

**RESEARCH TRENDS ON AI-SUPPORTED COLLABORATIVE LEARNING IN
ENGLISH AS A FOREIGN LANGUAGE CLASSROOMS: A BIBLIOMETRIC
ANALYSIS OF SCOPUS-INDEXED ARTICLES**

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ABSTRACT

This study examines trends in research on artificial intelligence (AI)-based collaborative learning from 2015 to 2025. In the field of education, the rapid development of artificial intelligence opens up various new possibilities, such as personalized learning, automated feedback, and interactive learning environments. However, research that comprehensively reflects developments in this field remains limited. Therefore, this study aims to identify publication trends, key contributors, and dominant research topics. The method used in this study is bibliometric analysis based on data obtained from the Scopus database. The data was analyzed using VOSviewer software to examine the growth of article publications, author productivity, country contributions, citation frequency, and co-occurrence of keywords. The results show that the number of articles increased sharply, particularly during the 2022–2025 period. The United States, China, and Hong Kong are the top countries in terms of the number of publications. Keyword analysis identified key topics in education, including artificial intelligence, collaborative learning, learning analytics, and digital innovation. In conclusion, artificial intelligence-based collaborative learning is a rapidly growing field of research with great potential to support the transition toward the education of the future.

Keywords: Artificial Intelligence (AI), EFL, Collaborative Learning

ABSTRAK

Penelitian ini mengkaji tren penelitian tentang pembelajaran kolaboratif berbasis kecerdasan buatan (AI) dari tahun 2015 hingga 2025. Di bidang pendidikan, perkembangan pesat kecerdasan buatan membuka berbagai kemungkinan baru, seperti pembelajaran yang dipersonalisasi, umpan balik otomatis, dan lingkungan pembelajaran interaktif. Namun, penelitian yang secara komprehensif mencerminkan perkembangan di bidang ini masih terbatas. Oleh karena itu, studi ini bertujuan untuk mengidentifikasi tren publikasi, kontributor utama, dan topik penelitian yang dominan. Metode yang digunakan dalam studi ini adalah analisis bibliometrik berdasarkan data yang diperoleh dari basis data Scopus. Data

dianalisis menggunakan perangkat lunak VOSviewer untuk mengkaji pertumbuhan publikasi artikel, produktivitas penulis, kontribusi negara, frekuensi kutipan, dan kemunculan bersama kata kunci. Hasil menunjukkan bahwa jumlah artikel meningkat tajam, terutama selama periode 2022–2025. Amerika Serikat, Tiongkok, dan Hong Kong merupakan negara-negara teratas dalam hal jumlah publikasi. Analisis kata kunci mengidentifikasi topik-topik utama dalam pendidikan, termasuk kecerdasan buatan, pembelajaran kolaboratif, analitik pembelajaran, dan inovasi digital. Kesimpulannya, pembelajaran kolaboratif berbasis kecerdasan buatan merupakan bidang penelitian yang berkembang pesat dengan potensi besar untuk mendukung transisi menuju pendidikan masa depan.

Kata Kunci: Artificial Intelligence (AI), Bahasa Inggris sebagai bahasa asing (EFL), Pembelajaran kolaboratif

A. Introduction

The rapid development of digital technology has brought about significant changes in many sectors, including education. One of the most influential new initiatives in recent years is artificial intelligence (AI), which enables learning processes and decision-making, and refers to computer systems designed to perform tasks that typically require human intelligence, such as learning, reasoning, and problem-solving. In the field of education, artificial intelligence is increasingly being used to support the learning process through intelligent tutoring systems, personalized learning environments, automated feedback, and learning analytics. As noted by Zawacki-Richter (2019), artificial intelligence can transform higher education by

creating more flexible and efficient learning systems. Consequently, artificial intelligence has become a major topic in contemporary educational research.

On the other hand, collaborative learning is increasingly viewed as an effective instructional approach that emphasizes relationships among students to achieve shared learning goals. This approach enables students to exchange ideas, solve problems together, and develop critical thinking skills through social interaction. Collaborative learning is deeply rooted in Vygotsky's social constructivism theory, which emphasizes the importance of dialogue in constructing knowledge. Previous research has shown that collaborative learning can improve student engagement,

academic achievement, communication skills, and critical thinking abilities (Jeong et al., 2019).

Therefore, collaborative learning continues to be widely implemented in both traditional and digital learning environments. Despite its many advantages, the implementation of collaborative learning often faces challenges. Uneven participation, poor communication, a lack of cohesion, and difficulties in tracking individual contributions are common obstacles in group work. In the context of online learning, where real-time supervision is severely limited, these obstacles become much more difficult to overcome. Researchers have begun integrating AI technology into collaborative learning environments to address these issues. AI can be used to track individual engagement, assess group interactions, provide real-time feedback, and generate personalized learning recommendations for each group member (Tan et al., 2022).

Recent studies indicate that the importance of artificial intelligence in collaborative learning environments is increasingly recognised. In their systematic review, Tan et al. (2022)

found that AI techniques such as machine learning, natural language processing, and intelligent agents have been widely used over the past two decades to support collaborative learning processes. Similarly, Chen et al. (2024) report that AI-based learning analytics tools effectively enhance the quality of collaboration in computer-supported collaborative learning environments, monitor learner engagement, and optimise group learning outcomes. Furthermore, as emphasised by Ba et al. (2026), artificial intelligence agents are increasingly being used to facilitate communication, coordination, and adaptive support in collaborative learning activities.

The growing interest in AI-based collaborative learning is reflected in the increasing number of publications in prestigious journals indexed in Scopus and Google Scholar. For example, in journals such as *Computers & Education*, *Computers and Education: Artificial Intelligence*, *Educational Research Review*, and *Frontiers in Psychology*. This trend indicates that AI-supported collaborative learning is increasingly becoming an active and important field in contemporary educational research.

However, although research on this topic continues to grow, a comprehensive overview of the development of research on artificial intelligence (AI)-based collaborative learning remains scarce. To understand current research trends and future opportunities, it is important to examine publication trends, the most frequently used keywords, as well as influential authors, productive countries, and leading publishers. One effective method for studying these trends is bibliometric analysis, which is a systematic analysis of scientific articles using quantitative methods.

Therefore, this study aims to analyze trends in research on artificial intelligence (AI)-based collaborative learning published in the Scopus database between 2015 and 2025. Specifically, this study examines the annual growth in the number of publications, the most frequently used keywords, authors with the most publications, the most frequently cited authors, the top contributing countries, and the leading publishers. The results of this study are expected to provide valuable insights for researchers, educators, and policymakers regarding future trends in AI-supported collaborative learning.

B. Research Method

This study utilizes bibliometric methods to analyze publication trends in artificial intelligence (AI)-based collaborative learning. This approach was chosen for its ability to provide a systematic and quantitative evaluation of research developments in a specific field based on scientific publication data. The primary data source for this study is the Scopus database, while visualization tools such as VOSviewer were used to identify patterns of relationships among variables, including author collaboration, keyword occurrence, and publication distribution.

C. Research Findings and Discussion

The primary source of data collection in this research methodology is the Scopus database. In the first step, articles were searched for using keywords related to AI-based collaborative learning in language learning environments. By limiting the search to publications from 2015 to 2025, a total of 992 research articles were identified, representing research developments over the past decade. Initial data from the Scopus database

(Figure 1) indicates that a total of 1,152 articles were found.

All search results are exported in CSV format to facilitate further processing and analysis. Next, the CSV file is opened and cleaned in Microsoft Excel using the following steps: open Microsoft Excel, select the Data tab, choose "From Text/CSV," and then import the downloaded file. This process aims to ensure the data is well-organized, easy to read, and ready for further analysis. After cleaning, the data is used for visualization analysis with VOSviewer software to identify patterns of relationships between variables such as author collaboration and keyword frequency. The results are shown in figure 2.

In the next stage, the information underwent sequential filtering and cleaning. In the first stage, keywords that deviated from the main research topic were removed, leaving a total of 292 documents relevant to the topic. Next, duplicate or irrelevant documents were removed, leaving a total of 212 articles. In the final stage, using language criteria, only English-language articles and books were selected, resulting in a total of 204 research articles. This data selection

process was conducted in accordance with PRISMA, developed by David Moher and colleagues (2009). This method (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) consists of the identification, screening, eligibility assessment, and finally inclusion stages. The data that passed through all these selection stages were used as the primary sample for bibliometric analysis to identify trends, publication patterns, and opportunities for future research. Presented in figure 3.

The use of VOSviewer in this analytical framework allows for a more organized and interconnected presentation of data. The VOSviewer software, developed by Nisse Jan van Eck and Ludovico Waltman of Leiden University, helps identify research patterns and supports the overall research objectives by clearly visualizing the relationships between variables, as presented in Table 1.

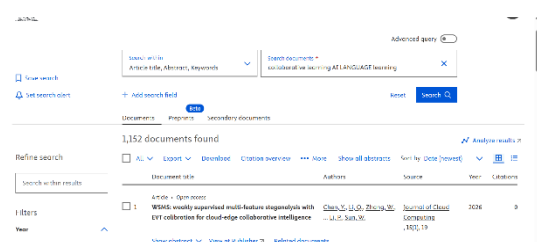


Figure 1 Search Queries in the Scopus Databased

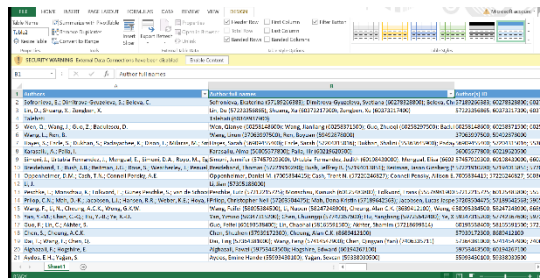


Figure 2 CSV layout Format into Microsoft Excel View

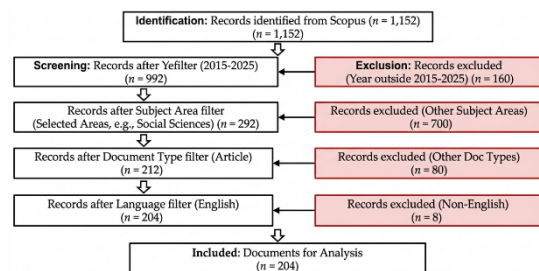


Figure 3 Prisma Flow for Sample Identification

Table 1 Vos Viewer Software Retrieval Setting to Bibliometric Analysis

Type	Method	Thres	Unit	Sel
Co-auth.author	Full	2	keep docs	Max
Co-auth.country	Full	5	keep docs	Max
Co-occ.keyword	Full	5	ignore docs	40
Citation org	Full	3	keep docs	Max
source	Full	1	keep docs	Max

Publication Frequency of AI-Based Collaborative Learning Research (2015-2025)

Research findings on collaborative learning obtained from the Scopus database for the period 2015–2025 were analyzed in Microsoft Excel CSV format. The data was then classified by year, systematically grouped by the number of articles, and sorted. The findings indicate that AI-based collaborative learning research experienced a significant increase from 2022 to 2025. During this period, the number of publications peaked in 2025, with a total of 124 articles. This suggests that academic interest in using artificial intelligence for collaborative learning is growing. The distribution of publication frequency is shown in Figure 4.

Keywords Frequently Used in AI-Based Collaborative Learning Research Articles

At this stage, to identify the most frequently used keywords in this study, a combined frequency method was applied to all detected keywords. Based on the initial results, 40 keywords were identified, as shown in Figure 5. However, since not all of these keywords were fully aligned with the main focus of the study, an additional screening process was

conducted. After this screening, the number of keywords included in the final analysis was reduced to 22.

Some of the keywords eliminated in this process include terms that are too general or not specific enough to the research topic, such as student, collaborative learning, teaching, large language model, teachers, ChatGPT, educational computing, learning system, computer-aided instruction, ethical technology, human-AI collaboration, AI in education, education, chatbots, feedback, AI, learning, and human. This filtering process aims to improve the accuracy of the analysis and ensure that the keywords used truly represent the main focus of the research.

The Most Authors of Articles on AI-based Collaborative learning

At this stage, the study examined the authors who have demonstrated the highest productivity in publishing research articles. The analysis presented in Figure 6 identifies a total of 15 authors who are considered productive within this field. Among them, Chen Xieling and Xie Haoran stand out as the most prolific contributors, each having published 3

documents. This result highlights their notable role and substantial contributions to advancing research on collaborative learning supported by artificial intelligence.

Authors with the Most Citations in AI-Based Collaborative Learning Research

At this stage, the researcher also analyzed the authors with the highest number of citations using VOSviewer software. The results of this analysis identified the top 3 authors with the highest number of citations. Chen Xieling ranked first with a total of 627 citations, followed by Xie Haoran with the same number of citations, namely 627. Meanwhile, the third position was held by Cheng Gary K.S. with 604 citations. These findings indicate that these three authors have a high level of influence in the development of AI-based collaborative learning research, as reflected by the high number of citations to their works. The results of the analysis can be seen in Figure 7.

Countries with the Highest Number of Publications in Artificial Intelligence-Based Collaborative Learning Research.

At this stage, the researchers also analyzed the countries with the highest number of publications in this field of research. Based on the results presented in Figure 8, 18 countries were identified as contributors to the publication of scientific articles. In this analysis, we selected the three countries with the highest number of publications. The United States ranked first with a total of 39 documents, followed by China with 34 documents, and Hong Kong in third place with 15 published documents. These results indicate that these three countries play a significant role in the development of AI-based collaborative learning research. The results can be seen in Figure 8.

The Most Productive Publishers in Research on Artificial Intelligence-Based Collaborative Learning

At this stage, the researchers analyzed the most productive publishers in publishing articles on AI-based collaborative learning. Based on the analysis results, nine publishers were identified as actively contributing to this field. However, the researchers selected the top three publishers with the highest number of publications. The top position is held

by **Education and Information Technologies**, with 11 documents (21.15%), followed by **Computers and Education: Artificial Intelligence** in second place with 8 documents (15.38%), and **Interactive Learning Environments** in third place with 7 documents (13.46%). These results indicate that these three publishers play the most significant role in the publication of AI-based collaborative learning research. Detailed data can be found in Table 2.

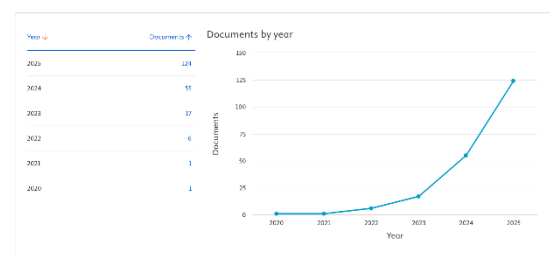


Figure 4 Publication Frequency on AI-Based Collaborative Learning Researchers by year

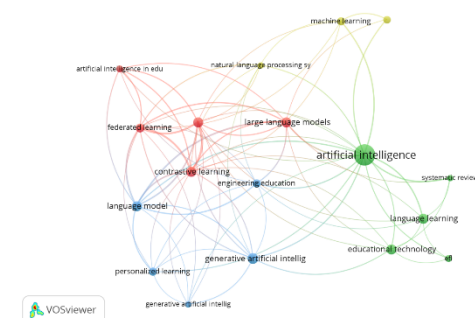


Figure 5 The Most Commonly used Keyword in Articles discussing AI-Based Collaborative Learning

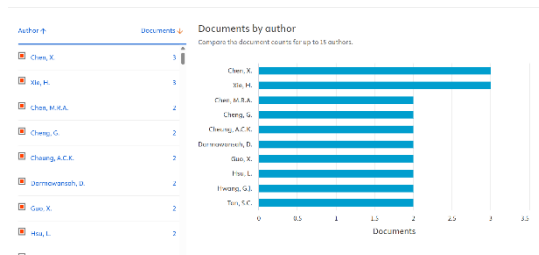


Figure 6 The Most Authors of Articles on AI-based Collaborative learning



Figure 7 Authors with the Most Citations in AI-Based Collaborative Learning Research

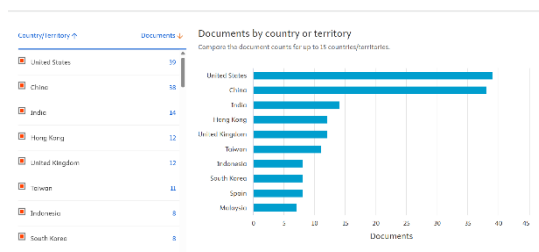


Figure 8 Countries with the Highest Number of Publications in Artificial Intelligence-Based Collaborative Learning Research

Table 2 The Most Productive Publishers in Research on Artificial Intelligence-Based Collaborative Learning

Publisher	Publication	Percentage
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Education	11	21.15%
and		
Information		
Technologies		
Computers	8	15.38%
and		
Education:		
Artificial		
Intelligence		
Interactive	7	13.46%
Learning		
Environments		
Frontiers in	6	11.54%
Education		
Educational	5	9.62%
Technology		
and Society		
British	5	9.62%
Journal of		
Educational		
Technology		
The	4	7.69%
Education		
University of		
Hong Kong		
Department	3	5.77%
of English		
Language		
Education		
University of	3	5.77%
Toronto,		
Canada		

E. Conclusion

Based on the results of a bibliometric study of works published in Scopus between 2015 and 2025, it can be concluded that research on

artificial intelligence (AI)-based collaborative learning has experienced remarkable growth and shows an upward trend year over year. The sharp increase in the number of publications since 2022, which peaked in 2025, indicates that the integration of artificial intelligence into collaborative learning has become a primary focus for academics and researchers in many countries. This finding aligns with research conducted by Yun, Lee, & Choi (2024), which notes that academic interest has grown rapidly in recent years due to the potential impact of artificial intelligence (AI) on the learning process.

Based on the analysis, research contributions in this field are still dominated by a handful of developed countries the United States, China, and Hong Kong, which have a high number of publications and strong international collaboration networks. The dominance of these countries indicates that the development of artificial intelligence in education is largely led by regions that already possess well established technological and research capabilities. Furthermore, a few authors, with a large number of publications and

citations, wield significant influence and play a crucial role in shaping trends in this research field. As confirmed by Zhai et al. (2024), this supports the finding that the development of artificial intelligence in education is largely led by institutions and countries with robust digital infrastructure.

On the other hand, keyword analysis indicates that the research primarily focuses on the integration of artificial intelligence into education, collaborative learning, digital learning innovation, learning analytics, and language learning development. These findings align with a systematic review conducted by Lin and Wang (2022), which states that integrating artificial intelligence into collaborative learning can improve group performance. They found that artificial intelligence is widely used to analyze social interactions, discussion patterns, learners' emotions, and learning characteristics.

Overall, this study demonstrates that artificial intelligence (AI)-based collaborative learning is a rapidly evolving interdisciplinary field that is crucial for meeting the educational needs of the 21st century. Therefore, it is recommended that

future research be expanded to include information sources beyond Scopus, such as Web of Science, Dimensions, and Google Scholar, in order to conduct a more comprehensive analysis. Additionally, future research should focus on real-world classroom applications, particularly within the English as a Foreign Language (EFL) learning environment. This is supported by the research of Putri & Jaya (2026), which concluded that while EFL students use artificial intelligence as a collaborative partner for academic tasks, ethical and digital literacy challenges persist. Future research should also examine the impact of data privacy, teacher training, and generative AI technologies such as ChatGPT, adaptive learning systems, and intelligent tutoring systems on student learning outcomes. Therefore, we hope that the findings of this study will serve as a foundation for educational institutions and researchers to develop more innovative, effective, and sustainable AI-based collaborative learning strategies.

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