

A COMPUTATIONAL BIBLIOMETRIC ANALYSIS OF SCIENCE EDUCATION RESEARCH USING VOSVIEWER

RINA MARYANTI^{1,*}, ASEP BAYU DANI NANDIYANTO^{2,*},
ACHMAD HUFAD¹, S. SUNARDI¹, DWI NOVIA AL HUSAENI³,
DWI FITRIA AL HUSAENI³

¹Departemen Pendidikan Khusus, Universitas Pendidikan Indonesia, Indonesia

²Departemen Kimia, Universitas Pendidikan Indonesia, Indonesia

³Departemen Pendidikan Ilmu Komputer, Universitas Pendidikan Indonesia, Indonesia

*Corresponding Author: nandiyanto@upi.edu, maryanti.rina@upi.edu

Abstract

Science education is a very important science to learn and discuss because it is tightly related to everyday life. The phenomena that exist in the environment are related to science, so science education is important to learn. In addition, research on science education is important. This research aimed at the analysis of bibliometric data in the field of science education by using the mapping analysis software VOSviewer. Research data is also obtained through the reference manager application. The search results from the keyword "Science education" are used as data in this research. From the search results in the 2017-2021 range, we obtained data from as many as 991 relevant published articles. The results showed that from 2017 to 2021 the number of research on science education continued to decline. A significant decrease occurred in 2019. Until now, the exact causative factor has not been found, but one of the suspected factors is the result of the deployment of Covid-19. The conditions and situations of the pandemic have resulted in researchers experiencing a decrease in the productivity of their research activities. The results of this study show how important it is to use bibliometric analysis data. This research demonstrates the score of the analysis bibliometric about providing information on how the phenomena occur. This research was meant the assist and serve as to reference for researchers undertaking as well as deciding on research topics, especially about science education.

Keywords: Bibliometric, Data analysis, Science education, VOSviewer.

1. Introduction

Science is a science that deals with natural phenomena that occur around us. It is closely related to everyday life. Science education is important to be understood and learned by all of us, especially students in schools [1-10]. Science education is not only concerned with numbers and formulas as well as laboratory experiments, but science education covers a broad range of phenomena that often occur in the surrounding environment in everyday life. Science education studies the processes, methods, attitudes, skills, and products of science or scientific work [11].

Research on science education must continue to be developed. This is important for us to know because of the importance of understanding and studying it. One of the tools that can be used is the reference manager [12] application. The reference manager application is used as a tool for bibliometric data collection. To find out how many research results are related to aspects related to science education, VOSviewer software analysis is carried out to find out the mapping of the required data.

VOSviewer is a program that visualizes bibliographies or data sets with bibliographic fields (author, title, journal, etc.) [13-21]. The VOSViewer software may also reflect the high-frequency topic's trend, effect, and evolutionary process [22]. The bibliography is derived from the words "bilio" (book) and "grafi" (graphic) as well as (writing). As a result, a bibliography might be defined as a list of books or magazine articles, usually on a specific topic. VOSviewer is utilized in the realm of research for bibliometric analysis [23-27], seeking themes that can still be explored, and showing the more widely used references in certain domains [28].

There are many studies on science education, including Curriculum on science education in vocational high schools [1], learning media for science education for students [29], science education for students with special needs [30], science learning methods [31], science education in junior high schools [32]. But until now, there has been no study that discusses bibliometric analysis in the field of science education using VOSviewer software as a tool to assist in the analysis of mapping the volume number of research in the field of science education. This can make it easier to determine the desired quantity as well as up-to-date data.

By combining the mapping analysis with VOSviewer software, the study hopes to perform bibliometric engineering research in science education. This study is designed to aid academics in researching and identifying research themes, particularly in the field of science education.

2. Methods

In this study, the data from the articles used in this research are based on the research from the publications that have been published in the Google Scholar of the indexed journals. We used Google Scholar for this paper because it is free to use, whereas Scopus is not. However, in future studies, we would consult the Scopus database. To acquire research data, the reference managers program is employed. Publish or Perish was the reference manager's application used in this study. The software Publish or Perish was used to do a literature review on the topic we've chosen. Every journal article data collected by Google Scholar that complies with the search for the study's themes is supported in the file that is utilized by VOSviewer.

Each item was vetted in this study, and only publications relating to science education were included. We use the keyword " science education " in the topic, keyword, and abstract criteria to find statistics on "publish or perish". As the result, 1000 articles were gathered and evaluated based on the chosen theme. The articles used for this research were published between the specific years (from 2017 to 2021). After that, the collected articles are saved in *.ris format. Then, in the context of bibliometric maps, we use the VOSviewer tool to see and analyse trends. We create data mappings articles from prepared database sources. There are three forms of data mapping: network, density, and overlaying visualization. Furthermore, we select the words that will be displayed in the network mapping view of VOSviewer.

3. Results and Discussion

3.1. Research developments in the field of science education

Figure 1 shows the increase or development of science education research from 2017 to 2021. Based on Fig. 1, the development of science education research over the last 5 years has decreased, especially since 2019. This is evidenced by the decrease in the number of articles from 2019 by more than 50%. As for the number of articles each year, for the last 5 years, namely: 2017 totalled 429 articles, 2018 totalled 257 articles, 2019 totalled 157 articles, 2020 totalled 112 articles, and 2021 totalled 36 articles. One of the factors causing the decline in the number of studies could be the impact of the COVID-19 pandemic [33].

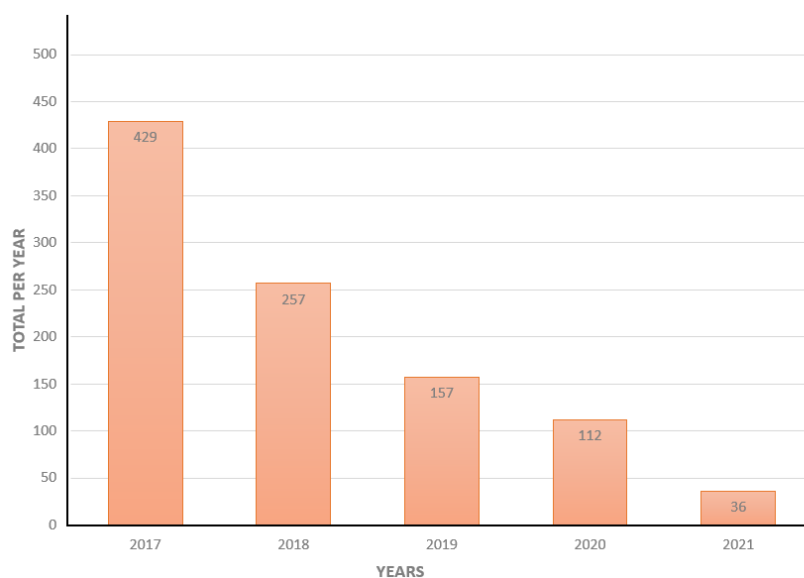


Fig. 1. The stage of development of science education research.

3.2. Effect of afterbody

In VOSviewer, the minimum number of relationships between each term is two. The data was then evaluated by VOSviewer, as well as the results were classified into seven groups: Cluster 1 represented in Red, Cluster 3 in Blue, Cluster 2 in

Green, Cluster 4 in Yellow, Cluster 6 in Cyan, Cluster 5 in Purple, and Cluster 7 by Orange. Each cluster describes the relationship between two or more terms. VOSviewer has three different representations for bibliometric mapping: connection visualization (in Fig. 2), overlay visualization (in Fig. 3), and density visualization (see detailed information in Fig. 4). Coloured circles are used to label keywords. The number of keywords in the title and abstract is closely related to the size of the circle. As a result, the frequency at which letters and circles appear determines their size. The letters and circles become larger as the keyword appears more often.

Figure 2 shows the link between the terms. Relationships are depicted in network visualization as networks or lines linking various terms. [33]. The clusters in each of the problem areas examined are depicted in Fig. 2. Other terms are most closely related to the study keywords.

- i) Cluster 1, which contains 35 items contains research keywords. The items are area, art, business, concept, development, discipline, education, engineering, entrepreneurship education, evidence, example, future, history, humanity, ICT, implementation, importance, inclusive education, innovation, law, management, natural science, need, person, practice, process, science, social science, society, state, time, training, value, world, and year.
- ii) Cluster 2, which contains 35 items contains research keywords. There are 44 links in the keyword study. The items are ability, academic achievement, activity, approach, classroom, context, curriculum, difference, effect, environment, factor, focus, gender, grade, implication, inquiry, international journal, learning, level, math, mathematics education, model, perception, performance, problem, project, relationship, school, science education, self, skill, stem, stem education, student, and subject.
- iii) Cluster 3, which contains 31 items contains research keywords. There are 172 links in the keyword study. The items are article, change, crossref, effectiveness, field, google scholar, impact, intervention, knowledge, literature, literature review, London, medical education, medicine, Medline, meta-analysis, motivation, outcome, part, participant, program, PubMed, question, review, strategy, student achievement, study, systematic literature review, systematic review, Taylor and Francis Online, and web.
- iv) Cluster 4, which contains 27 items contains research keywords. There are 72 links in the keyword study. The items are application, awareness, challenge, communication, comparison, computer science education, course, engagement, engineering education, higher education, higher education institution, institute, integration, international conference, issue, journal, New York, physics, proceeding, social medium, survey, sustainable development, system, understanding, USA, and way.
- v) Cluster 5, which contains 24 items contains research keywords. There are 72 links in the keyword study. The items are assessment, attitude, case study, covid, environmental, equity, Eurasia journal, experience, HTTP, Indonesia, information science, instruction, mathematics, nature, pandemic, perspective, philosophy, relation, teacher, teacher education, teaching, technology education, theory, and use.

4. Conclusions

By combining mapping analysis with VOSviewer software, this work seeks to undertake bibliometric science education. The references manager tool Publish or Perish was utilized to collect data for this study. The information obtained was filtered using the phrase "science education". Topic areas, titles, keywords, and abstracts were among the bibliographic data used in this study. We found 991 relevant articles published between 2017 and 2021 based on the search results. The number of journals researching science education has been increasing since 2019, according to this survey. Photocatalysts are currently a popular topic of investigation among scientists. When you search for "science education," you'll get eight clusters, each with a different number of things.

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