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Bibliometric review: The use of interactive media in education

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Abstract

The use of interactive media in education has rarely been studied using bibliometric methods to provide a better reference point for future research. This study aims to provide a broad survey of the bibliometric literature on the use of interactive media in education. Compiled from Scopus database, 1489 articles published from 2015 to 2025 were analyzed in this study. VOSviewer software was used to analyze co-authorship, co-occurrence, and citations. The results showed that most of the interactive media research literature was published in the US. Correspondingly, the highest number of citations also came from US authors. The most frequent keywords were Interactive media, Virtual Reality and Students. Due to the high variability of interactive learning media for each study, the current research suggests that further research is focused on research development models through the integration of interactive media in education, particularly VR/AR in the learning process. To the best of the researcher's knowledge, studies on the use of interactive media in education with bibliometric analysis are rarely explored further.

Keywords

Interactive media, education

INTRODUCTION

The development of digital technology has brought a wave of significant transformation in various sectors, including the world of education. Interactive media, ranging from web-based simulation to virtual reality (VR) and augmented reality (AR), is increasingly integrated into the learning process. This integration promises a more interesting, personalized, and effective learning experience for students at all levels (Radianti et al., 2020). Its potential to improve the understanding of abstract concepts, train practical skills, and motivate students has sparked great research interest in recent decades.

However, along with the abundance of scientific publications in this field, a new challenge arises: how to comprehensively understand the development, trends, focuses, and knowledge networks formed from these studies? Reviewing traditional literature is often limited to handling large volumes of data and revealing hidden patterns that are only visible through quantitative analysis. This is where the bibliometric method offers a strong approach. Bibliometrics allows researchers to systematically analyze a large number of scientific publications, map the relationship between authors, institutions, countries, keywords, and citation trends, thus providing a holistic picture of the dynamics of a research field (Donthu et al., 2021).

Although the use of interactive media in education has been widely researched, the bibliometric approach to comprehensively map and analyze the landscape of literature is still relatively rarely explored further. The lack of a thorough bibliometric review can hinder new researchers in identifying seminal works, potential collaboration networks, and the most relevant

research trends and loopholes to be explored in the future (Zupic & Čater, 2015). Without a clear research map, research efforts can become fragmented or less directed.

To achieve this goal, the study collected and analyzed 1,489 scientific articles published between 2015 and early 2025, which were indexed in the Scopus database. Scopus' selection is based on its broad scope and strong reputation in international scientific literature. The analysis is carried out using VOSviewer software, a tool specifically designed for bibliometric network visualization. We focus on co-authorship analysis to see collaboration patterns, co-occurrence to understand the structure of topics, and citation analysis to measure the impact of the work.

The main findings of this study reveal several key insights: The United States emerges as a dominant contributor, both in terms of the number of publications and the accumulation of citations, reflecting the country's strong leadership in educational technology research. Keyword analysis confirms that "Interactive Media", "Virtual Reality", and "Students" are the most frequently appearing concepts, confirming the main focus of the research on the application of immersive technology and student learning experience. These findings not only provide a picture of the current state of the art but also highlight areas, such as the development of a more systematic VR/AR integration model, which requires more in-depth exploration in the future.

Thus, this research provides an original contribution through the first comprehensive bibliometric map for the use of interactive media in education. We hope this systematic review can serve as a valuable guide for researchers, educators, and education stakeholders to understand the evolution of the field, identify influential works and potential collaboration networks, and design a more focused and evidence-based research agenda forward. The bibliometric approach that we apply bridges the gap by providing a more structured and measurable reference base to advance research and practice of interactive media-based educational innovation.

So far, there still needs to be more literature that discusses Interactive media in education using bibliometric analysis. The specific goal of this study is to identify the following questions:
RQ1. who are the most prominent authors on the topic of Interactive media?
RQ2. what are popular keywords related to the research topic of Interactive media?
RQ3. who are the researchers who get the most citations?

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

The integration of digital technology has revolutionized pedagogical practice, with interactive media (such as simulations, virtual environments, game-based applications, and collaborative platforms) being the main catalyst. This media offers significant advantages over traditional methods, such as increased student engagement (Huang et al., 2019), facilitation of understanding abstract concepts through dynamic visualization (Mayer, 2014), and opportunities for personalized and contextual learning (Sung et al., 2016). Immersive technologies such as Virtual Reality (VR) and Augmented Reality (AR) in particular, have shown great potential in creating immersive learning experiences and improving learning outcomes in various disciplines, ranging from science to technical skills training (Radianti et al., 2020).

Therefore, this study is explicitly designed to fill this methodological gap. We conducted a comprehensive bibliometric review by analyzing 1,489 articles from Scopus (2015-2025) using VOSviewer, focusing on co-authorship, co-occurrence, and citation analysis, to provide the first holistic map of the field of research on the use of interactive media in education.

METHODS

The study of bibliometric literature uses systematic and detailed methods(Garza-Reyes, 2015). The bibliometric analysis also uses the establishment of thought that focuses on the limits of knowledge (Churiyah, M. et al., 2022)(Nuryana et al., 2024). In this study, the researchers implemented a five-stage method (Setyaningsih, I. et al., 2018), as presented in Figure 1 below.

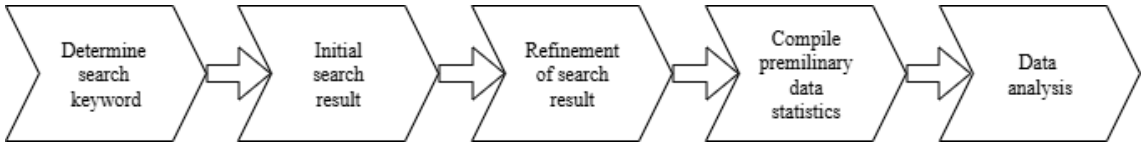


Figure 1.
Five-stage method

Search keywords determination

At this stage, database selection is used to search for articles by selecting appropriate search terms in the research using keywords chosen (Sa'adah & Zagladi, 2023). Electronic databases are used as a source of information. The keywords that researchers used in collecting articles were "Interactive media" AND "higher education".

Initial search results

Initial search results are obtained from searching for keywords for the first time. The initial search results show the number of articles with the required keywords. After getting the initial results, the researchers then screened all articles based on the criteria determined in this study (Kurnia, H.R. et al., 2023).

In this study, the researcher searched for articles specifically for "journals" and "proceedings," only "title words" and the year "2015–2025". The initial research found a total of 1489 articles. The results are compiled in comma separated value (CSV) format to input all-important article information such as titles, abstracts, keywords, author and affiliate names, and references.

Search results refinement

Refining search results is a step taken to retrieve data with more accurate results according to what the researcher needs. In other words, it is an article selection for the analysis (Utami & Karlina, 2022). Furthermore, to make relevant improvements, each article metadata is further processed on the Excel file, which is then resaved as on the CSV file for further use for further data analysis.

Preliminary data statistics compiling

In this stage, the collected data is stored in CSV form. In the early stages, components of journal articles and complete proceedings (year of publication, volume, number, page, etc.) are examined, and the researcher adds the necessary information if incomplete data is found. Data analysis is done to group articles by source, year of publication and publisher.

Data analysis

This bibliometric literature study is used to analyze and visualize bibliometric networks using VOSviewer software because it can work efficiently with large data sets and provides a variety of exciting analyses, visuals and investigations (Van Eck & Waltman, 2010). VOSviewer can also create author, publication or journal maps based on network-shared citations or keyword maps based on shared networks (Hudha et al., 2020). Bibliometric data saved in CSV format will be visualized using VOSviewer. VOSviewer can be applied to analyze and create graphical representations in the form of bibliometric maps.

RESULTS AND DISCUSSION

Countries with top regions ranked based on the number of publications

Table 1 shows that out of 1489 articles worldwide, the country with the most dissemination of articles on interactive media topics in Education is the United States, followed by China, United Kingdom and Canada. Indonesia ranks seventh in the writing of articles about interactive media and the United States is the pioneer in writing 336 articles. In this case, the US has better access to funding compared to other countries so that it is able to support the sustainable development of media.

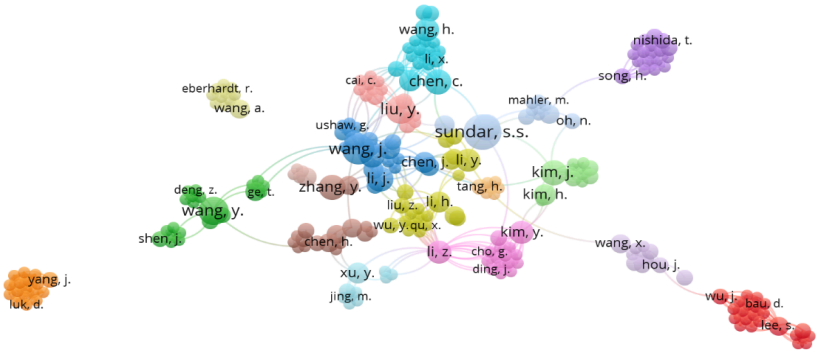
Table 1 Top region countries ranked by number of publications

Countries/regions	Document	Citation
United States	336	7114
China	145	946
United Kingdom	103	946
Canada	55	690
Australia	56	588
Germany	62	448
Indonesia	175	440
Spain	34	419
Belgium	10	306
India	90	306
Japan	44	306
Denmark	17	292
South Korea	44	291
Italy	24	286
Singapore	11	266
egypt	9	257
Netherland	28	244
Austria	11	230
Portugal	27	195
Hongkong	18	194

Source(s): Authors' own work

Co-authorship

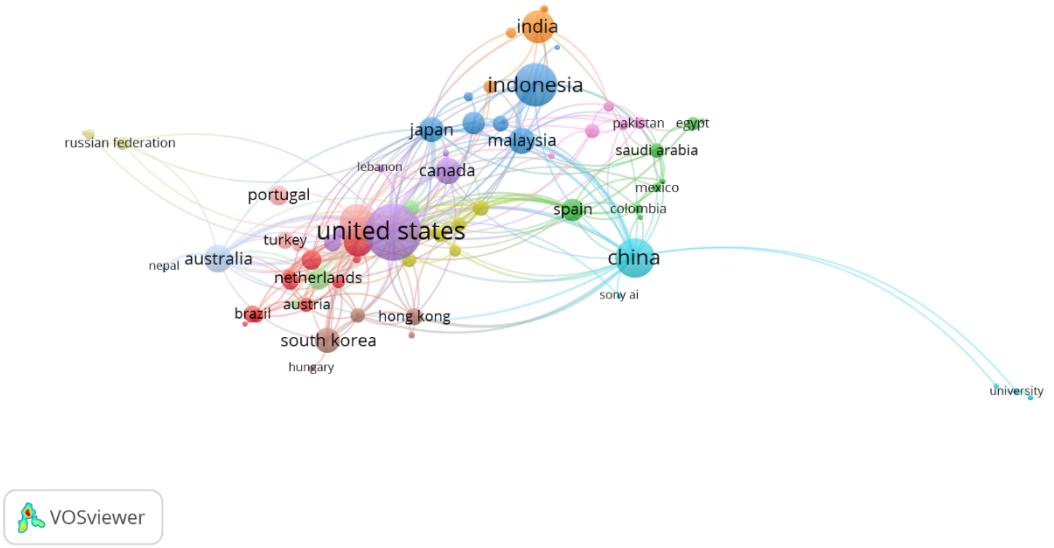
Co-authorship analysis is used to examine the collaboration network between authors. In other words, this analysis aims to see the relationship between a writer and other writers in producing articles (Soesanto & Handalani, 2023). VOSviewer then visualizes the network by displaying the author's name, institution affiliation, and country of origin (Zakiyyah et al., 2022). Figure 2 shows sixteen groups of authors in the analyzed research topic. Through this approach, the pattern of scientific collaboration between authors, institutions, and countries in interactive media research can be identified. Every author is connected in a network, which means that there is a collaborative relationship in research on interactive media topics in the field of education. Analysis is carried out with a thorough calculation method, where each co-authorship is weighted according to the number of items (authors, institutions, countries) in the publication. The results of the analysis show that the size of the node represents the number of publications in a certain data set, both authors, institutions, and countries. The closer the collaboration between the authors, the closer the items on the map and the thicker the connecting line (Hern´andez-torrano & Ibrayeva, 2020).



Source(s): Authors' own work

Figure 2
Co-Authorship

Figure 3 explains that most of the authors of interactive media topics are United States, followed by China, United Kingdom and Canada. Interactive media in developed countries is growing rapidly along with the advancement of digital technology and the increasing need for people for a more participatory and immersive communication experience. The utilization of interactive media is widely applied in the education sector through e-learning-based learning, gamification, virtual reality (VR), and augmented reality (AR) which is proven to be able to increase participation and learning effectiveness (Teixeira, 2023)



Source(s): Authors' own work

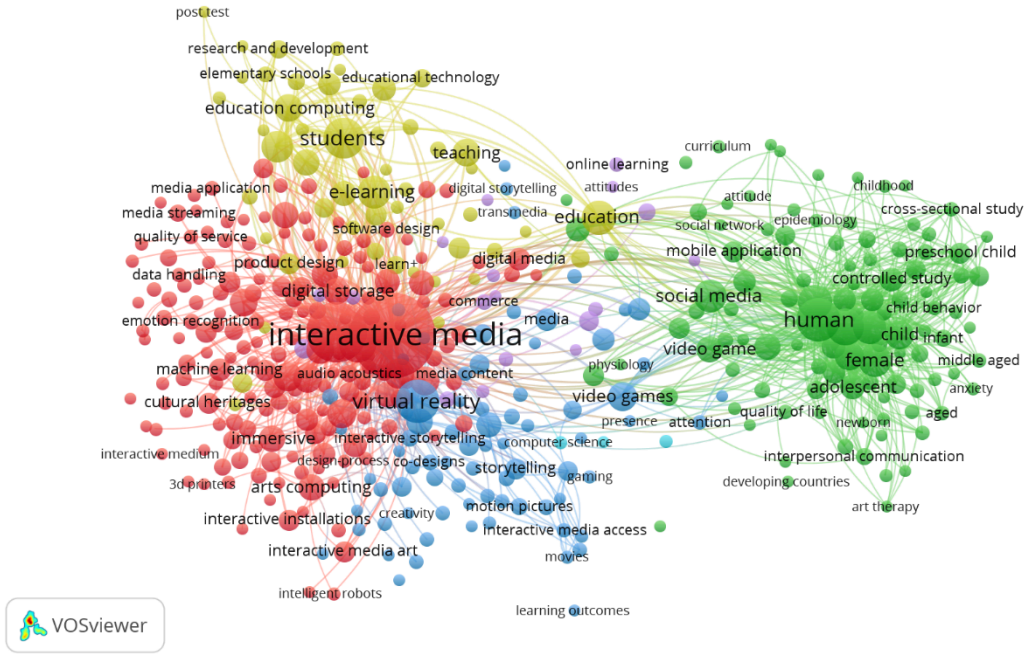
Figure 3
Co-Countries

Co-occurrence

Co-authoring analysis is used to examine collaboration patterns between authors. This analysis aims to identify the relationship between authors in a field of research (Zhou, X. et al., 2022). The co-appearance analysis method in bibliometrics has experienced significant development over the past two decades. This approach is useful in mapping and identifying scientific clusters that have academic relevance (Zhou, X. et al., 2022).

The results of the analysis show that there are various research clusters, which indicates that in the future researchers have the potential to integrate important ideas in higher education more comprehensively. The interesting aspect in this analysis lies in the use of keywords obtained from titles, abstracts, and keyword lists in each document. The frequency of the simultaneous appearance of keywords in a document shows the strength of the relationship between the terms (Hern´andez-torrano & Ibrayeva, 2020).

Based on Figure 4, there are six groups of research results with interactive media keywords. The first group consists of 431 items related to technology utilization research, such as artificial intelligence, augmented reality, case-studies. The second group reflects a broader aspect of interactive media related to research on the use of interactive media for the development of learning in schools and universities, such as cognitive development, curriculum, mobile applications. At the same time, the third group highlights the role of interactive media in social interaction, psychology, and humanities aspects of the use of interactive media, such as collaboration, learning outcome, interactive medi a content. The fourth group focuses on the role of interactive media in learning, such as ritical thinking skills, e-learning, virtual reality, technology. The fifth group consists of keywords related to user-related technology adaptation, including decision making, digital interactive media, online learning. The sixth group focuses on computer science



Source(s): Authors' own work

Figure 4
Co-occurrence

CONCLUSION

Based on a bibliometric analysis of 1,489 articles from the Scopus database (2015-2025), it can be concluded that research on the use of interactive media in education has shown significant growth, with the United States being the primary contributor and citation leader. The research landscape is dominated by topics such as Interactive Media, Virtual Reality, and Students, indicating a strong focus on the application of immersive technologies such as VR/AR in learning contexts.

However, key findings reveal high variability in approaches and implementations of interactive media, indicating that research in this area remains scattered and has not yet been integrated into a comprehensive development model. Therefore, this study recommends that future research agendas should not solely explore new technologies but rather focus on developing systematic research models to integrate interactive media, particularly Virtual and Augmented Reality (VR/AR), into the educational process more effectively and measurably. Overall, this study successfully fills a gap in the literature by presenting a rare bibliometric mapping in the field, while also providing a clear foundation and direction for future researchers.

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