

Mapping Global Research Trends in Interactive Learning Media: A Bibliometric Analysis of Scopus Publications (2021-2025)

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Abstract: This study maps and analyzes global research trends in interactive learning media from 2021 to 2025, with a focus on emerging technologies and pedagogical shifts. A quantitative bibliometric method was used, drawing data from the Scopus database and analyzing it through bibliometric mapping and visualization techniques. The results show a steady rise in publication output and expanding collaborative networks across institutions and countries. Thematic evolution highlights the increasing prominence of mobile learning, artificial intelligence integration, and immersive digital environments. This study provides a novel and comprehensive mapping of post-pandemic research patterns and identifies clusters that connect technology design with learning effectiveness. Practically, the findings offer data-driven insights for educators, policymakers, and developers to strengthen future digital learning strategies. The study also reinforces the theoretical foundations of educational technology and supports evidence-based innovation in interactive and adaptive learning models.

Keywords: Bibliometric Analysis, Educational Technology, Interactive Learning Media, Mobile Learning, Research Trends

A. Introduction

Interactive learning media has emerged as one of the most transformative innovations in education and instructional technology. By integrating multimedia elements, gamification, and digital interactivity, learning environments have shifted from static, teacher centered settings to dynamic, student-centered ecosystems. Empirical evidence indicates that interactive learning media significantly enhances learners' motivation, engagement, and conceptual understanding through real-time feedback and adaptive learning (Alqahtani & Rajkhan, 2020; Chen et al., 2023; Mayer, 2021). This transformation reflects a broader shift toward digital pedagogy and personalized learning environments in 21st century education (Dhawan, 2022; Kirkwood & Price, 2022).

Despite extensive research on the pedagogical and technological aspects of

interactive learning, limited attention has been paid to the meta scientific evolution of this field on a global scale. Most existing studies have examined instructional models, design frameworks, or media effectiveness in specific contexts (Al-Fraihat et al., 2023; González-Zamar et al., 2020; Hwang & Fu, 2022). However, there remains a lack of bibliometric evidence revealing how global scholarship on interactive learning media has evolved in terms of publication growth, collaboration networks, and thematic development. This gap restricts researchers' ability to identify dominant research clusters, emerging trends, and influential contributors shaping the intellectual landscape of the field (Muhammad et al., 2022; Polat, 2025).

Recent years (2021–2025) represent a critical phase in the evolution of educational technology, characterized by post-pandemic digital acceleration and the growing integration of artificial intelligence, mobile applications, and interactive platforms in higher education (Wong & Cheung, 2022; Zawacki-Richter et al., 2023). In this context, bibliometric analysis offers a rigorous and data-driven approach to understanding the structure and dynamics of global research (Donthu et al., 2021; Xue & dkk, 2025). Previous bibliometric studies have explored related domains such as e-learning, mobile learning, and digital (Lin & Chen, 2023; Sharma et al., 2022; Zou, 2025), but few have specifically mapped interactive learning media as an independent and evolving research field. Therefore, this study introduces a quantitative bibliometric analysis of Scopus-indexed publications from 2021 to 2025, aiming to identify publication trends, collaboration patterns, thematic clusters, and leading contributors in interactive learning media research. The novelty of this work lies in its comprehensive mapping of a rapidly expanding domain using objective bibliometric techniques rather than traditional narrative or systematic review approaches (Donthu et al., 2021).

The findings are expected to advance both theoretical and practical understanding of the intellectual structure and evolution of interactive learning media. They provide strategic insights for researchers, instructional designers, and policymakers seeking to align educational innovation with emerging technological trends (Spector, 2021; Zawacki-Richter et al., 2023). Accordingly, this study addresses the following research question: How has global research on interactive learning media evolved between 2021 and 2025 in terms of publication productivity, thematic trends, and collaborative networks?

B. Methods

Research Design

This study employed a quantitative bibliometric approach to systematically map and analyze global research trends in interactive learning media published between 2021 and 2025. The bibliometric method was selected because it provides a

comprehensive, replicable, and transparent means of evaluating publication dynamics, citation networks, and thematic structures across scientific disciplines (Donthu et al., 2021). The research design was descriptive in nature, relying exclusively on secondary data extracted from the Scopus database. This design ensures the reproducibility and objectivity of findings through standardized bibliometric indicators and analytical procedures (Aria & Cuccurullo, 2017).

Data Collection and Criteria

Data were collected from the Scopus database on September 25, 2026, which was chosen for its extensive coverage of peer reviewed international journals and advanced citation indexing capabilities (Elsevier, 2023). The following Boolean search query was applied to the Title, Abstract, and Keyword fields:

Search Query: TITLE-ABS-KEY ("interactive learning media" OR "interactive educational media" OR "digital learning media" OR "interactive multimedia learning") AND (PUBYEAR > 2020 AND PUBYEAR < 2026)

The search was restricted to publications written in English within the subject areas of Education, Computer Science, and Social Sciences to ensure disciplinary relevance. The initial search retrieved 1,243 documents, which were subsequently screened for duplicates, irrelevant records, and incomplete metadata. After refinement, 1,112 valid records were retained for bibliometric analysis. The inclusion and exclusion criteria were defined as follows:

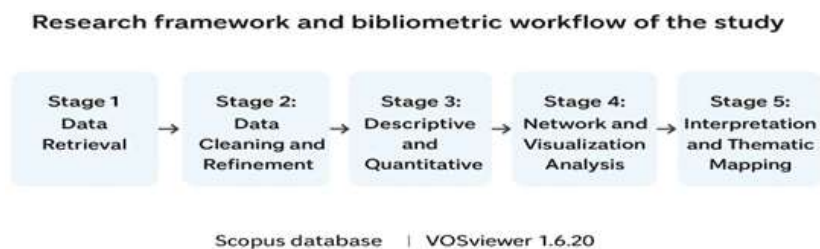
Inclusion criteria:

1. Publications indexed in Scopus between 2021–2025.
2. Articles or conference papers explicitly focusing on the educational or pedagogical use of interactive media.
3. Documents containing complete bibliographic metadata (title, abstract, author, affiliation, keywords).

Exclusion criteria:

1. Non-English documents, review notes, editorials, or book chapters.
2. Duplicate or incomplete metadata entries.
3. Publications unrelated to the context of interactive learning or instructional media.

Research Framework and Analysis Workflow



The methodological process followed five main stages (Aria & Cuccurullo, 2017; Donthu et al., 2021; Eck & Waltman, 2014):

1. Data Retrieval, extracting bibliographic data from Scopus using predefined search terms and inclusion criteria.
2. Data Cleaning, Removing duplicates and non-relevant items, and standardizing author names and keyword variants.
3. Data Processing, Importing the refined dataset into analytical tools, including VOSviewer (v1.6.20) and Bibliometrix (R package).
4. Descriptive and Network Analysis Conducting quantitative assessments of publication trends, citation patterns, and collaborative networks (authors, institutions, and countries).
5. Interpretation and Synthesis, Identifying emerging themes, influential contributors, and future research directions in interactive learning media.

The overall research workflow is illustrated in Figure 1, summarizing the sequential stages from data acquisition to thematic interpretation.

Figure 1. Research framework and bibliometric workflow of the study.

(If using LaTeX, insert the figure as “Figure~\ref{fig:workflow}” with the caption below.)

This diagram presents the methodological stages undertaken in the bibliometric analysis, including (1) data retrieval, (2) cleaning and normalization, (3) data processing and mapping using VOSviewer and Microsoft Excel, (4) network and trend analysis, and (5) synthesis of findings. The workflow ensures analytical transparency and reproducibility across all phases of data handling and interpretation (Aria & Cuccurullo, 2017; Donthu et al., 2021).

Data Analysis and Visualization

The bibliometric data exported from Scopus were analyzed using VOSviewer (v1.6.20) for network visualization and Bibliometrix (R 4.3 environment) for descriptive analytics. Quantitative metrics such as annual publication trends,

document types, and source distributions were computed using Microsoft Excel (Elsevier, 2023). Co-authorship, co-occurrence, and co-citation networks were constructed to explore collaborative structures and intellectual linkages within the research field (Polat, 2025; Zou, 2025).

Each node in the visualization represented an author, keyword, or cited source, while the link strength indicated the frequency of co-occurrence or co-citation. The total link strength (TLS) was used to measure the degree of connectivity among research entities. Network maps were color-coded by clusters to indicate thematic groups, thereby allowing the identification of dominant research fronts and emerging topics (Eck & Waltman, 2014; Xue & dkk, 2025).

Validity and Reliability

To ensure data accuracy and analytical reliability, duplicate records were manually removed, and keyword normalization was performed to merge synonymous terms (e.g., “interactive media” and “digital learning media”). The visual outputs generated by VOSviewer and Bibliometrix were cross-validated to ensure consistency across mapping and statistical analyses (Aria & Cuccurullo, 2017). The replicability of the workflow allows future researchers to reproduce similar analyses using the same query and methodological parameters (Polat, 2025; Zou, 2025).

C. Results and Discussion

Analysis of Publication Trends by Year

The growth of research in the field of Information Technology (IT) has been characterized by continuous development in response to the rising demand for digital innovation in education and industry. To analyze this evolution, bibliometric data from the Scopus database were examined for the period 2021–2026, focusing specifically on publications related to interactive learning media. This analysis aimed to illustrate the overall trend of scholarly productivity and to identify the most active publication periods in this research domain. As shown in Figure 1, the number of publications exhibited a steady upward trajectory from 2021 to 2024, followed by a slight decrease in 2025. In detail, Scopus recorded 517 documents in 2021, 530 in 2022, 590 in 2023, and a peak of 713 in 2024, before declining slightly to 634 documents in 2025. The sharp rise until 2024 reflects a period of intensified academic interest in digital learning technologies and the integration of interactive media, particularly in the post-pandemic era when digital transformation became a central focus of education systems worldwide. Conversely, the slight decline in 2025 may indicate stabilization or diversification of research themes into more specialized subfields of interactive technology.

Year ↓	Documents ↑
2025	634
2024	713
2023	590
2022	530
2021	517

Figure 1. Documents Indexed in Scopus by Year (2021–2025)

To provide a clearer overview of the annual publication performance, Table 1 presents the detailed distribution of documents by year. The data confirm that 2024 represents the peak period of research productivity, supporting the observation of an upward trajectory in academic interest in interactive media studies.

Table 1. Number of Documents Indexed in Scopus by Year (2021–2026)

Year	Number of Documents
2021	517
2022	530
2023	590
2024	713
2025	634

Note. Source: Scopus database, 2025

The findings presented in Figure 1 and Table 1 demonstrate that research on interactive learning media has experienced substantial growth from 2021 to 2024, corresponding with a global trend in adopting digital and mobile learning tools. This progression underscores the relevance of bibliometric mapping in identifying the evolution of scientific attention toward technology enhanced education (Aini, 2024; Talapiu et al., 2025). Furthermore, the observed fluctuation in 2025 suggests a shift in focus among scholars, potentially toward more advanced topics such as artificial intelligence integration, adaptive learning, and immersive technologies in education.

Trend Analysis of Annual Publication Growth

The visualization presented in Figure 2 further reinforces the upward trajectory of publication activity in the domain of interactive learning media. The data clearly depict a gradual and sustained growth from 2021 to 2024, reaching its peak before a slight contraction in 2025. This finding signifies an overall positive research momentum over the observed period, underpinned by growing global recognition

of the pedagogical value of technology mediated learning environments.

From a bibliometric perspective, the steady increase between 2021 (517 documents) and 2023 (590 documents) indicates the early stage of thematic consolidation, where scholars began exploring conceptual frameworks and empirical validation of interactive learning media in higher education. The steep rise in 2024 (713 documents) represents the maturity phase of research activity, characterized by extensive experimentation, model development, and evaluation of learner engagement strategies using mobile and multimedia platforms.

The subsequent decline to 634 publications in 2025 does not necessarily suggest diminishing academic interest. Instead, it reflects the natural progression of a research field entering a phase of specialization. During this stage, publications often become more focused on niche areas such as artificial intelligence integration, immersive simulations, personalized learning algorithms, or hardware software interaction design rather than general explorations of media interactivity. This trend is consistent with bibliometric evolution theories, where initial expansion is typically followed by diversification and methodological refinement across subdomains (Donthu et al., 2021; Zupic & Čater, 2015). In a broader context, this temporal trend aligns with global shifts in educational technology research, where emphasis is moving from digital adoption to adaptive and intelligent learning systems. The dominance of publications in 2024 signifies a peak of collective academic engagement and cross-disciplinary collaboration. Meanwhile, the moderate reduction in 2025 may indicate research saturation in certain traditional themes, coupled with a growing emphasis on evidence-based impact studies and sustainable implementation frameworks in digital pedagogy.

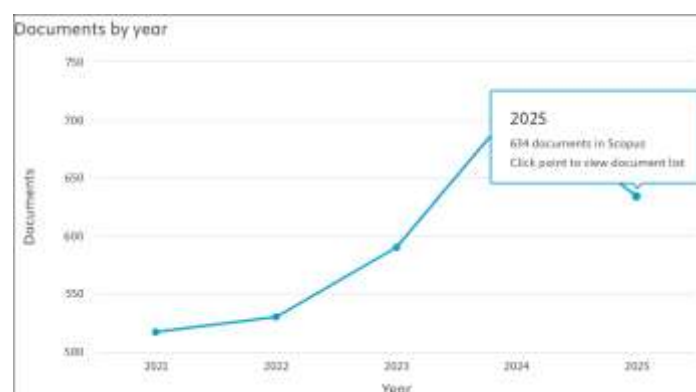


Figure 2. Trend of Scopus-Indexed Publications on Interactive Learning Media (2021-2025)

Overall, the findings from Figure 2 demonstrate that the field of interactive learning media continues to evolve dynamically. The data suggest that although the number

of publications reached its maximum in 2024, the ongoing diversification in 2025 indicates that research on this topic remains vibrant and adaptive to emerging technologies and pedagogical innovations. This trajectory underscores the importance of continuous bibliometric monitoring to understand how global academic communities respond to technological changes in education.

Analysis of Publication Sources by Year

Figure 3 below illustrates the distribution of publications related to interactive learning media across various sources or journals during the period 2021–2025. The data reveal noticeable fluctuations in the number of documents published by each source, reflecting the dynamic engagement of different academic publishers in promoting studies within this field.

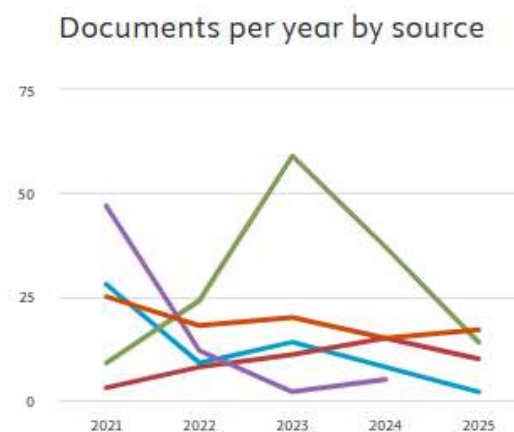


Figure 3. The Distribution of Publications to Interactive Learning Media

From Figure 3, it is evident that one source experienced a significant peak in 2023, indicating an increased focus or possibly a special issue dedicated to technology-enhanced learning or digital pedagogy during that year. However, after reaching its highest point (around 50–60 documents), a substantial decline followed in 2024–2025, suggesting a redistribution of publication outputs to other sources or the completion of a thematic research cycle. In contrast, several other sources maintained relatively stable but lower levels of publication, typically ranging between 10 and 25 documents per year. This pattern indicates the presence of a core group of journals that consistently support research on interactive learning media, complemented by emerging or occasional sources that contribute irregularly depending on the topic's prominence or editorial focus.

Overall, this analysis suggests that while interest in interactive learning media remains strong, the publication dominance tends to shift over time, likely influenced by evolving research trends, editorial priorities, and funding directions. Such diversification is beneficial as it broadens the academic dissemination of findings

and promotes interdisciplinary collaboration within the domain of educational technology.

Author Productivity and Contribution Analysis

Figure 4 presents the distribution of documents by author within the research domain of interactive learning media from 2021 to 2025. This visualization highlights the productivity levels of individual contributors and identifies the authors most frequently engaged in this area of study.



Figure 4. The Distribution of Documents by Author

As illustrated in Figure 4, the category [No Author ID found] dominates the dataset, accounting for more than 140 publications. This indicates that a substantial portion of documents indexed in Scopus lacks standardized author identifiers, such as Scopus Author IDs or ORCID profiles. The absence of consistent author metadata represents a notable limitation in bibliometric mapping, as it reduces the precision of author-level productivity analysis and hinders accurate citation tracking. This finding underscores the importance of improving author registration practices and metadata completeness in scholarly databases.

Beyond this category, several identified scholars including Marini, A., Khan, O. S., Safitri, D., Elmunsyah, H., and Hidayat, W. N. demonstrate recurring productivity, each contributing approximately five to ten publications during the analyzed period. Their works generally explore themes related to digital pedagogy, educational technology integration, and the application of interactive media in learning contexts. This suggests a consistent scholarly commitment to advancing theoretical and practical discussions in this research domain.

The overall distribution pattern reflects a collaborative and decentralized authorship landscape, where research on interactive learning media is shaped by contributions

from diverse academic and institutional backgrounds rather than being dominated by a single prolific author. Such diversity enriches the field by fostering interdisciplinary perspectives, methodological innovation, and cross-contextual knowledge exchange.

In summary, the analysis reveals two key observations: (1) the presence of incomplete author metadata that limits precise productivity tracking, and (2) a healthy distribution of research contributions across multiple active scholars. Together, these findings highlight the collective and evolving nature of research collaboration in the field of interactive learning media, aligning with global trends in educational technology emphasizing openness, interdisciplinarity, and shared authorship.

Institutional and Affiliation Analysis

Figure 5 illustrates the distribution of publications by institutional affiliation within the research domain of interactive learning media from 2021 to 2025. This analysis identifies the universities and organizations that have demonstrated the highest productivity in contributing to research outputs indexed in the Scopus database.

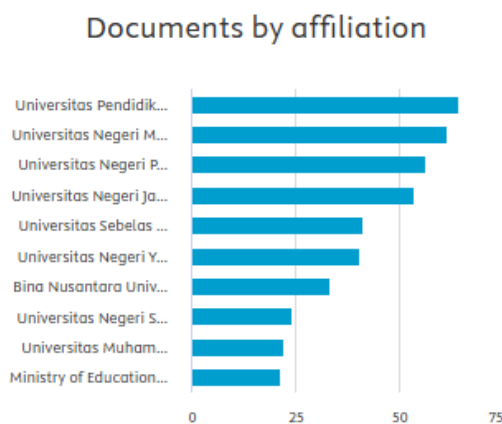


Figure 5. The Distribution of Publications by Institutional Affiliation

As shown in Figure 5, the majority of publications originate from Indonesian higher education institutions, reflecting the strong national focus and growing academic engagement in the field of interactive learning media. Universitas Pendidikan Indonesia (UPI) appears as the most prolific institution, followed closely by Universitas Negeri Malang, Universitas Negeri Padang, and Universitas Negeri Jakarta, each contributing between 55 and 70 documents over the analyzed period. These findings indicate a robust institutional commitment to advancing technology-enhanced learning and digital pedagogy in Indonesian universities.

The dominance of these institutions aligns with their strategic emphasis on teacher education, educational technology, and curriculum innovation domains that

naturally intersect with the study of interactive learning media. The consistent output from Universitas Sebelas Maret, Universitas Negeri Yogyakarta, and Bina Nusantara University further illustrates the diversification of contributions across both public and private higher education sectors. Although the number of documents from Universitas Muhammadiyah, Universitas Negeri Semarang, and the Ministry of Education and Culture is relatively smaller (approximately 20–30 publications), their participation highlights the collaborative ecosystem that supports the development and implementation of digital learning research in Indonesia. The involvement of the Ministry also reflects governmental support for educational digitalization initiatives.

Overall, the affiliation analysis demonstrates that research on interactive learning media is largely concentrated in teacher training and technology-oriented universities, but also benefits from cross sectoral engagement involving both academic and policy institutions. This institutional collaboration suggests a sustainable foundation for future innovation and knowledge dissemination in the field of interactive and technology-mediated learning.

Document Type Analysis

Figure 6 provides an overview of the distribution of document types related to interactive learning media research indexed in the Scopus database between 2021 and 2025. This analysis identifies the dominant forms of scholarly output and helps understand how knowledge in this domain is disseminated across various publication channels.

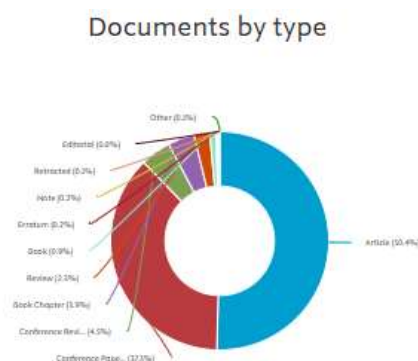


Figure 6. Overview Of the Distribution of Document Types Related to Interactive Learning Media

As illustrated in Figure 6, the majority of the documents are classified as journal articles (50.4%), indicating that most research on interactive learning media is disseminated through peer-reviewed academic journals. This dominance reflects the field's maturity and the increasing scholarly recognition of interactive media as a

significant area of inquiry within educational technology and digital pedagogy. Journal articles are typically preferred for their rigorous peer-review standards and broad accessibility to the academic community.

The second largest category comprises conference papers (13.1%), emphasizing the active role of academic conferences as platforms for the early dissemination of findings and exchange of emerging ideas. This trend suggests that researchers in this field value both rapid communication of innovation and collaborative knowledge building opportunities that conferences provide. Other types of documents, including book chapters (9.3%), reviews (2.1%), and editorials (0.6%), contribute to the diversity of publication formats. Although these forms represent smaller proportions, they play crucial roles in consolidating theoretical frameworks, offering methodological insights, and stimulating scholarly debate. Meanwhile, document types such as notes, errata, and retracted papers each account for less than one percent, indicating minimal issues with publication quality or correction within this field. Overall, the predominance of journal articles and conference papers highlights a dual pathway of scholarly communication formal peer-reviewed dissemination alongside dynamic, conference-based exchanges. This combination demonstrates the vibrancy of research on interactive learning media and underscores its sustained academic and professional relevance. The balance between publication types further supports the field’s development toward theoretical consolidation and applied innovation.

Subject Area Analysis

Figure 7 presents the distribution of research publications on interactive learning media across various subject areas as indexed in the Scopus database during the 2021–2025 period. This classification provides insight into the multidisciplinary nature of research in this field and highlights its intersections across domains of knowledge.

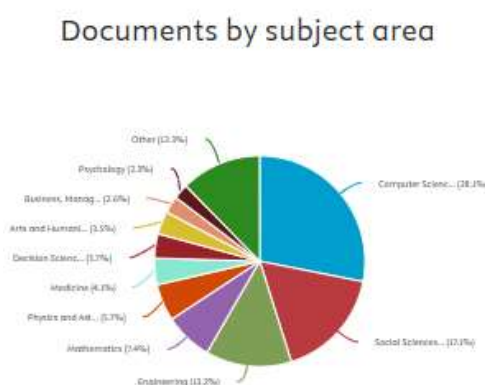


Figure 7 The Distribution of Research Publications on Interactive Learning Media

As depicted in Figure 7, the largest proportion of publications belongs to the Computer Science domain (28.1%), demonstrating the central role of computational approaches and digital technology in the design and development of interactive learning media. This dominance underscores the technological foundation of such research, particularly in areas like software engineering, mobile application development, and artificial intelligence integration for adaptive learning systems.

The Social Sciences category follows with 23.1%, indicating a strong pedagogical and behavioral orientation. This finding highlights that interactive learning media is not merely a technical construct but also deeply rooted in educational psychology, curriculum design, and instructional methodology. The integration of social science perspectives supports the understanding of learner engagement, motivation, and cognitive development in digital learning environments.

The Engineering field accounts for 13.2% of publications, reflecting research efforts in hardware design, interactive systems, and educational robotics. Meanwhile, disciplines such as Mathematics (7.4%), Physics and Astronomy (4.7%), and Medicine (4.1%) show that interactive learning tools have been increasingly applied in STEM education and medical training simulations. Smaller contributions come from areas like Decision Sciences (1.7%), Arts and Humanities (1.5%), and Psychology (2.7%), which, though modest in percentage, add depth to the interdisciplinary character of the field.

Overall, this distribution reveals that research on interactive learning media lies at the intersection of technology, education, and engineering, forming a strong triadic relationship among computer science, social sciences, and engineering. Such multidisciplinary indicates that advancements in interactive learning media require both technological innovation and pedagogical insight to create meaningful and effective digital learning experiences.

D. Conclusions

This bibliometric analysis provides a comprehensive and data driven overview of global research trends on interactive learning media published between 2021 and 2025. The results reveal significant growth in scholarly productivity, thematic diversification, and collaborative networks, reflecting the field's maturation during the post-pandemic era of digital transformation. A notable surge in publication output during 2023 and 2024 underscores the heightened academic and institutional focus on technology enhanced learning and interactive digital pedagogy. The dominance of journal articles compared to conference papers and book chapters further demonstrates the academic community's preference for peer-reviewed dissemination channels, which ensures greater visibility and scientific credibility.

Geographically, the findings indicate that higher education institutions remain the primary contributors to this research domain, with Indonesia emerging as one of the most active countries in publication output. This regional prominence highlights the accelerating adoption of educational technologies in Southeast Asia, aligning with the global shift toward digital literacy and innovation driven learning ecosystems. The subject distribution across Education, Computer Science, and Social Sciences confirms the interdisciplinary nature of this field, where pedagogical theories, technological frameworks, and human computer interaction converge to advance interactive learning experiences.

From a practical perspective, the insights derived from this bibliometric mapping offer valuable guidance for educators, policymakers, and developers. Understanding the structural dynamics of global research enables stakeholders to make informed, data driven decisions in designing, implementing, and evaluating interactive learning media. Institutions may leverage these results to foster international collaborations, identify underexplored topics such as AI driven personalization and immersive learning and align their strategic research agendas with global digital education priorities.

For future studies, researchers are encouraged to extend bibliometric inquiries by integrating cogitation, co-word, and thematic evolution analyses to reveal deeper conceptual linkages and intellectual structures within the field. Moreover, longitudinal investigations examining the pedagogical effectiveness and learner outcomes associated with interactive media applications across diverse cultural and institutional contexts will further enrich the empirical foundation of this domain. Such studies will ensure that technological advancements are meaningfully aligned with pedagogical principles and cognitive learning needs, thereby sustaining the transformative potential of interactive media in education.

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