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Bibliometric analysis of the use of VOSviewer in educational research: Trends and implications

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Abstract

This study aims to explore the use of the VOSviewer application in the context of educational research and its impact on improving research quality. The method used was a qualitative descriptive approach, utilizing a literature review and bibliometric analysis to evaluate relevant publications from Google Scholar using the Publish or Perish tool. This analysis identified dominant trends and topics in educational literature adopting VOSviewer from 2014 to 2023. The results showed a significant increase in the number of relevant publications, especially since 2020, indicating the increasing interest and relevance of VOSviewer applications in education research. VOSviewer is proven to be an effective tool in managing and analyzing research data, improving the efficiency, accuracy, and validity of research results. This research lies in comprehensively analyzing the use of VOSviewer to map and understand trends in education research, which has not been discussed much in depth before. This research makes an important contribution to the development of innovative and efficient educational research methods, opening up opportunities for further research in the use of information technology to improve the quality of educational research.

Keywords: VOSviewer, Publish or Peris, Education

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1. INTRODUCTION

Education is a key pillar in the progress of society and the nation (Apriliasari, 2022; Staeheli & Hammett, 2010). In an era where information technology plays a crucial role, the VOSviewer application emerges as a research tool that contributes significantly to improving the quality of educational research (Bi & Han, 2013; Criollo-C et al., 2023). VOSviewer is software for building and visualizing bibliometric networks (Effendy et al., 2021; Wrigley et al., 2019; Orduña-Malea & Costas 2021). In recent years, educational research has increasingly adopted information technology to improve the efficiency and validity of findings (Bakan Kıraç, & Sahmurova, 2022; Arianti, A2024 Alkhattabi, 2017; Carlisle et al., 2017; Martins et al., 2022; Wang & Wang, 2022; Oyewola & Dada 2022). The VOSviewer application is particularly relevant in this context as it enables the management and analysis of research data quickly and accurately (Huang, 2023; Wang, 2021; Yu, 2023; Santoveña-Casal & López 2024). As an intuitive and feature-rich platform, VOSviewer provides a potential solution to address various methodological challenges in educational research.

The purpose of this study was to explore the use and analysis of the VOSviewer application in the context of educational research and its impact on improving research quality (Corr et al., 2020; Davies et al., 2010; Lim et al., 2017). The main focus covers the research design stage to data analysis, with an emphasis on the efficiency, accuracy, and validity of research results (Van et al., 2022). The use of this technology is expected to make a positive contribution to the advancement of educational research and development.

This research combines a literature review on technology integration in educational research with empirical results obtained from using the VOSviewer app (Arnold & Sangrà, 2018; Gause et al., 2022). This is expected to provide a comprehensive insight into the potential of this application as an innovative tool in supporting the improvement of the quality of educational research (Zin & Jacobus, n.d.). As a result, a thorough bibliometric analysis of the literature on VOS Viewer and Education is important to support future authors and researchers. Some of the studies that have used VOS Viewer are listed below:

1. Bibliometric Analysis Of Learning Models Research Using Vosviewer (Nova et al., 2023)
2. Tren Manajemen Pendidikan: Analisis Bibliometrik Menggunakan Aplikasi Vosviewer [Education Management Trends: Bibliometric Analysis Using the Vosviewer Application] (Rahim & Awaliyah, 2023)
3. Analisis Bibliometrik Profesionalisme Guru: Penelitian Menggunakan Aplikasi Vosviewer [Bibliometric Analysis of Teacher Professionalism: Research Using the Vosviewer Application] (Nova et al., 2023)

Based on these considerations, this study conducted a comprehensive bibliometric analysis of the literature on VOSviewer research and education. Articles from Google Scholar were examined and classified based on research distribution and affiliation (Subagja et al., 2022). This analysis was able to identify the most published research topics, particularly the topic of “VOSviewer and education”, which opens up opportunities for further research. Bibliometric analysis methods, including the use of Google Scholar data-based tools such as Publish or Perish (PoP). Publish or Perish (PoP) is a software that helps academics evaluate their research performance based on citation analysis. PoP takes citation data from sources such as Google Scholar, Microsoft Academic, and CrossRef, and processes it into bibliometric metrics. The main steps of PoP are: 1. Citation Data Retrieval: PoP retrieves data from user-selected sources by entering author names, keywords, or publication titles. 2). Data Analysis: PoP calculates metrics such as total citation count, h-index, g-index, m-index, and impact factor. 3). Reporting and Visualization: PoP provides reports and graphs to understand citation distribution and metric evolution. and 4). Data Storage and Export: Analysis results can be saved in formats such as CSV, RIS, or PDF (Iriyani et al., 2023).

This research addresses the challenge of effectively evaluating literature and conducting bibliometric analysis in the context of educational research. Traditional methods of literature review and bibliometric analysis often lack integration with advanced technological tools that can enhance the depth and breadth of the analysis. The problem lies in finding a comprehensive approach that not only reviews existing literature but also leverages empirical data to provide actionable insights (Brika et al., 2022; Deveci, 2022).

By integrating VOSviewer technology, this research aims to bridge the gap between theoretical understanding and practical application. VOSviewer is a powerful tool for visualizing and analyzing bibliometric data, which can reveal patterns and trends that are not easily discernible through traditional methods (Kriouich & Sarir 2024). This integration is expected to yield deeper insights into how educational research can be improved and made more efficient (Zin & Jacobus, n.d; Mohebi, 2021).

The current state of educational research often suffers from fragmented approaches to literature evaluation and a lack of robust tools for bibliometric analysis. This study seeks to address these issues by demonstrating the practical utility of VOSviewer technology, thereby contributing to the development of innovative and efficient research methods in education.

2. METHODS AND MATERIALS

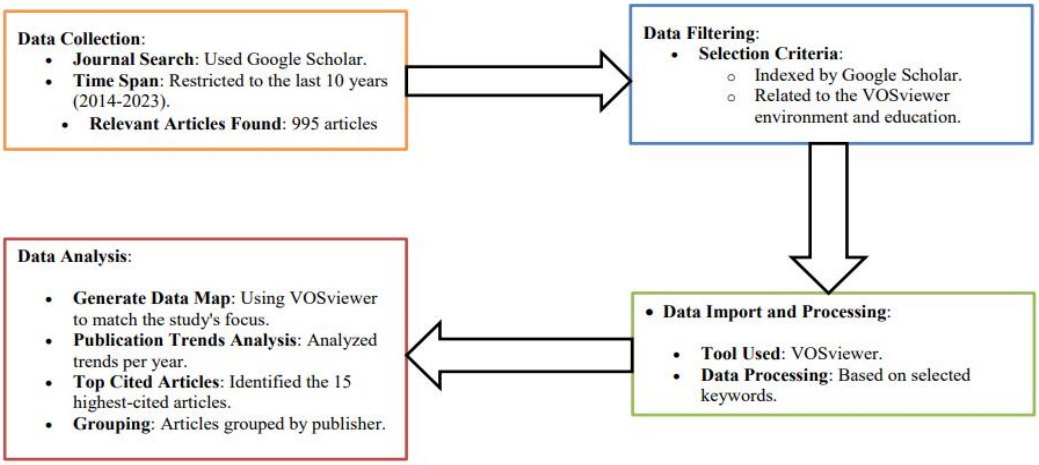
This study applies a qualitative descriptive approach to describe the use of data in this research. Data sources were obtained from journals indexed on Google Scholar, focusing on the topic of "VOSviewer and education". The data collection process utilized the Google Scholar publication search method, with detailed specifications outlined previously (López-Cózar et al., 2017).

When collecting data, researchers refer to the Publish or Perish literature system as guidance. This method makes it possible to find relevant articles or journals by using several sources, such as Crossref, Google Scholar, Google Scholar Profile, PubMed, Microsoft Academic, Scopus, and Web of Science. The goal of Publish or Perish is to compile existing research on the selected topic, which will serve as the basis for research data.

The journal search using Google Scholar restricted the period to the last 10 years (2014-2023), which resulted in the discovery of 995 relevant articles. Journal selection criteria ensured that all journals were indexed by Google Scholar and related to the topics of the Viewer VOS environment and education. The data was then imported into the VOS viewer, where it was processed based on the selected keywords. VOSviewer was used to generate a data map that matched the focus of the study. The study also analyzed publication trends per year and identified the 15 highest-cited articles out of a total of 995 articles, grouped by publisher can be seen in Figure 1.

Figure 1

VOS Viewer and Education Research



3. RESULTS

Table 1 and Figure 2 present the results of the search conducted using the Publish and Perish software, which yielded 995 papers on the subject of VOS Viewer published in journals between 2014 and 2023.

Table 1

Number of VOS Viewer and Education articles per year

Year	Number of Articles
2014	0
2015	1
2016	2
2017	1
2018	3
2019	3
2020	22
2021	106
2022	280
2023	577

Figure 2

Comparison chart of the number of articles against the year of publication

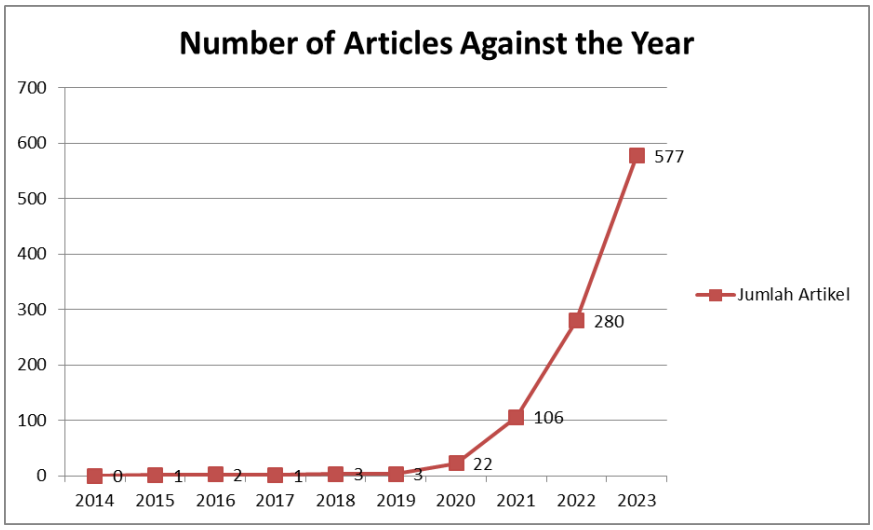


Table 1 shows a significant trend of growth in the number of articles related to VOS viewers and education from 2014 to 2023. At the beginning of the period (2014-2017), the number of articles was relatively low but increased slowly. In 2020, there was a drastic spike in the number of articles published, jumping from 3 articles in 2019 to 22 articles. This surge further increased rapidly in the following years, with the number of articles jumping to 106 in 2021, and 280 in 2022, and peaking at 577 articles in 2023.

The comparison graph in Figure 2 will reflect this trend, showing an exponential increase in the number of articles over time. The significant increase is especially pronounced after 2019, suggesting perhaps a growing interest in the topic or a change in publishing or information distribution policies. This phenomenon could indicate important developments in the field of VOS Viewer and Education that drove the growth of relevant academic literature during the observed period based on Google Scholar indexing.

Articles on the topic of VOS Viewer published from 2014 to 2023 found the top 10 cited articles showing interesting citation patterns from different articles can be seen in Table 2. The table lists the most cited articles, with a significant number of citations from each article.

The most cited article was “A Bibliometric Analysis of Covid-19 Research using VOSviewer” published in 2020 in the Indonesian Journal of Science. This article received 644 citations, showing the significance of Covid-19 research in the scientific literature in 2020.

In addition, some of the other articles that appear in this table also attract attention. For example, the article “Geogebra Software in Mathematics Learning: A Literature Study” published in 2023 in the Scientific Journal of Realistic Mathematics received 240 citations, indicating a strong interest in the use of Geogebra software in math learning.

Similarly, other articles, such as “Bibliometric analysis: Research focus on problem-based learning in mathematics learning",” Low Carbon Education: A Review and Bibliometric Analysis", and articles related to Islamic finance research, also showed significant interest from the scientific community.

This pattern provides insights into ongoing research trends and interests in a variety of fields, from bibliometric analysis of Covid-19 to approaches to learning mathematics and studies on Islamic finance. This kind of analysis can help identify topics that are important in the current scientific literature and research directions that are likely to develop in the future.

Table 2

Most cited VOS Viewer and Education articles

No	Cites	Title	Year	Source	Publisher

1	644	A Bibliometric Analysis of COVID-19 Research using VOSviewer (Boonroungrut et al., 2022)	2020	Indonesian Journal of Science …	ejournal.kjpupi.id
2	240	Software Geogebra Pada Pembelajaran Matematika: Studi Literatur (Fathurrahman & Fitrah, 2023)	2023	Jurnal Ilmiah Matematika Realistik	jim.teknokrat.ac.id
3	165	Low Carbon Education: A Review and Bibliometric Analysis (Hudha et al., 2020).	2020	European Journal of …	ERIC
4	154	A bibliometric analysis of materials research in an Indonesian journal using VOSviewer (Nandiyanto & Husaeni, 2022)	2021	Journal of Engineering …	kuwaitjournals.org
5	143	Pemetaan Penelitian Akad Mudharabah Pada Lembaga Keuangan Syariah: Studi Bibliometrik Vosviewer Dan Literature Review (Budianto, 2023)	2022	J-EBIS (Jurnal Ekonomi Dan Bisnis Islam)	journal.iainlangsa.ac.id
6	134	Pemetaan Penelitian seputar Bank CIMB Niaga Syariah dan Konvensional: Studi Bibliometrik VOSviewer dan Literature Review (Rohimah et al., 2023)	2023	JEMPER (Jurnal …	repository.uin-malang.ac.id
7	133	A bibliometric analysis of chemical engineering research using Vosviewer and its correlation with covid-19 pandemic condition (Nandiyanto et al., 2021)	2021	Journal of …	jestec.taylors.edu.my
8	130	Pemetaan Penelitian Seputar Manajemen Zakat Pada Lembaga Keuangan Syariah: Studi Bibliometrik VOSviewer Dan Literature Review (Budianto et al., 2023)	2023	Jurnal Ekonomika Dan …	journal.unesa.ac.id
9	127	Pemetaan Penelitian Seputar Risiko Kredit pada Perbankan Syariah dan Konvensional: Studi Bibliometrik VOSviewer dan Literature Review (Budianto, 2023)	2023	BANCO: Jurnal Manajemen Dan Perbankan …	ejurnal.iainpare.ac.id
10	125	Analisis bibliometrik perkembangan penelitian bidang ilmu instrumentasi (Tupan et al., 2018)	2018	BACA: Jurnal …	jurnalbaca.pdii.lipi.go.id

There is a maximum of two study subject keywords that can be linked to VOSviewer. Subsequently, a collection of research publications was gathered to examine the correlation between these terms. Table 3 displays the division of the data collected on the subject of VOSviewer and Education into forty-four (44) clusters.

Table 3

VOS Viewer and Education Cluster

Cluster	items
Cluster 1 (28 items)	bibliometric analysis of higher order thinking skills sphere in, a bibliometric analysis of, scientometric analysis of twenty years of research on the academy, vosviewer application help, widely cited used Microsoft excel, derived from Scopus database and web, bibliometric analysis method, bibliometric, from, to, management, through vosviewer, we, using vosviewer application, using vosviewer, an overview of the spread of Islam through bibliometrics, mapping, this study analyzes themes, application of network data envelopment analysis in measuring efficiency in the education sector, efficiency measurement, VOS viewer software, global map of religious education research issues, vosviewer program, science, a software, bibliometrics study on Scopus database year, bibliometric study, research trends.
Cluster 2 (24 items)	bibliometric map, bibliometrics, computational bibliometric analysis, contribution, e-learning, essential skill, evolution, Google Scholar using Vosviewer, literature review, learning, map, mapping, mapping analysis, opportunity, pbl, library marketing research mapping, physics education, science education, science education research, skill, software, stem, literature network analysis system, trend, vosviewer tool
Cluster 3 (23 items)	analysis of much variable calculus research with Google Scholar database using Vosviewer, authorship, bibliometric analysis study, bibliometric computational mapping analysis, bibliometric evaluation strategy, bibliometric review, biology education, citation patterns, data collection, data mapping, examination, Google Scholar indexed Vosviewer, growth, investigation, keywords, learning in mathematics learning, emergence analysis, perish software, publication trends, universitas pendidikan Indonesia, video, vocational high school, vosviewer program
Cluster 4 (23 items)	Analysis, bibliometric analysis of research development in the field of children's literacy, bibliophily, and vosviewer, development map, conducted using vosviewer, literacy education in schools, literature review, though, using bibliometric analysis, using bibliometric tool, slna method, primary education, perish so, a bibliometric analysis, a bibliometric study, primary school, study of artificial intelligence in education, related meta-analysis studies, study show, to find out, vosviewer and, Zotero
Cluster 5 (22 items)	bibliometric analysis, citation, citation reference, computational mapping, density visualization, determinant, differentiated learning, islamic education, kajian bibliometric, keyword occurrence, Mendeley, network visualization, overlay visualization, pop software, published data, research trends, ris format, scientific creativity, teacher, vosviewer, vosviewer network mapping
Cluster 6 (21 items)	bibliometric analysis tools, bibliometrics, critical thinking, and Mendeley to improve tegal student bond scientific writing skills, development analysis research, excel, numbers, history, inquiry, keyword mapping, literature, literature study, keyword mapping, keyword mapping, publication software training, perish, physics education, physics, research methods, technology, vosviewer used
Cluster 7 (21 items)	bibliometric analysis of trends in the use of ICT in mathematics learning, CSV, data visualization, English, frequency analysis, games, mathematics learning, Microsoft Excel, nvivo, character education, data publication, is for use in Vosviewer software, scholar, scientific publications, Scopus database, teacher leadership, trend analysis, age, vosviewer, vosviewer and nvivo, vosviewer network mapping visualization
Cluster 8 (20 items)	bibliometric analysis using vosviewer, bibliometric analysis of mathematical reasoning ability, bibliometric analysis of students' interest in learning mathematics, productivity analysis of educational research, VOS viewer software assistance, bibliography, critical thinking skills, in physics learning, using vosviewer, critical thinking skills, mathematics, using VOS viewer software, in mathematics lessons, mathematics education, bibliometric research, participants,

	VOS viewer software, it is vosviewer, trends in medicinal plant research in Indonesia from year to year, vosviewer is a bibliometric analysis tool
Cluster 9 (20 items)	This paragraph discusses several topics in the field of Islamic economics and financial institutions. In this text, there is research on Islamic and conventional banks, research mapping on mudharabah and musyarakah contracts, and zakat management in Islamic financial institutions. The text also mentions bibliometric vosviewer study and literature review as the methods of analysis used. This paragraph underlines the importance of research and mapping in the development of Islamic economics.
Cluster 10 (18 items)	bibliometric analysis on the Scopus database, bibliometric analysis of educational technology research on publications, bibliometric data analysis, dissemination, institutional aspects, institutional relationships, learning management systems, mapping processes, pads, Islamic education in international publications, perish applications, problem areas, relationships, articles relevant, study period, indexed by Google Scholar, VosViewer mapping analysis calculations, VosViewer visualization.
Cluster 11 (18 items)	Islamic religion, a bibliometric analysis of it, a bibliometric analysis of research on adversity quotient, a bibliometric analysis of learning media research trends using the Google Classroom platform using Vosviewer software, analysis of the development of introducing Indonesian priority animals in children's education, classifying clusters using Vosviewer in the field of tourism, the study of fiqh through concepts, the use of Google Scholar with Vosviewer, the use of Vosviewer software, there are still shortcomings in the education of the introduction of Indonesian priority animals in children, the influence of the demonstration method in learning fiqh in pesantren through the concept of non-formal education, research data, math topics, media topics, article objectives, Vosviewer shows relevant facts.
Cluster 12 (17 items)	bibliometric approach, bibliometric mapping, bibliometric mapping, development disability, elementary school, increase, using vosviewer in Google Scholar database, independent learning, online learning, pandemic, discovery research, this research was conducted to determine, the development of research that discusses discovery learning, research independent learning, systematic literature review, threshold
Cluster 13 (17 items)	The problem-based learning paradigm in analyzing students' mathematical critical thinking skills through scientific publications can be done using Vosviewer. This bibliometric research uses bibliometric methods and a flipped classroom approach with limited face-to-face learning methods. This study also uses a complete data collection method and independent student mathematical critical keywords through Vosviewer. Literature analysis was conducted to understand the use of Vosviewer and the purpose of this study was to provide training in analyzing scientific publications using bibliometric methods and Vosviewer. The results of this bibliometric analysis can be applied in a more contextualized problem-based learning approach.
Cluster 14 (16 items)	bank bukopin sharia and conventional, bank guarantees in sharia and conventional financial institutions, bank permata sharia and conventional, and bibliometric vosviewer, and bibliometric vosviewer sakinah maulidah mastniah, used in bibliometric studies, used to analyze bibliometric data collected from, library research, open source software, qualitative approach, first, project, literature study, sharia, and conventional, vosviewer is, vosviewer is used in this study to analyze and analyze bibliometric data.
Cluster 15 (15 items)	This text describes the use of Vosviewer software to analyze bibliometrics and map the research literature, art, keyword clusters, and teacher education uin raden intan lampung during being, discovery, engineering, mathematics, science education, perished, research opportunity, science learning, scientific publications indexed, steam, study physics education faculty, vosviewer app

Cluster 16 (15 items)	bibliometric analysis of project-based e-modules, bibliometric analysis of online learning development, bibliometric analysis of vosviewer, vosviewer application, zoom application using vosviewer, bibliometric vosviewer, bibliometric vosviewer and literature review, educative, mapping results using vosviewer number, learning media, methods, mapping of bibliometric studies vosviewer, mapping of research topics around istishnapada contract in the industry, technological developments, elementary school using vosviewer
Cluster 17 (13 items)	systematic literature review analysis, covid, hybrid learning, Mendeley application, Quran memorization method in Indonesia, future education, research using applications, perish and vosviewer, physics learning, related research, search result extraction, similarity viewer, visualization
Cluster 18 (13 items)	bibliometric analysis approach, bibliometric mapping analysis, cluster, education, Google Scholar database, journal of Physical Education and Sport, multilateral, learning using games based on vosviewer bibliometric analysis, research map, research methodology, training, vosviewer application, vosviewer mapping
Cluster 19 (13 items)	bibliometric analysis of years, bibliometric analysis of Islamic religiosity studies, augmented reality, from bibliometric maps, results, VOS viewer software, research mapping of technology use, Islamic religious education, early childhood education, research advance, and VOS viewer software, technology, early childhood
Cluster 20 (12 items)	abstract model eliciting activity, affiliation, change, further research, innovation, mathematical connection, mathematics education, mea, mea, model, model eliciting activities on mathematical connection ability based on vosviewer perspective
Cluster 21 (12 items)	bibliometric analysis using, bibliometric method, Google Classroom, Google Scholar, Google Scholar, this research method is a class action research, bibliometric computational mapping of learning analysis Google Classroom using Vosviewer, perish program, research approach, research data, search results service, against applied mathematics research trends
Cluster 22 (12 items)	artificial intelligence, bibliographic data, bibliometric network, bibliometric dan vosviewer, computational thinking, cooperation, entrepreneurship, mosques in European countries, trends in mosque studies, vosviewer bibliometric analysis, vosviewer is, which Diana Lisa and processed use vosviewer
Cluster 23 (11 items)	Based on the results of bibliometric research on Islamic religious education, it was found that the co-occurrence analysis technique was used to analyze the frequency of keywords appearing in the Scopus database. Visualization using Vosviewer was conducted to gain a deeper understanding of potential topics for future studies in the field of Islamic religious education. This research was conducted by the Library and Information Science Study Program of Universitas Pendidikan Indonesia this year, using a quantitative descriptive study method. In the document, Vosviewer was used to retrieve relevant information.
Cluster 24 (11 items)	bibliometric analysis, sourced from Google Scholar database data collection through search with, Indonesia in physics learning, communication skill research, use of vosviewer to create maps can use of vosviewer to create visual maps as well, perish and, cognitive development learning strategies for young children, augmented reality research trends, biology education research trends, vosviewer is used in this study to be able to analyze and
Cluster 25 (10 items)	bibliometric analysis based on Google Scholar using Vosviewer, character education research, CSV format, hot, islamic boarding school, character education in boarding schools, research analysis, ris, scientific article, which utilizes Vosviewer software
Cluster 26 (9 items)	called co-analysis, using software, in this study the data was processed using, mapping of research topics around the influence of microeconomic variables, the program uses Vosviewer, bibliometric studies bibliometric methods, self-regulated learning research trends in the year, the purpose of bibliometric analysis in, to analyze and

Cluster 27 (8 items)	bibliometric analysis of performance, bibliometric analysis of performance, bibliometric analysis of teacher professionalism, systematic analysis of bibliographic data, it can be concluded that, overlay, education or pedagogic means, formal education through institutions, research using vosviewer applications,
Cluster 28 (7 items)	compiling analytical maps, synthesis of nanocrystalline words, synthesis of nanocrystalline cellulose, packaging application research, and bibliometric research on the development of information architecture in Google Scholar using Vosviewer software.
Cluster 29 (6 items)	This bibliometric analysis involves the use of the Google Scholar database in researching digital literacy in literature related to the development of digital literacy in education. This research is a bibliometric review.
Cluster 30 (5 items)	in Scopus, halal tourism, Scopus, tourism infrastructure development study, study literature review
Cluster 31 (5 items)	bibliometric analysis, mapping, materials research, materials research, case study
Cluster 32 (5 items)	This bibliometric analysis aims to examine research trends in developmental schools, analyze the co-occurrence between the schools, and examine convergence, empiricism, and nativism.
Cluster 33 (4 items)	bibliometric analysis of science literacy using Vosviewer in science education, in physics education, specifically literacy, to analyze and visualize literacy research in science education.
Cluster 34 (4 items)	bibliometric analysis of, based on gender differences, using vosviewer-based Google Scholar data, vosviewer-based scale mathematics
Cluster 35 (3 items)	Bibliometric analysis of research on waqf intention has been conducted using Vosviewer and R Studio. In addition, the use of Vosviewer and bibliophily was also carried out in the bibliometric analysis.
Cluster 36 (3 items)	Buana Mathematics, a scientific journal of mathematics and mathematics education, mathematics based on gender differences
Cluster 37 (3 items)	and Zotero for, training in using the application, training in literature study preparation techniques using Vosviewer, and citation techniques using Zotero.
Cluster 38 (3 items)	the research methods used in this article are, the VOS viewer method approach in the systematic literature review, the introduction of traffic signs in early childhood
Cluster 39 (2 items)	bibliometric analysis of financial statement fraud, national and international developments on the topic of financial statement fraud
Cluster 40 (2 items)	bibliometric analysis of Sabah qiraat using Voyeviewer based on Google Scholar data, Voyeviewer edition.
Cluster 41 (2 items)	By using VosViewer for bibliometric analysis of mathematics literature, this study aims to analyze the bibliometric analysis of mathematics literature in the Scopus database.
Cluster 42 (2 items)	analysis results show the trend of the thesis, analysis results show the trend of thesis
Cluster 43 (2 items)	instructional technological leadership research, vosviewer is used to visualize the bibliography
Cluster 44 (2 items)	bibliometric data, environmental awareness publication

From Table 3, there are several clusters, each containing similar groups of topics and terms in the bibliometric-based literature. For example, Cluster 1 focuses on bibliometric analysis of higher-order thinking skills, particularly in the context of the application of VOSviewer to look at research trends and topic distribution in scientific research. This cluster shows the application of technologies such as VOSviewer in looking at research developments in various domains, including scientometric analysis and mapping of religious education issues.

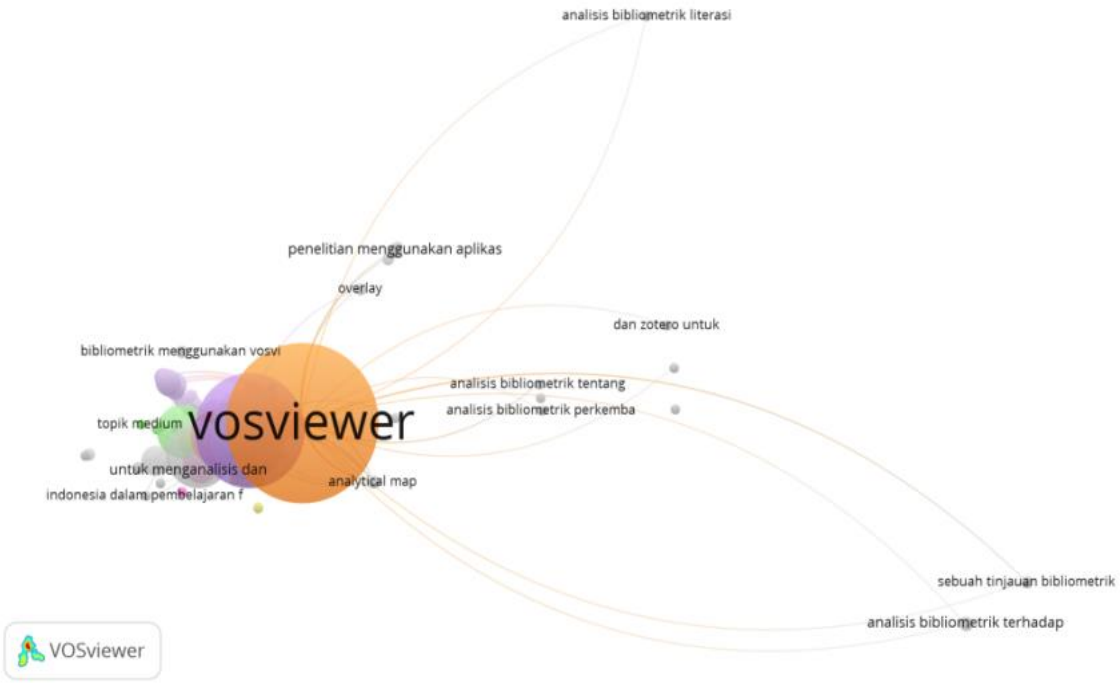
On the other hand, Cluster 5 covers bibliometric analysis related to Islamic education, with a focus on citations, network mapping, and overlay visualizations. This cluster shows research on research trends in Islamic education and scientific creativity, and the use of tools such as VOSviewer to analyze research structures and issues in this context. Thus, the use of bibliometric applications

such as VOSviewer allows researchers to see and understand more deeply the trends and distribution of research in specialized fields, such as Islamic education, with a focus on specific developments and images.

Table 3 displays the relationships between terms. Relationships are shown in network visualization as networks or lines joining one thought to another. Figure 3 shows clusters in each of the investigated concern areas. Additional terms that are most closely associated with the study's keywords (Al Husaeni, 2023).

Figure 3

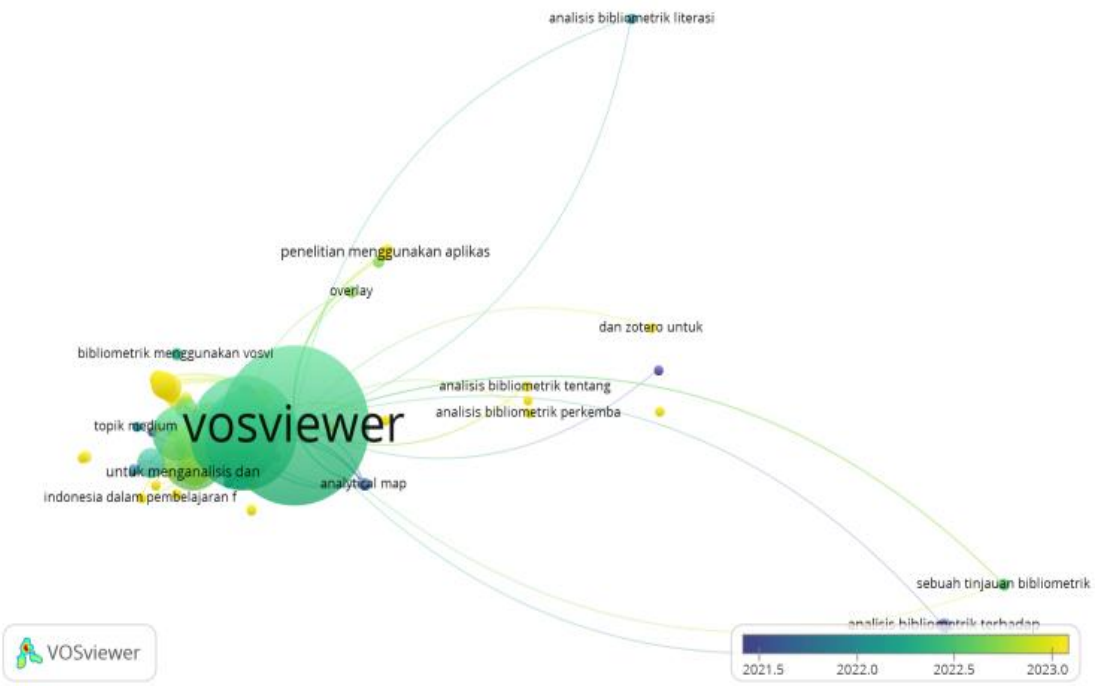
Network visualization of VOS Viewer and Education



The study patterns for VOS Viewer and Education are depicted in Figure 3; the research for VOS Viewer, which is based on Figure 4, spans the years 2014 through 2023.

Figure 4

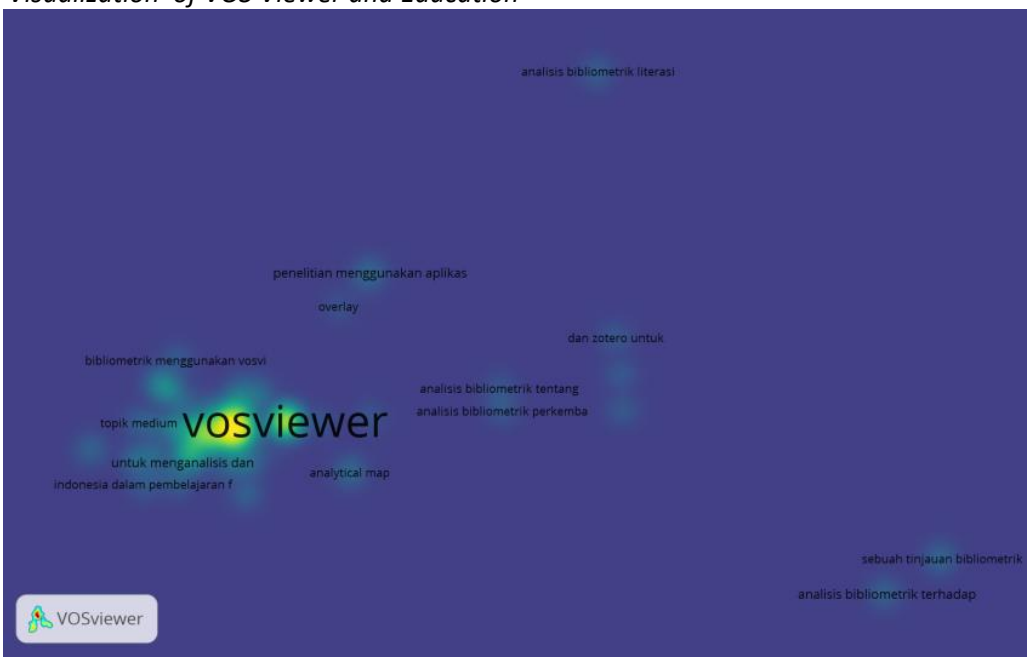
Visualization of VOS Viewer and Education overlay



According to Figure 5's density depiction, there is an increasing amount of research being done on this topic; the denser the keywords, the darker the yellow color and the wider the circle. If the color fades and becomes mixed in with the green background, the number of studies drops. There is a link between two terms in each cluster. The most often used term in cluster 1 for VOS Viewer and Education research is "forest."

Figure 4

Density Visualization of VOS Viewer and Education



These clusters explain the network connections between keywords. It is important to understand how results are related so that therapists can conduct further research. This means the results can be used for further development.

We will be able to map VOS Viewer research that makes contributions to the field of education using bibliometric analysis. Actually, by making pertinent connections between subfields that may be examined with bibliometric methods, we can create innovative research.

4. CONCLUSION

This research reveals a significant trend of growth in the number of articles related to VOS Viewer and Education from 2014 to 2023. The number of published articles experienced a spike in 2020 and increased rapidly thereafter, reflecting the growing interest in this topic. The bibliometric analysis also highlighted the most cited articles, indicating strong interest from the scientific community in topics such as COVID-19 research, math learning, and Islamic finance.

This research provides an in-depth understanding of the growth of academic literature related to VOS Viewer and Education over the observed period. The significant spike in the number of articles in 2020 marks an important shift in research interest and focus. Bibliometric analysis of the most cited articles provides insight into the most relevant and significant topics in the academic literature. For example, the linkage of Covid-19 research with VOS Viewer shows the important impact of the pandemic on research activities.

The visualization of clusters and term networks in VOS Viewer and Education provides a comprehensive view of the relationships between different concepts and research topics. This analysis can help identify emerging trends and research directions in the field. This research demonstrates that the use of bibliometric analysis, especially with the use of VOS Viewer software, provides a powerful tool for understanding trends, foci, and interrelationships in academic literature. By utilizing this novelty, future research can be guided to explore emerging topics and determine the most productive research directions within the domains of VOS Viewer and Education.

5. RECOMMENDATIONS

Moving forward, leveraging these insights can guide future research endeavors towards fruitful avenues within the realm of VOS Viewer and Education. Researchers can capitalize on the identified trends to delve deeper into emerging topics such as the integration of VOS Viewer in educational technology development amidst the challenges posed by Covid-19. The significant increase in publications post-2020 suggests a growing interest in innovative methodologies for data visualization and analysis in educational research. Furthermore, exploring prominent themes like math learning and Islamic finance can foster interdisciplinary approaches, enhancing educational practices and policy development. By harnessing the power of bibliometric analysis and VOS Viewer, future studies can explore uncharted territories, uncover novel research directions, and contribute meaningfully to advancing knowledge and practice in the field of education.

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