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Community of Inquiry in Technology-Mediated Collaborative Learning: A Bibliometric Analysis (2021-2025)

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Abstract

Background and Aim: Technology-mediated learning has attracted growing interest in higher education, including applications of the Community of Inquiry (CoI) framework. This study mapped publication trends, contributors, bibliographic relationships, and research themes in this field between 2021 and 2025.

Materials and Methods: Bibliometric data were retrieved from Dimensions AI on 22 July 2026. Article selection was reported using PRISMA 2020. The initial 37,715 records were filtered by publication year, publication type, research field, Sustainable Development Goal, open-access status, and selected source titles, yielding 278 open-access journal articles. Performance analysis, bibliographic coupling, and keyword co-occurrence analysis using VOSviewer examined publication patterns, citation impact, contributing authors, organizations, countries, sources, and thematic associations.

Results: Annual output increased from 37 articles in 2021 to 67 in 2023, declined to 55 in 2024, and reached 69 in 2025. China and the United States contributed 32 and 31 publications, respectively. A study by Ayanwale received the most citations (291), while Education and Information Technologies demonstrated the highest citation impact among the analyzed sources. Bibliographic coupling identified publication groups sharing reference structures. Keyword co-occurrence revealed three thematic clusters: educational technology, student engagement, and learning effectiveness; CoI and learning interaction; and COVID-19, online teaching, and learner perceptions.

Conclusion: The corpus demonstrates continuing scholarly attention to CoI and technology-mediated learning, highlighting influential contributions and interconnected themes. These findings provide a descriptive foundation for further research. Interpretation and generalization require consideration of database coverage, open-access selection, source-title restrictions, and the predefined search strategy, which delimit the literature's scope and representativeness.

Keywords: Community of Inquiry, Social Media Supported Learning, Collaborative Learning, Bibliometric Analysis, Educational Technology, Higher Education

Introduction

The advancement of digital technologies has transformed higher education by expanding learning beyond conventional classroom environments into online and technology-mediated settings. These environments include learning management systems, mobile technologies, social media platforms, virtual learning environments, and other digital tools that facilitate communication, interaction, knowledge sharing, and learner engagement. Such developments have also increased interest in collaborative learning, a pedagogical approach rooted in social constructivism that emphasizes social interaction, co-construction of knowledge, and skills development (Sappaile et al., 2025; Zhang, 2023). The integration of collaborative learning into technology-mediated environments has increased interest in theoretical frameworks that explain how meaningful online learning occurs. Among these, the Community of Inquiry (CoI) framework proposed by Garrison et al. (1999) provides a prominent theoretical lens for understanding online learning through the interaction of cognitive presence, social presence, and teaching presence. Although originally developed for computer-mediated conferencing,

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the framework has been applied across different online and blended learning contexts to examine interaction, engagement, knowledge construction, and learning experiences (Fiock, 2020; Martin et al., 2022; Moore & Miller, 2022). The broader use of digital technologies therefore provides an important context for examining how the CoI framework has been represented across contemporary technology-mediated learning research.

The COVID-19 pandemic further accelerated the adoption of technology-mediated education, with educational institutions increasingly relying on online platforms to sustain teaching and learning (Bond et al., 2021; Hodges et al., 2020). This period generated substantial scholarly attention to technology-supported learning and to theoretical frameworks used to understand online teaching and learning experiences. Consequently, research related to the Community of Inquiry framework has been examined across a range of technology-mediated educational contexts, including online, blended, mobile and social-media-supported learning environments.

Existing studies have examined different aspects of Community of Inquiry research, including teaching presence, social presence, cognitive presence, learner engagement, online learning and technology-supported education. In addition, previous bibliometric research has examined the broader development of CoI scholarship (Khodabandelou et al., 2026). However, bibliometric patterns within the selected 2021–2025 corpus analyzed in the present study remain useful for examining publication productivity, citation performance, influential contributors, bibliographic relationships, and recurring keyword associations across contemporary technology-mediated learning research. The present study therefore focuses on describing and interpreting these patterns within the selected corpus rather than claiming to provide a complete representation of all CoI research.

The concepts represented in the literature are related but not synonymous. Social media-supported learning refers specifically to the use of social networking and communication platforms for learning-related activities (Perez et al., 2023), whereas online learning is a broader category encompassing learning delivered through digital environments (Ayoub et al., 2024). Distance learning concerns the separation of learners and instructors and may employ various technologies (Sophonhiranrak, 2021), while mobile learning emphasizes learning through mobile devices. Blended learning combines online and face-to-face components (Garrison & Kanuka, 2004), whereas emergency remote teaching describes the temporary shift to remote instruction during a disruption (Ayoub et al., 2024; Hodges et al., 2020). These forms of technology-mediated learning may overlap within individual studies, but they are treated as distinct concepts in interpreting the present corpus.

Bibliometric analysis provides a systematic approach for examining the structure and development of a research field through publication performance, citation relationships, collaboration networks, bibliographic coupling, and keyword co-occurrence (Donthu et al., 2021). These techniques make it possible to identify patterns that may not be readily apparent from individual studies, including changes in publication activity, influential contributions, research collaboration, intellectual relationships, and thematic concentrations. Accordingly, the present study examines publication trends, citation performance, influential authors and sources, organisational and country contributions, collaboration patterns, intellectual relationships, and thematic patterns in the selected literature. By mapping these dimensions, the study provides a focused view of recent CoI scholarship in technology-mediated collaborative learning and identifies areas that warrant further empirical and longitudinal investigation.

Methodology

This study employed a bibliometric research design to examine research patterns related to the Community of Inquiry framework and technology-mediated learning. The analysis focused on publication trends, citation performance, authorship, country and institutional contributions, bibliographic coupling and keyword co-occurrence within the selected corpus. The study followed the PRISMA 2020 framework to report the identification and filtering of records. The bibliometric dataset was sourced from the Dimensions AI database and was subsequently refined according to the predefined publication, disciplinary, SDG, open-access, and source-title criteria.

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The bibliometric data were retrieved from the Dimensions AI database on 22 July 2026. The retrieval date represents the date on which the database records were obtained and is distinct from the publication period analyzed in the study, which was restricted to 2021–2025. Dimensions AI was used as the data source because it provides bibliographic information including publication details, citation counts, author affiliations, institutional information and Sustainable Development Goal classifications.

Search Strings

The database search was conducted using a Boolean search strategy designed to retrieve publications containing Community of Inquiry-related terminology together with terms representing technology-mediated learning contexts. The documented search expression was: ("Community of Inquiry" OR "CoI") AND ("social media" OR WhatsApp OR Telegram OR Facebook OR "mobile learning" OR "online learning" OR "distance learning").

The use of the acronym “CoI” may introduce retrieval ambiguity because the acronym can have meanings unrelated to the Community of Inquiry framework. This potential limitation is therefore acknowledged when interpreting the composition of the final corpus.

The initial search yielded 37,715 records. The dataset was subsequently filtered by publication year (2021–2025), document type (journal articles), research discipline (Education), Sustainable Development Goal classification (SDG 4: Quality Education), open-access status, and the selected source titles. These sequential filtering steps resulted in a final corpus of 278 articles. The restriction to selected source titles was applied as a methodological scope decision and does not imply that the selected journals represent the complete body of research in the field.

Table 1 *Inclusion and Exclusion Criteria*

Criterion	Inclusion	Exclusion
Publication Year	2021–2025	Before 2021 or after 2025
Document Type	Journal articles	Conference papers, books, book chapters, editorials, reviews, dissertations
Research Field	Education (ANZSRC Code 39)	Other disciplines
SDG	SDG 4 – Quality Education	Other SDGs
Accessibility	All Open Access	Closed-access publications
Source Titles	Eight selected education journals	All other journals

PRISMA Screening

The article-selection process was reported using the PRISMA 2020 framework. The initial Dimensions AI search identified 37,715 records. Sequential database filtering restricted the records to publications from 2021–2025 (17,092), journal articles (9,326), Education research (3,960), publications aligned with SDG 4: Quality Education (2,481), open-access publications (1,849), and publications from the selected source titles (278). No duplicate records were identified or removed. The final corpus therefore consisted of 278 articles for bibliometric analysis.

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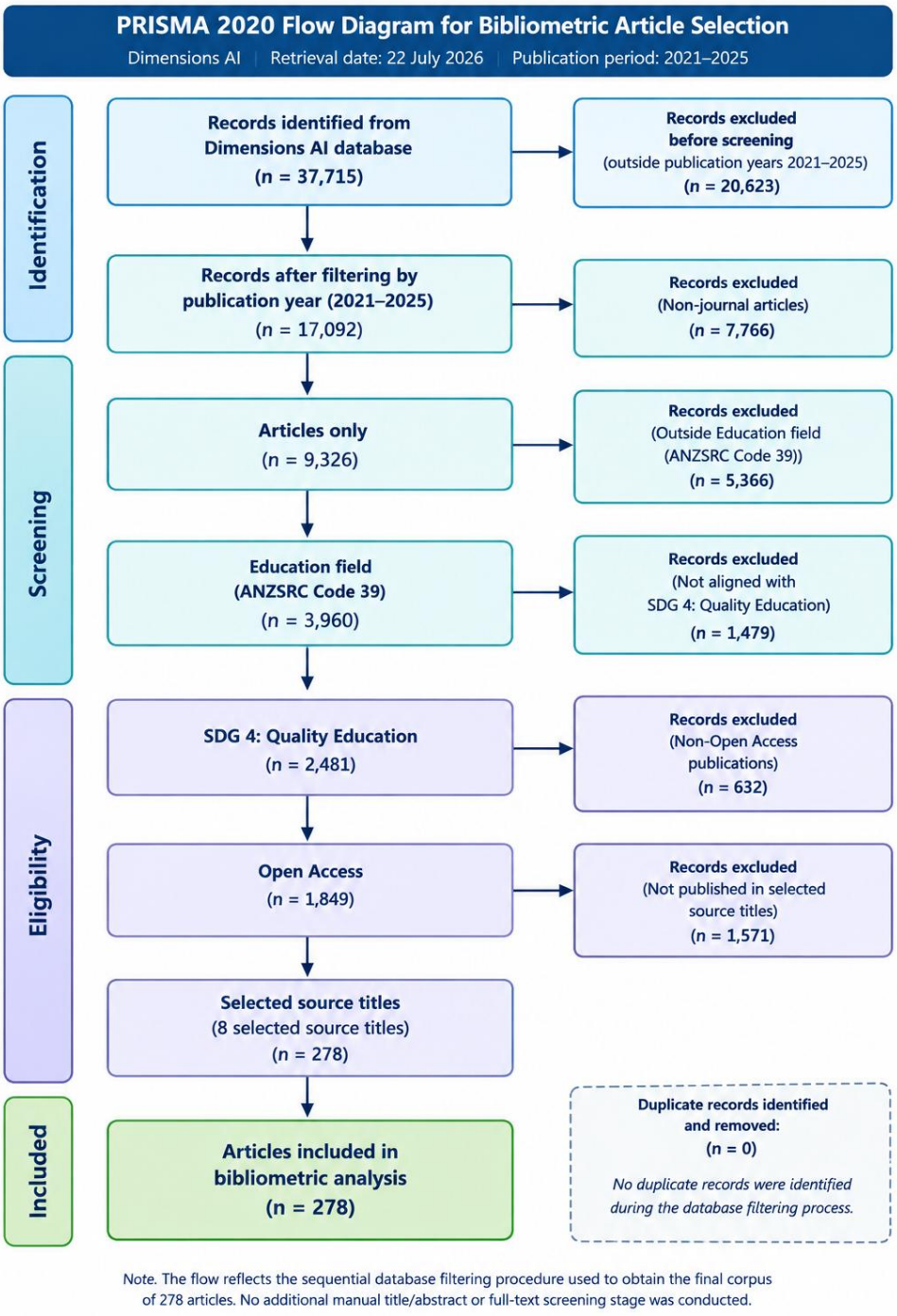


Figure 1 *PRISMA Flowchart*

Data Analysis

The bibliometric analysis combined descriptive publication analysis with VOSviewer-based network analysis. Descriptive statistics were used to examine annual publication productivity, citation performance, and contributions by authors, sources, organizations and countries. VOSviewer was used to analyses bibliographic coupling and keyword co-occurrence. The VOSviewer threshold was set at 60 or below according to the specified analysis setting. This threshold was applied separately from the selection of the top 10 documents. The top 10 documents were selected according to citation ranking, from the highest to the lowest number of citations. Therefore, the top 10 ranking should not be

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interpreted as a selection based on the VOSviewer threshold. Total Link Strength (TLS) in bibliographic coupling was interpreted as the aggregate strength of bibliographic coupling relationships rather than as a direct measure of collaboration.

Publication Trend Analysis

The publication analysis of the 278-article corpus shows variation in annual research productivity between 2021 and 2025. The number of publications increased from 37 articles in 2021 to 50 in 2022 and 67 in 2023, declined to 55 in 2024, and increased again to 69 in 2025. The pattern indicates sustained scholarly attention to Community of Inquiry and technology-mediated learning within the selected corpus. The decline in 2024 represents an annual fluctuation and should not be interpreted as evidence of a decline in the overall research field.

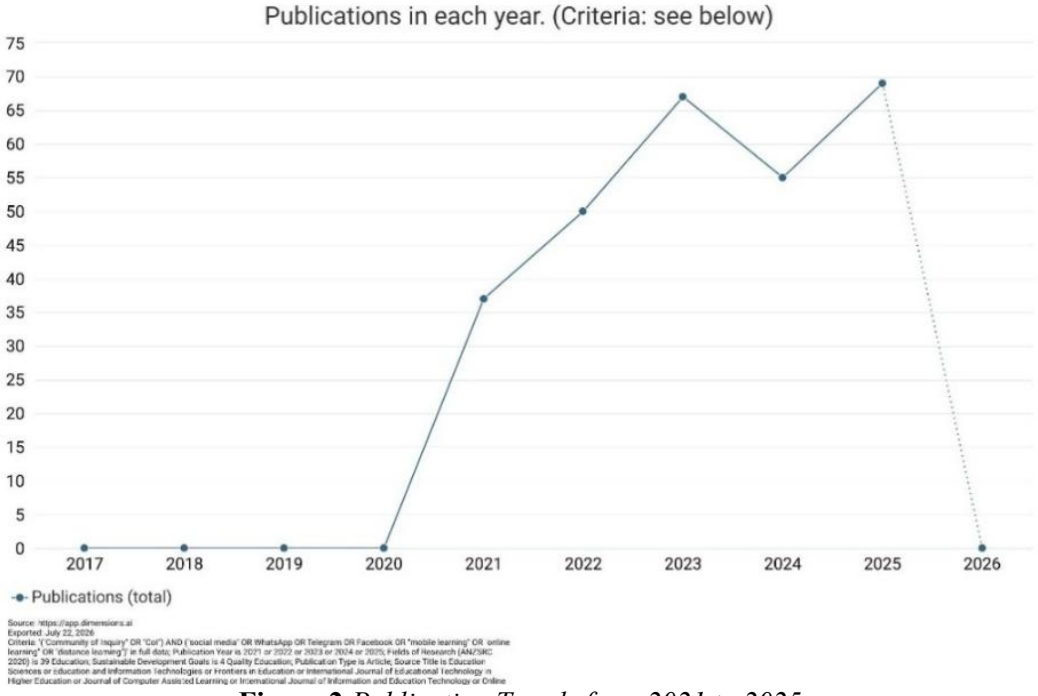


Figure 2 *Publication Trends from 2021 to 2025*

As shown in the above figure, the study was restricted to publications published between 2021 and 2025. The figure was generated using **VOSviewer**, which automatically displays a broader publication-year axis. The zero values shown for years outside the 2021–2025 study period do not represent additional years included in the analysis; rather, they indicate that no records from those years were present in the final 278-article corpus because publications outside the specified study period were excluded during the database filtering process. Therefore, only the 2021–2025 publication trend was considered in this study.

Performance Analysis: Documents, Sources, Authors, Organizations, and Countries

Performance analysis was conducted to identify publication, author, source, organizational, and country-level patterns within the corpus. Citation counts were used as a descriptive indicator of citations received by publications. Where network analyses were conducted, Total Link Strength (TLS) was interpreted according to the specific VOSviewer network, such as co-authorship or bibliographic coupling. In the bibliographic-coupling analysis, TLS represents the aggregate strength of an item's bibliographic coupling links with other items and should not be interpreted as a direct measure of collaboration.

Document Level Performance

The citation analysis identified Ayanwale et al. (2024) as the most cited publication in the final corpus, with 291 citations, followed by Kuhail et al. (2023) with 219 citations and Sato et al. (2024) with 135 citations. Other highly cited publications included Heilporn et al. (2021) with 108 citations,

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Baig and Yadegaridehkordi (2023) with 82, Divjak et al. (2022) with 68, Yu (2021) with 61, Bizami et al. (2023) with 48, Getenet et al. (2024) with 47 and Sofi-Karim et al. (2023) with 43 citations. These publications represent the highest citation counts within the final corpus and were selected for the top-10 performance table according to citation ranking. Their inclusion in the ranking does not indicate that all ten publications focus specifically on social media-supported learning or that they were selected using the VOSviewer threshold.

Source Level Performance

The results show that research on Community of Inquiry and social media-supported learning was mainly published in a limited number of educational technology journals, with Education Sciences being the most prolific (74), followed by Education and Information Technologies (59) and Frontiers in Education (48). However, the highest citation impact belongs to Education and Information Technologies (2,876), and the International Journal of Educational Technology in Higher Education is not far behind (2,375), indicating that scholarly impact is not always proportional to publication output. Concerning bibliographic links, Education Sciences (20), Education and Information Technologies (19) and the International Journal of Educational Technology in Higher Education (18) are the journals with the most connections. The bibliographic coupling values indicate differences in the strength of shared reference structures among the selected source journals. These values describe bibliographic relatedness within the corpus rather than direct institutional or author collaboration.

Author Level Performance

The performance analysis suggests that research productivity in the Community of Inquiry and educational technology literature is not centralized but distributed among a wide range of scholars. The most prolific authors were Wilfried Admiraal and Nadira Saab with three published articles and similar numbers of citations: 67 and 69, respectively. Tracy Douglas published fewer articles but led in citation impact (102 citations), suggesting that the impact of research may be a result of the importance of the studies rather than the number of studies. Other contributors are Melissa Bond (31 citations), Meina Zhu (34 citations), and Ezechiel Nsabayezu (36 citations), showing that there are diverse contributions from various specialists in different educational contexts. Overall, the results indicate that publication productivity and citation impact were distributed across multiple authors rather than concentrated in a small number of researchers. Where bibliographic coupling was examined, the TLS values indicate differences in shared reference structures among authors and should not be interpreted as direct measures of collaboration.

Organizational Level Performance

The institutional analysis pointed to some universities that make significant contributions to Community of Inquiry and social media learning research. The six top institutions produced 4 articles each, indicating balanced productivity. The University of Johannesburg has the most research influence (234 citations), followed by Central China Normal University (123), University of Tasmania (109), Hong Kong Polytechnic University (108), and Beijing Normal University (89); the University of South Africa has 36 citations. The variation in Total Link Strength indicates differences in bibliographic relatedness among the selected institutions. These values should not be interpreted as direct measures of institutional collaboration because bibliographic coupling is based on shared references rather than co-authorship relationships.

Country Level Performance

The research on technology-mediated and social media-supported collaborative learning shows a global distribution of performance with strong contributions from developed and emerging countries. China is the most prolific country with 32 publications, followed by the United States (31), Australia (20), the United Kingdom (18), and South Africa (13). Germany had 11 publications but possessed the highest citation impact (1,043 citations), reflecting its strong influence on scholarly work. Australia also rated high with 853 citations, and the United States and South Africa contributed 494 and 360 citations, respectively. The network results also show differences in link strength among countries. These values should be interpreted according to the specific network analysis conducted and should not be conflated with citation impact or bibliographic coupling.

Bibliographic Coupling Analysis

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Bibliographic coupling analysis examines the extent to which publications share references and therefore provides an indicator of bibliographic relatedness among items in the corpus. Unlike citation analysis, which reflects citations received by publications, bibliographic coupling identifies similarities in the reference structures of publications. In this study, bibliographic coupling was examined at the document, source, author, organization, and country levels.

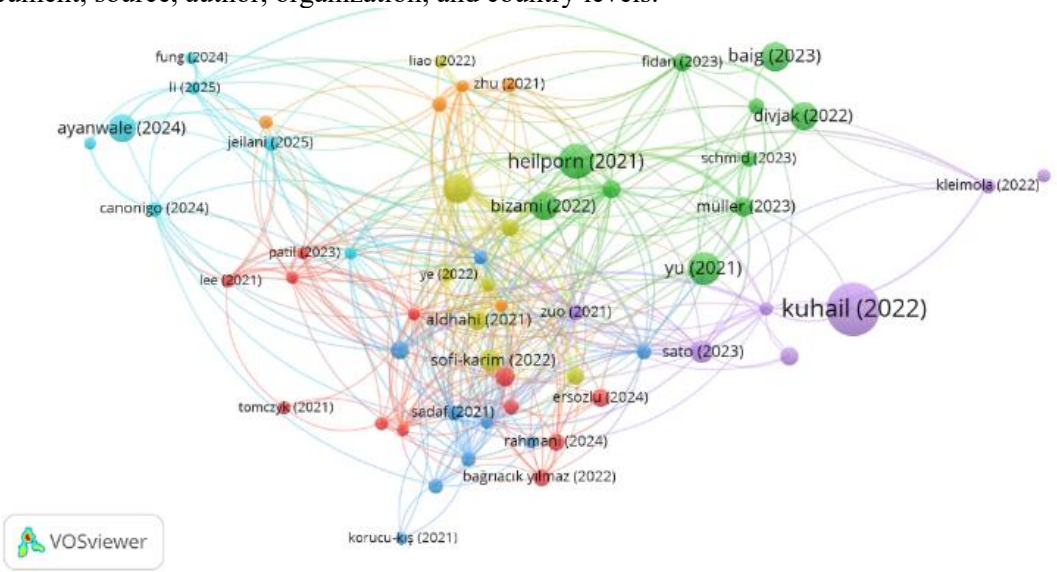


Figure 3 *Bibliographic Coupling Analysis*

Document Level Coupling

The bibliographic coupling analysis showed different levels of bibliographic relatedness among the selected documents. Heilporn et al. (2021) and Sato et al. (2024) recorded the highest Total Link Strength among the documents shown in the analysis, with TLS values of 4. Sofi-Karim et al. (2023), Bizami et al. (2023), and Getenet et al. (2024) recorded TLS values of 3. In contrast, some highly cited publications, including Kuhail et al. (2023) and Ayanwale et al. (2024), showed weaker bibliographic coupling. This indicates that citation impact and bibliographic relatedness represent different dimensions of publication performance.

Table 2 *Bibliographic Coupling of Top 10 Documents*

Rank	Authors	Title	Citations	Total Link Strength
1	Ayanwale et al. (2024)	Examining artificial intelligence literacy among pre-service teachers for future classrooms	291	0
2	Kuhail et al. (2023)	Interacting with educational chatbots: A systematic review	219	1
3	Sato et al. (2024)	Navigating the New Normal: Adapting Online and Distance Learning in the Post-Pandemic Era	135	4
4	Heilporn et al. (2021)	An examination of teachers' strategies to foster student engagement in blended learning in higher education	108	4
5	Baig and Yadegaridehkordi (2023)	Flipped classroom in higher education: a systematic literature review and research challenges	82	0

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Rank	Authors	Title	Citations	Total Link Strength
6	Divjak et al. (2022)	Flipped classrooms in higher education during the COVID-19 pandemic: findings and future research recommendations	68	0
7	Yu (2021)	The relationship between technology acceptance and self-regulated learning: the mediation roles of intrinsic motivation and learning engagement	61	0
8	Bizami et al. (2023)	Innovative pedagogical principles and technological tools capabilities for immersive blended learning: a systematic literature review	48	3
9	Getenet et al. (2024)	Students' digital technology attitude, literacy and self-efficacy and their effect on online learning engagement	47	3
10	Sofi-Karim et al. (2023)	Online education via media platforms and applications as an innovative teaching method	43	3

Source Level Coupling

The bibliographic coupling analysis of source journals underpins the intellectual link in the Community of Inquiry and social media-supported learning research. The journal Education Sciences was the most connected journal with the highest Total Link Strength (TLS) of 2,954, thus being the source with the highest bibliographic coupling strength among the selected sources. Education and Information Technologies followed with a TLS of 2,895 and the highest number of citations of 2,876, indicating a high citation count within the analyzed corpus. Other noteworthy journals are Frontiers in Education (TLS = 2,011), International Journal of Educational Technology in Higher Education (TLS = 1,955), Journal of Computer Assisted Learning (TLS = 1,584), and Computers and Education Open (TLS = 1,450). Meanwhile, the International Journal of Information and Education Technology had a relatively low TLS of 309, while Online Learning had no bibliographic coupling (TLS = 0), indicating different citing patterns or specialized directions.

Author Level Coupling

At the author level, strong bibliographic coupling was observed between Wilfried Admiraal and Nadira Saab, each with a TLS of 189, indicating stronger bibliographic coupling relationships with other authors in the analyzed network. Tracy Douglas and Tracey Muir follow closely with a TLS of 117. Other contributors with lower coupling strengths include Florence Martin (TLS = 28), Melissa Bond (24), and others down to Mustafa Fidan (7). Interestingly, the number of citations is not always proportional to the coupling strength; Douglas, for example, had 102 citations with only two publications, and the stronger connections of Admiraal and Saab did not translate into more citations. This shows that some authors indicate differences in the reference structures underlying their publications.

Organizational Level Coupling

The institutional bibliographic coupling analysis shows significant differences in intellectual similarity among the top research organizations, with each having four publications but varying in coupling strength. The University of Tasmania has the highest Total Link Strength (TLS) of 55; i.e., it has stronger bibliographic coupling relationships with other institutions in the analyzed network. Then Hong Kong Polytechnic University (TLS=41), Central China Normal University (TLS=36), University of South Africa (TLS=28), and Beijing Normal University (TLS=23). The University of Johannesburg has the weakest coupling (TLS = 9) with the highest citation count of 234. The variation between these measures indicates that institutional research impact and the intellectual connectivity of scholarship are distinct aspects of scholarly contribution. For instance, institutions like Tasmania and Hong Kong

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Polytechnic University shared references, while Johannesburg has attained citation impact via unique research.

Country Level Coupling

Bibliographic coupling analysis at the country level reveals the global intellectual structure of CoI research. China was first with a TLS of 1,515, which means that it is highly interconnected with the publications of other countries, indicating its important position in the international knowledge network. The United States is next with a TLS of 1,114. The United Kingdom (998) and Australia (923) are also significant intellectual hubs in educational technology research. Other countries with large bibliographic links are Canada (538), South Africa (523), Spain (480), Turkey (335), Malaysia (236), and Greece (212). The observed TLS values indicate differences in the degree of shared reference structures among countries. Higher bibliographic coupling therefore indicates greater similarity in the references used by publications from the respective countries, rather than demonstrating that researchers necessarily use identical theoretical frameworks.

Co-occurrence Analysis by Cluster

The keyword co-occurrence analysis identified three clusters of terms that represent recurring thematic associations within the analyzed corpus. Co-occurrence analysis examines the frequency with which keywords appear together in publications and can therefore be used to identify patterns of conceptual association. The identified clusters are interpreted as thematic groupings within the corpus rather than as evidence of causal relationships or theoretical development.

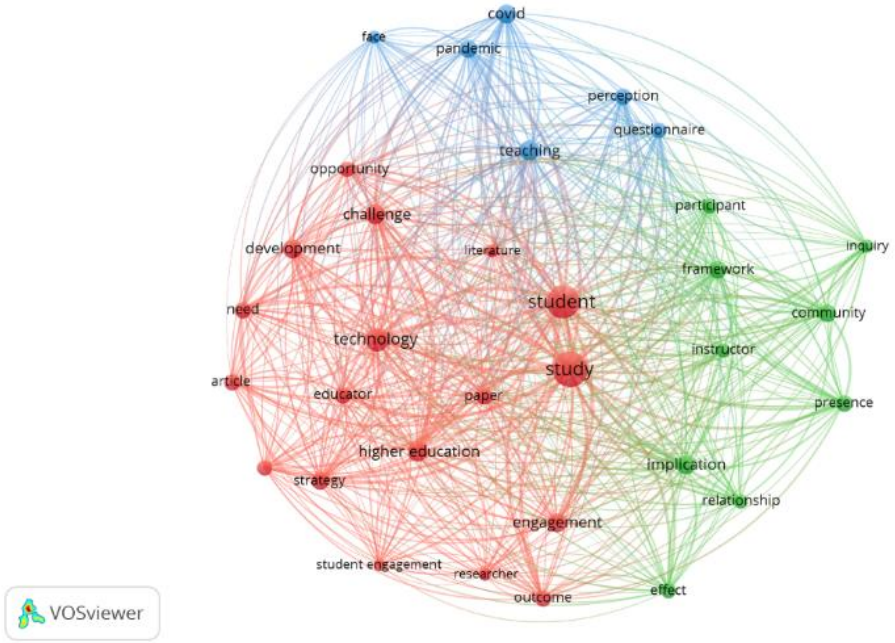


Figure 4 *Keyword Co-Occurrence Analysis by Cluster*

Cluster 1 (Red): Educational Technology, Student Engagement, and Learning Effectiveness. The first cluster was primarily associated with educational technology, student engagement, and learning-related terms. The keywords also highlight researchers' attention to the opportunities and challenges of technology integration and the role of educators in facilitating technology-supported collaborative learning.

Cluster 2 (Green): Community of Inquiry Framework and Learning Interaction. The second cluster contains terms associated with the Community of Inquiry framework and learning interaction. The presence of terms related to teaching, social and cognitive dimensions indicates that CoI-related concepts remain represented within the analyzed corpus. However, keyword co-occurrence does not establish that the three presences operate as mechanisms within the studies or demonstrate their effectiveness. Such relationships require empirical analysis at the study level.

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Cluster 3 (Blue): COVID-19, Online Teaching and Learner Perceptions. This cluster reflects the prominence of pandemic-related and online teaching terms within the analyzed corpus. The presence of terms such as perception, questionnaire, and teaching suggests that a portion of the literature examined learner or instructor experiences during the transition to online education. These associations should be interpreted as characteristics of the publication corpus rather than as evidence of causal effects of the pandemic.

Taken together, the clusters indicate recurring associations among educational technology, learner engagement, Community of Inquiry-related concepts, and pandemic-related online learning within the analyzed corpus. The results provide an overview of the themes represented in the selected publications but do not by themselves establish a temporal evolution or theoretical maturation of the field.

Co-occurrence Analysis: Top Keywords

The co-occurrence analysis, based on author keywords extracted from the Dimensions AI dataset and analyzed with VOSviewer, highlights the conceptual core and thematic orientation of research on Community of Inquiry and social media-supported learning. The measure of occurrence is how often a term occurs in the dataset, and the relevance score is how specific or defining a term is to the topic, in relation to the whole corpus and not its common usage in the wider literature.

Table 3 *Co-Occurrence Analysis Top 15 Keywords*

Rank	Term	Occurrences	Relevance
01	Study	231	2.392
02	Student	204	2.0636
03	Technology	101	0.6888
04	Engagement	86	0.5518
05	Higher Education	78	0.3809
06	Challenge	77	0.2903
07	Teaching	76	0.2956
08	Covid	69	2.4686
09	Development	67	0.2415
10	Implication	66	0.7236
11	Framework	64	0.7357
12	Community	62	0.9109
13	Pandemic	62	2.37
14	Strategy	59	0.4657
15	Need	54	0.421

As shown in Table 3, study (231 occurrences) and student (204) are the most frequent keywords, indicating a strong learner-centered and empirical orientation in the literature. Technology (101) and engagement (86) further clarify the significance of digital technologies and learner participation in Community of Inquiry research. Note that COVID (69) and pandemic (62) have the highest relevance score, which signals a separate research stream related to the pandemic. Meanwhile, community, framework, and implication, although less frequent, show relatively higher relevance and reflect the conceptual focus on the Community of Inquiry framework. Overall, the keywords point to three main orientations: technology-supported student learning, the Community of Inquiry framework, and COVID-19-related online learning.

Discussion

The bibliometric findings indicate sustained scholarly attention to Community of Inquiry (CoI) and technology-mediated learning within the selected corpus of 278 articles published between 2021 and 2025. Annual publication output increased from 37 articles in 2021 to 69 in 2025, although the

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decline in 2024 demonstrates that this development was uneven. This pattern suggests continuing interest within the journals and publication categories examined, rather than uninterrupted growth across the entire field. The findings should also be understood in relation to the study's restrictions to open-access articles, selected source titles, Education research, and SDG 4 classifications. Consequently, the observed publication trajectory provides a bounded account of scholarly activity and does not independently demonstrate increasing theoretical maturity or improvements in educational practice.

The performance analysis revealed differences between publication productivity and citation visibility. Education Sciences contributed the largest number of articles, whereas Education and Information Technologies received the highest citation count among the selected sources. These differences show that publication volume and citations represent distinct aspects of research performance. Similarly, the prominence of publications addressing artificial intelligence literacy, educational chatbots, and blended learning suggests that the retrieved corpus intersects with broader educational technology scholarship. Their citation rankings should therefore be interpreted within the scope of the search strategy, rather than as direct evidence of their centrality to CoI theory. Donthu et al. (2021) distinguish performance analysis from science mapping, supporting the use of complementary indicators when examining research activity. In the present study, citation counts indicate scholarly attention recorded at retrieval, while offering limited grounds for evaluating theoretical contribution, methodological quality, or educational effectiveness.

Bibliographic coupling further demonstrated that citation visibility and shared reference structures did not necessarily coincide. Some highly cited publications displayed relatively weak coupling, whereas other documents shared stronger bibliographic relationships within the analyzed network. A plausible interpretation is that the corpus brings together studies drawing on partially overlapping bodies of literature. However, this interpretation requires examination of the publications' substantive content. Strong coupling identifies shared references; it does not establish agreement between findings, consistent operationalization of CoI constructs, or direct collaboration between researchers. Conversely, weak coupling should not automatically be interpreted as intellectual isolation, because relationships may depend on network boundaries, inclusion thresholds, and the publications retained in the analysis.

The keyword associations involving educational technology, engagement, community, and teaching provide a basis for considering how technological environments are discussed alongside pedagogical processes. These associations are compatible with CoI-oriented instructional design, which emphasizes the development of cognitive, social, and teaching presence. Fiock (2020), for example, describes instructional strategies for deliberately incorporating these presences into online courses. The present keyword patterns may therefore identify a useful intersection between technological provision and the organization of meaningful learning activities. Nevertheless, keyword proximity cannot establish that a digital platform successfully supports any particular presence. That judgment requires evidence about instructional design, interaction quality, and learners' experiences.

Existing empirical synthesis provides a useful comparison while clarifying the limits of the present analysis. Martin et al. (2022) examined relationships between CoI presences and learning outcomes in online and blended environments. Their work addresses empirical associations that cannot be assessed through keyword co-occurrence or bibliographic coupling alone. Accordingly, the recurring appearance of engagement and CoI-related concepts in this corpus should be interpreted as evidence of thematic attention, rather than confirmation that the three presences produced greater engagement or achievement. Future research could connect the mapped themes with systematic examination of study designs, measurement instruments, and reported outcomes to determine how consistently the framework is applied across technology-mediated settings.

The visibility of COVID-19, pandemic, and online teaching terminology also situates the corpus within a period of substantial educational disruption. Bond et al. (2021) documented the rapid development of emergency remote teaching research during the first global online semester. Their findings provide contextual support for interpreting the pandemic-related themes identified here. However, the aggregated network does not demonstrate that the pandemic caused the observed

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publication increases or that emergency practices subsequently became established instructional approaches. Overall, this study contributes a descriptive map of research visibility, bibliographic relationships, and recurring terminology. Its principal value lies in identifying connections and questions for closer empirical investigation, while preserving the distinction between patterns in publications and evidence about learning processes.

Knowledge Contribution

The findings indicate continued scholarly attention to the Community of Inquiry framework across technology-mediated learning contexts. The presence of CoI-related terms alongside educational technology, engagement, and online learning terms suggests that the framework continues to appear in research addressing contemporary digital learning environments. However, bibliometric evidence alone cannot establish the effectiveness or theoretical validity of the framework in these contexts.

The bibliographic coupling analysis identified differences in the shared reference structures of publications, authors, organizations, and countries. These patterns indicate varying degrees of bibliographic relatedness within the corpus. They provide information about how publications draw upon related reference bases but do not establish theoretical convergence or collaboration by themselves.

The prominence of COVID-19-related terms in the keyword analysis indicates that pandemic-related online teaching constituted an important theme within the analyzed corpus. This pattern is consistent with the documented expansion of emergency remote teaching during the pandemic (Hodges et al., 2020; Bond et al., 2021). However, the bibliometric results do not establish that the pandemic directly caused the development or adoption of the CoI framework.

Lastly, the geographical distribution of publications indicates that research represented in the corpus was contributed by countries across different regions, although publication activity was concentrated in particular countries. The representation of countries and institutions therefore provides an indication of the geographical distribution of the analyzed literature. Further empirical research could examine how CoI-related constructs are studied across different cultural, institutional and technological contexts.

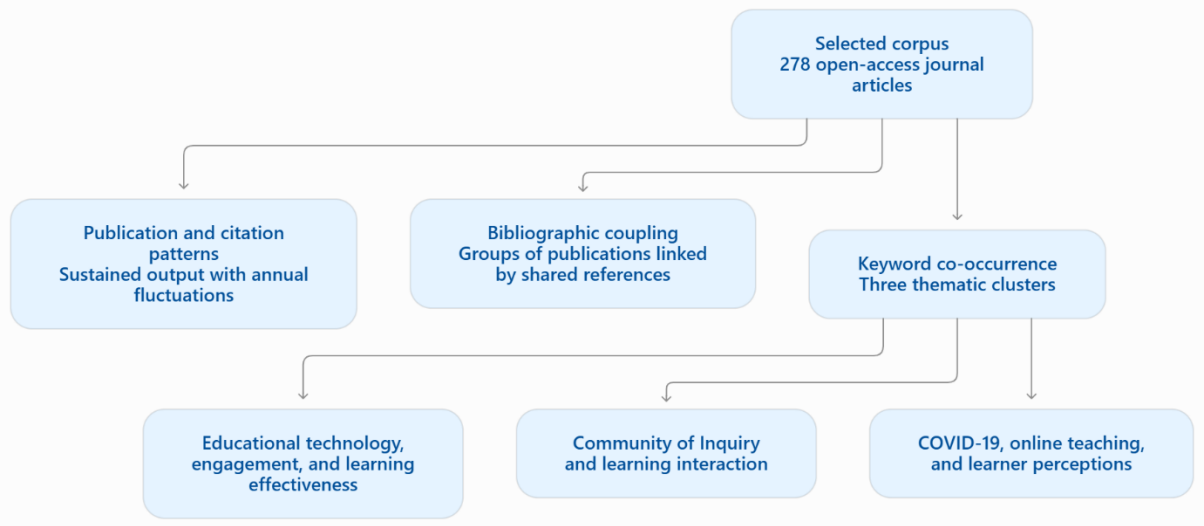


Figure 5 *Bibliometric Synthesis of Community of Inquiry Research in Technology-Mediated Learning, 2021–2025*
Note. The branches represent complementary analyses of the selected Dimensions AI corpus. Bibliographic coupling reflects shared references, and keyword co-occurrence reflects thematic association.

Publication output rose from 37 articles in 2021 to 69 in 2025, with a dip in 2024. The most prolific journal, *Education Sciences*, differed from the journal with the highest total citation count, *Education and Information Technologies*. Bibliographic coupling added a separate view by grouping publications according to shared references. The keyword analysis placed CoI and learning interaction

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alongside two broader strands of research on digital learning. One centered on engagement and learning effectiveness, while the other focused on online teaching and learner perceptions during COVID-19.

The contribution is a corpus-specific account of where CoI scholarship sits within technology-mediated learning research. The three clusters provide a basis for comparative studies of how specific platform features and instructional designs relate to teaching, social, and cognitive presence. Such studies can directly assess whether those presences are associated with collaborative learning outcomes across different educational settings.

Practical Contribution

Findings from this bibliometric analysis have provided significant implications for educators, higher education institutions, policy makers, and researchers. The findings indicate sustained scholarly attention to technology-mediated and social-media-related learning environments. However, the bibliometric analysis does not establish that specific platforms such as WhatsApp, Telegram or Facebook improve collaborative learning outcomes. The findings therefore point to the need for empirical studies examining how the affordances of specific platforms relate to teaching presence, social presence, cognitive presence, learner engagement and learning outcomes.

For educators and instructional designers, the identified research themes highlight the continued scholarly attention to student engagement, teaching strategies and learning experiences in technology-mediated environments. Empirical research can further examine how structured discussions, collaborative activities, peer feedback, and facilitation relate to the three CoI presences and learning outcomes.

For educational policymakers and institutions, the findings highlight the need for research attention to digital learning capacity, infrastructure, digital literacy, and institutional support. However, the present bibliometric analysis does not directly evaluate the adequacy of these conditions. Future empirical studies may therefore examine how infrastructure, educator digital competence, institutional policies and access conditions affect technology-mediated learning.

For researchers, the geographical and institutional distribution of the corpus identifies opportunities for further research in underrepresented contexts. Future studies may examine the applicability of CoI across different cultural and educational settings and investigate its relationship with emerging technologies such as artificial intelligence, immersive learning, and learning analytics.

Recommendations for Future Research

Based on the findings, the following are recommended for future studies:

Future research should examine the relationships among teaching presence, social presence, and cognitive presence and their associations with student engagement, collaborative learning, and other learning outcomes. Such empirical investigations would provide a clearer understanding of how the three Community of Inquiry presences relate to learning processes and outcomes across different technology-mediated environments.

Comparative studies should also examine how different technology-mediated platforms and their affordances relate to the three Community of Inquiry presences and students' learning experiences. This may provide further understanding of whether and how different digital platforms support interaction, engagement, knowledge construction, and collaborative learning.

Further empirical research should expand investigation to underrepresented geographical, cultural, and institutional contexts to provide broader contextual evidence on Community of Inquiry-related learning processes. Such studies may help determine how contextual differences shape the application and interpretation of the framework across different educational settings.

Future studies should also examine emerging technologies, including artificial intelligence, immersive learning, and learning analytics, in relation to the Community of Inquiry framework and technology-mediated learning. In addition, empirical research could investigate issues such as digital inequality, privacy, platform governance, and digital distraction to provide a more comprehensive understanding of the opportunities and challenges associated with technology-mediated learning.

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Finally, longitudinal bibliometric studies should be conducted to examine changes in publication patterns and thematic associations over extended periods. Such studies would provide stronger evidence of changes in research activity and thematic development than can be inferred from a single aggregated bibliometric analysis.

Limitations of the Study

This study has several limitations. First, the bibliometric dataset was obtained from the Dimensions AI database; therefore, publications not indexed in the database were not represented. Second, the analysis was restricted to open-access journal articles and selected source titles, which may have limited the coverage of the wider literature. Third, the search strategy included technology-mediated learning terms and may therefore have retrieved publications addressing broader digital learning contexts rather than studies that used Community of Inquiry as their primary theoretical framework. Fourth, bibliometric indicators such as citation counts, bibliographic coupling and keyword co-occurrence describe patterns of scholarly attention and bibliographic relationships but do not establish causal relationships, theoretical effectiveness or learning outcomes. Finally, keyword analysis is dependent on the terminology used and indexed in the retrieved publications. These limitations should be considered when interpreting the findings.

Declaration

1. Conflict of Interest

State any conflicts of interest. If none, declare that no conflict exists.

Statement: The authors hereby declare that there is no conflict of interest associated with this manuscript

2. Generative AI and AI-assisted Technologies

State the AI tool used and its purpose. If none was used, state accordingly.

AI tool: None.

Purpose: There was no use of generative AI or AI-assisted technology during the analysis or in the process of writing this manuscript.

3. Data Availability Statement

State the availability and source of the data or materials used in the study.

Statement: The bibliometric data analyzed in this study were retrieved from the Dimensions AI database and processed using VOSviewer. However, background and supporting literature cited in the Introduction and Discussion were drawn from openly accessible online journal articles.

4. Ethics Statement

State the ethics approval and approval number, if applicable. If not applicable, provide a brief explanation.

Statement: Not applicable. There is no human participation in this study; the study solely relied on previously published articles for data extraction. All findings, and arguments drawn from other authors' published work have been appropriately cited.

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