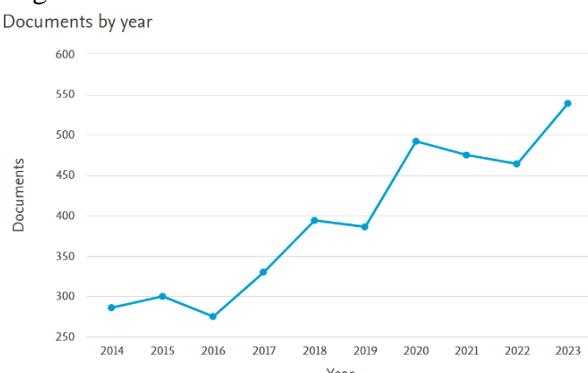


Figure 2. The Trend of Article Publishing Over the Past 10 Years

Figure 2 illustrates the annual publication trend on collaborative learning in higher education from 2014 to 2023. Overall, the data reveal a clear upward trajectory, indicating a growing scholarly interest in this research area. Although minor fluctuations occurred between 2014 and 2016, publication output increased substantially from 2017 onward. The most significant growth was observed after 2020, culminating in the highest number of publications in 2023. This trend suggests that collaborative learning has become an increasingly prominent topic in higher education research over the past decade.

## Most Productive Authors

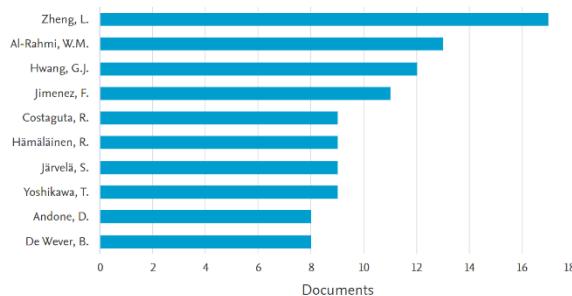


Figure 3. The 10 Most Productive Authors

Figure 3 illustrates the most productive authors in the field of collaborative learning in higher education based on the number of published documents. A small group of authors stands out with higher publication counts compared to others, indicating consistent scholarly engagement with the topic. These authors have contributed multiple studies over the analyzed period, reflecting their sustained focus on collaborative learning research. In contrast, a large number of authors have produced only one publication each, suggesting that many researchers engage with this topic on a more occasional basis. This distribution indicates that while the field benefits from contributions by a core group of productive authors, it also attracts a broad range of scholars from diverse academic backgrounds. Overall, the chart highlights the presence of a limited number of highly productive authors alongside a wider community of contributors, reinforcing the collaborative and expanding nature of research on collaborative learning in higher education.

## Word Cloud Analysis

The word cloud analysis illustrates the most frequently occurring keywords in research on collaborative learning in higher education. As expected, the term “collaborative learning” appears as the most prominent keyword, emphasizing its central role in the analyzed literature. Closely related terms such as “student engagement,” “active learning,” and “group work” highlight the strong focus on learner-centered approaches and interactive learning processes. Keywords related to educational contexts, including “higher education,” “curriculum,” and “teaching strategies,” indicate that collaborative learning is predominantly examined within formal instructional settings. In addition, technology-related terms such as “e-learning,” “online learning,” and “learning management systems” reflect the increasing integration of digital technologies in collaborative learning practices. The presence of keywords associated with collaboration dynamics, such as “peer interaction” and “teamwork,” further underscores the importance of social interaction in facilitating learning outcomes. Overall, the word cloud demonstrates the thematic diversity of collaborative learning research while reinforcing its interdisciplinary and technology-enhanced nature in higher education.

## Authors' Productivity Over Time

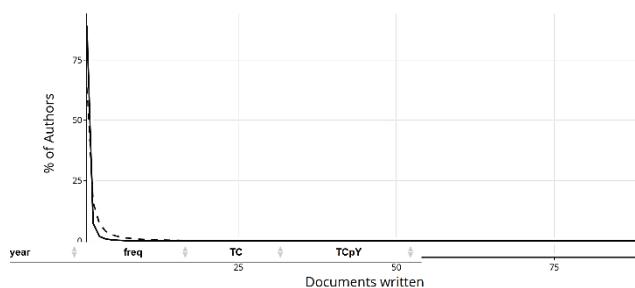


Figure 4. Author Productivity Over Time

As shown in Figure 4, author productivity in collaborative learning research within higher education follows Lotka's Law, where the majority of authors (89.1%) contributed only one publication, while a very small proportion produced multiple works. This distribution indicates that knowledge production is concentrated among a limited number of prolific researchers. The temporal analysis further reveals that several authors assumed dominant roles during specific periods, reflecting sustained scholarly engagement over time. Notable productivity was observed particularly during the middle phase of the analyzed period, between 2016 and 2020, suggesting a phase of intensified research focus on collaborative learning. In contrast, some authors maintained a continuous presence across a longer time span, indicating long-term contributions to the development of the field. Additionally, a group of authors emerged more prominently in the later years of the analysis, highlighting the entry of new influential contributors alongside established scholars. Overall, these findings depict a dynamic research landscape characterized by both continuity and renewal, where long-standing contributors coexist with emerging researchers in shaping collaborative learning scholarship in higher education.

## Authors Collaboration

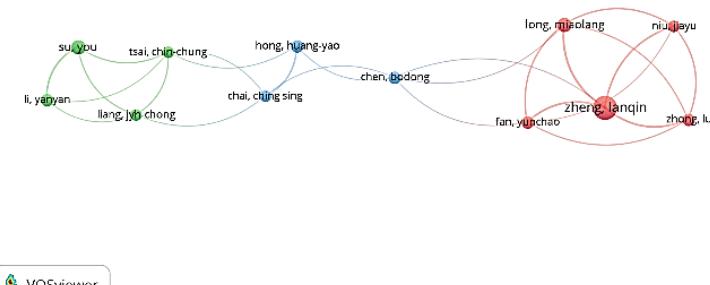


Figure 5. Authors Collaboration

Figure 5 visualization maps the co-authorship network among researchers in the field of collaborative learning in higher education. The nodes represent individual authors, with their size indicating the relative volume of publications or contributions to the field, while the links between nodes illustrate co-authorship relationships and collaboration intensity. The network is organized into several color-coded clusters, reflecting the presence of distinct research groups or collaborative communities. These clusters indicate that collaborative learning research is largely structured around closely connected author groups rather than a single, fully integrated network. Some authors occupy more central positions within their respective clusters, suggesting their influential role in sustaining research collaboration and knowledge production. Meanwhile, the limited connections between clusters highlight emerging inter-group collaborations, pointing to gradual integration across different research communities within the field.

## Affiliation Productivity

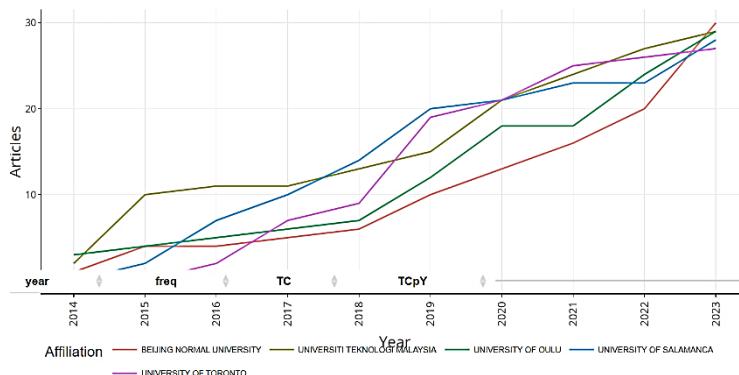


Figure 6. Affiliation Productivity

Figure 6 illustrates the publication productivity of the most relevant institutional affiliations in collaborative learning research in higher education from 2014 to 2023. The results show that a limited number of universities, such as Universiti Teknologi Malaysia, University of Salamanca, and University of Toronto, exhibit consistently higher and increasing publication outputs over time, indicating strong institutional engagement in this research area. In contrast, many other institutions contribute fewer publications. This pattern suggests that collaborative learning research in higher education is driven by a core group of productive institutions, supported by a broader set of contributing universities from diverse geographical regions, reflecting the global interest in this field.

## The Most Cited Articles

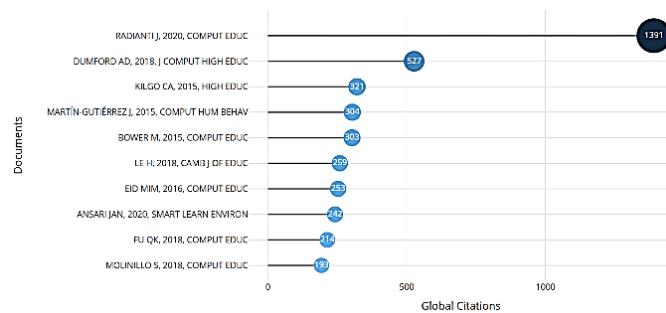


Figure 7. The Most Cited Articles

Figure 7 presents the most cited articles in collaborative learning research within higher education during the period 2014–2023. The results reveal a highly skewed citation distribution, with one article demonstrating a markedly dominant influence. The study by Radifani et al. (2020) published in *Computers & Education* emerges as the most influential work, receiving over 1,300 global citations, far exceeding all other publications in the dataset. This is followed by Dumford and Miller (2018) with approximately 527 citations, and Kılıçoglu (2015) with more than 400 citations, indicating their substantial impact on subsequent research. Other notable contributions, such as those by Martín-Gutiérrez et al. (2015) and Bower (2015), also received considerable citation attention, although at a significantly lower level. Overall, the figure demonstrates that scholarly influence in collaborative learning research is concentrated in a small number of highly cited articles, particularly those published in high-impact educational technology journals.

## Distribution of Subject Area

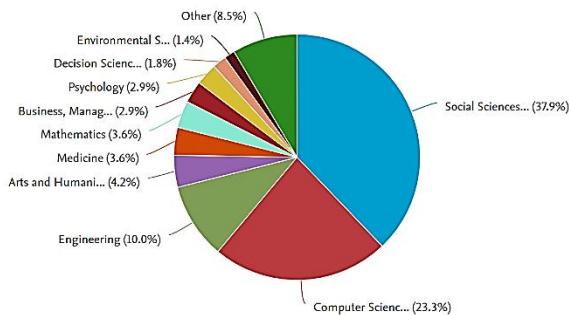


Figure 8. Distribution of Subject Area

Figure 8 illustrates the disciplinary landscape of collaborative learning research in higher education. Social Sciences dominate the field (approximately 38%), encompassing education and pedagogical studies that form the core of collaborative learning research. This is followed by Computer Science (around 23%), reflecting the increasing role of digital technologies, online platforms, and computer-supported collaborative learning environments. Other subject areas, including Engineering, Arts and Humanities, Psychology, and Health-related disciplines, contribute smaller yet significant proportions, addressing instructional design, cognitive processes, and applied learning contexts. Overall, this distribution highlights the inherently interdisciplinary nature of collaborative learning research, with a strong social science foundation complemented by technological and applied disciplinary perspectives.

#### IV. Discussion

This bibliometric analysis provides a comprehensive overview of the intellectual structure, research trends, and scholarly dynamics surrounding collaborative learning in higher education from 2014 to 2023. The findings reveal not only a steady growth in publication output but also important patterns related to author productivity, institutional dominance, thematic development, and disciplinary distribution, which collectively reflect the maturation and expanding relevance of collaborative learning as a pedagogical approach in higher education.

##### Research Growth and Scholarly Attention

The upward trend in annual publications indicates a sustained and increasing scholarly interest in collaborative learning within higher education. The acceleration of publication output after 2017, and particularly after 2020, suggests that collaborative learning has gained heightened relevance in response to contemporary educational challenges, including digital transformation and the global shift toward online and blended learning environments. This growth aligns with broader trends in higher education research that emphasize active learning, student engagement, and learner-centered pedagogies. The expansion of collaborative learning research during this period reflects its perceived effectiveness in fostering higher-order thinking skills, communication, and teamwork competencies that are increasingly demanded in modern educational contexts.

##### Author Productivity and Knowledge Concentration

The author productivity analysis demonstrates a highly skewed distribution consistent with Lotka's Law, where the majority of authors contribute only a single publication, while a small group of prolific researchers accounts for a substantial portion of the output. This pattern suggests that the intellectual development of collaborative learning research is driven by a core group of committed scholars who continuously shape the direction of the field. At the same time, the large number of occasional contributors indicates that collaborative learning attracts interest from researchers across diverse disciplines, reinforcing its interdisciplinary appeal. The temporal analysis of author productivity further highlights a dynamic research landscape characterized by both continuity and renewal, where long-standing contributors coexist with emerging scholars,

ensuring both stability and innovation in the field.

### **Collaboration Patterns and Research Networks**

The co-authorship network analysis reveals that collaborative learning research is structured around several distinct research clusters rather than a single, fully integrated scholarly network. These clusters reflect close-knit research communities, often shaped by shared institutional affiliations, geographical proximity, or common research interests. While strong intra-cluster collaboration suggests effective knowledge exchange within research groups, the relatively limited inter-cluster connections indicate opportunities for broader international and interdisciplinary collaboration. Strengthening cross-cluster partnerships may contribute to more integrated theoretical frameworks and comparative perspectives, thereby enhancing the global coherence of collaborative learning research in higher education.

### **Institutional Dominance and Global Contributions**

The analysis of institutional productivity shows that a limited number of universities play a dominant role in advancing collaborative learning research, while a broader range of institutions contributes at a lower frequency. This pattern reflects the uneven distribution of research capacity and resources across institutions. However, the presence of productive institutions from different regions highlights the global relevance of collaborative learning as a research topic. The international distribution of contributing institutions suggests that collaborative learning is not confined to specific educational systems but is widely recognized as a valuable pedagogical approach across diverse higher education contexts.

### **Citation Impact and Influential Scholarship**

The citation analysis demonstrates that scholarly influence within collaborative learning research is concentrated in a small number of highly cited articles, particularly those published in high-impact journals related to educational technology and pedagogy. These influential works often focus on the integration of technology with collaborative learning, underscoring the importance of digital tools in facilitating collaboration and interaction among learners. The dominance of a few highly cited studies suggests that foundational and methodologically robust research plays a critical role in shaping subsequent scholarship. At the same time, this concentration highlights the need for continued diversification of influential perspectives to prevent overreliance on a limited set of canonical works.

### **Thematic Development and Disciplinary Orientation**

The thematic and subject area analyses reveal that collaborative learning research in higher education is strongly rooted in the Social Sciences, particularly education and pedagogy, while also exhibiting significant contributions from Computer Science and other applied disciplines. The prominence of Social Sciences reflects the pedagogical and theoretical foundations of collaborative learning, which emphasize social interaction, learner engagement, and instructional design. Meanwhile, the substantial contribution of Computer Science highlights the growing role of digital platforms, computer-supported collaborative learning, and online learning environments. This interdisciplinary orientation indicates that collaborative learning functions as a bridge between pedagogical theory and technological innovation, enabling its adaptation to evolving educational landscapes.

### **Theoretical and Practical Implications**

From a theoretical perspective, the findings suggest that collaborative learning research has evolved toward an integrated framework that combines social constructivist principles with technology-enhanced learning theories. The sustained focus on collaboration, student engagement, and interaction supports the continued relevance of socio-cultural learning theories in higher education research. Practically, the results highlight the importance for educators and institutions

to design learning environments that promote meaningful collaboration, supported by appropriate technological tools. For researchers, the identified trends and gaps suggest opportunities for future studies that explore underrepresented themes, cross-disciplinary collaborations, and comparative international perspectives.

### Limitations and Future Research Directions

Despite its contributions, this study has several limitations. First, the analysis is limited to publications indexed in selected international databases, which may exclude relevant studies published in local or non-indexed journals. Second, bibliometric methods emphasize quantitative patterns and may not fully capture the qualitative depth or pedagogical nuances of collaborative learning research. Future studies could address these limitations by integrating systematic literature reviews or meta-analyses to complement bibliometric findings. Additionally, further research could explore emerging themes, such as collaborative learning in artificial intelligence-supported environments or culturally responsive collaborative pedagogies, to extend the current understanding of the field.

### V. Conclusion and Suggestions

This bibliometric analysis provides a comprehensive overview of the development of collaborative learning research in higher education from 2014 to 2023. The findings reveal a consistent growth in publication output, indicating increasing scholarly attention to collaborative learning as a key pedagogical approach in higher education. The results demonstrate that research in this field is characterized by a highly collaborative authorship pattern, a concentration of productivity among a limited number of core authors and institutions, and a strong citation impact driven by a small number of influential articles. The dominance of Social Sciences and Computer Science highlights the interdisciplinary nature of the field, particularly the integration of pedagogical and technological perspectives. Overall, this study contributes to a clearer understanding of the intellectual structure, research trends, and collaborative networks that shape the scholarly discourse on collaborative learning in higher education.

Based on the findings of this bibliometric study, future research is encouraged to further explore underrepresented regions and institutions to achieve a more balanced global perspective on collaborative learning in higher education. Researchers may also consider conducting longitudinal and mixed-method studies to complement bibliometric findings with deeper pedagogical insights. In addition, future bibliometric analyses could integrate multiple databases and advanced analytical tools to enhance data coverage and robustness. From a practical perspective, educators and policymakers are encouraged to leverage the identified research trends and influential themes, particularly technology-enhanced collaborative learning, to inform curriculum design and instructional innovation in higher education contexts.

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