



RESEARCH ON TEACHING MATERIALS IN SCIENCE EDUCATION: A BIBLIOMETRIC ANALYSIS FROM 2013 TO 2023

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ABSTRACT

The purpose of this study was to investigate the bibliometric properties of teaching materials in science education from 2013 to 2023. The bibliographic references were found in the Scopus databases by utilizing the keywords "teaching materials" AND "science education" (search date: February 22, 2024). For information analysis, the VOSviewer software program and the RStudio package were utilized. The findings verified that 111 journals and 170 papers covering 45 nations had been scanned. There is an increase in the publication of articles on the topic of teaching materials published in 2013-2023.

Germany, the United States of America, and Indonesia were the top three nations in this area. The majority of the publications were released in the Conference Series: Journal of Physics. Barendsen E is the author who has contributed the most. Network map and visualization results related to the relationship between topics discussed there are 4 in addition to the main topics namely teaching, education, curricula, and secondary schools.

Keywords: *Bibliometric analysis, teaching materials, science education, education*

1. INTRODUCTION

The success of the learning process, especially science education, is supported by the main components involved in it. As said by Anwar (2023), there are three main components in the learning process, namely teachers, students, and teaching materials. Teaching materials are one of the learning resources for students. In addition, teaching materials are also a reference in determining learning strategies so that the learning process becomes effective (Anwar, 2023). Teaching materials include various kinds of materials used to support teachers or instructors in the implementation of the learning process (Mudlofar, 2012). So, the characteristics of one teaching material will be different from the characteristics of other teaching materials, each teaching material should be tailored to the needs of students.

Research on teaching materials in science education is very important in this day and age. This is because research related to teaching materials in science education can improve the quality of learning (Sholehah, 2023). In addition, research related to the development of science teaching materials can also increase student interest (Oktiningrum, 2023). Then, how to keep up with the ever-changing developments in science, as well as following trends in research on teaching materials in science education from time to time. This ensures that students get learning that is relevant and in line with the latest developments in science.

In understanding trends, developments, and contributions of research on teaching materials in science education, bibliometric analysis. Bibliometric analysis is an approach in research that uses quantitative methods to analyze scientific publications, especially journal articles and references, to reveal trends, patterns, and relationships within them (Ayu, 2020). Thus, the use of bibliometric analysis can provide an in-depth understanding of the dynamics of teaching materials research in science education, as well as a strong foundation for the development of future educational strategies and policies.

In this research, we conducted a bibliometric analysis from 2013 to 2023 to explore research on teaching materials in science education. Through this approach, the purpose of this study was to investigate the bibliometric properties of this topic. The bibliometric analysis will provide valuable insights for educational practitioners and



researchers in understanding the dynamics and changes in the development of teaching materials in scientific education.

2. METHODS

There are four stages of bibliometric analysis method related to teaching materials. The first stage is using Scopus web data. The second stage is the stage of entering related keywords. The third stage exports data in the form of CSV and RIS. The last stage is analyzing data using the R Studio application and VOSviewer software. The stage is shown in Figure 1.

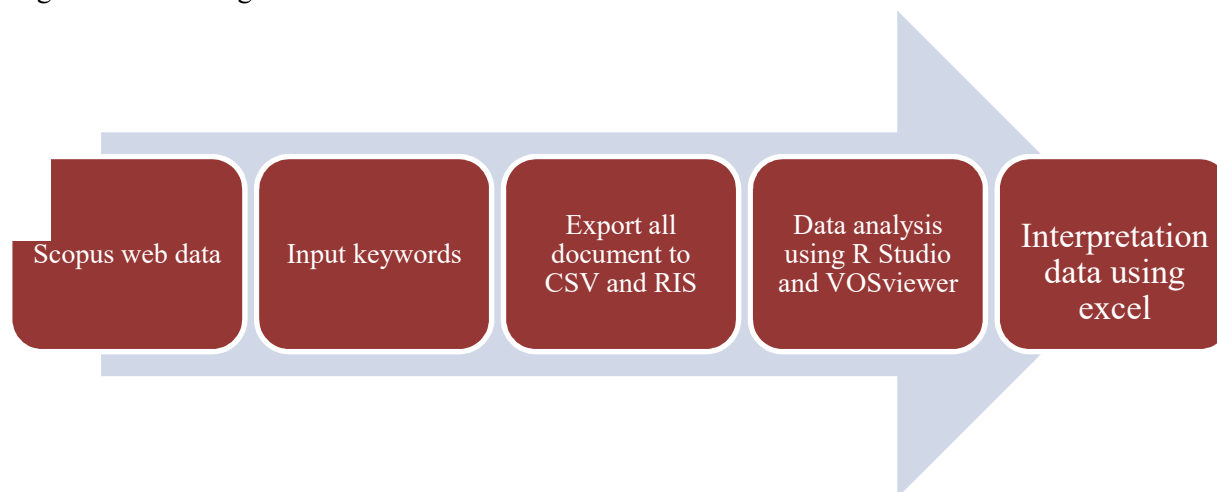


Figure 1. Four Stages of Bibliometric Analysis Method

Scopus, keywords, CSV and RIS, R Studio, and VOSviewer

In the first stage, data related to the present study were retrieved from Scopus on February 22, 2024. Scopus is feasible as a database for bibliometric analysis (AlRyalat, 2019). This is because Scopus has many indexed journals (Singh, 2021). Second, the keyword for searching journal articles was "teaching materials" and "science education". Only publications published from 2013 to 2023 were considered for retrieval as related data. Third, bibliographic data for 170 publications were acquired from the Scopus website and saved as.csv and ris files. The stored data contains citation information, bibliographic information, as well as abstracts, and keywords. Fourth, The.csv file is imported into R Studio. Then, choose the results that you want to research related to teaching materials. Four results will be researched, annual recording, top 10 countries, most relevant journal, and publication author. In addition to csv. files, ris. files are also imported into VOSviewer software to draw network maps and visualize them. As said by Al Husaeni (2022) one of the tools for bibliometric analysis can be the VOSviewer software.

3. RESULTS & DISCUSSION

Annual Recording

As shown in Figure 2, there is an increase in the publication of articles on the topic of teaching materials published in 2013-2023. Although in 2013-2018 the number of articles published was still below 15, the following 5 years experienced an increase above 15. The number increased sharply from 2018 to 2019, with the number of articles from 14 to 22. One possible reason for this is the need for a new approach to teaching materials research. This is in line with Sadeghi's (2019) statement that improving education leads to changes in learning methods.

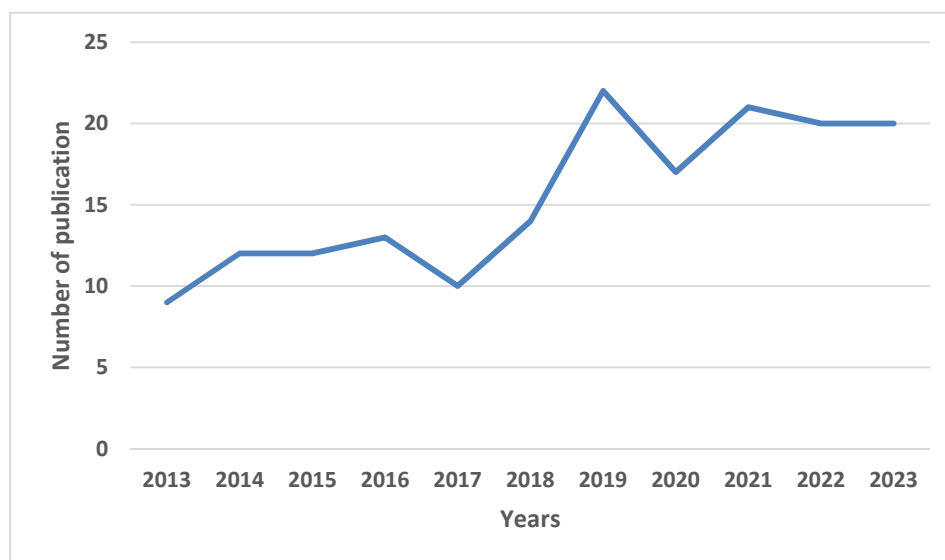


Figure 2. Annual Recording

Top 10 Countries

There were 47 distributions of countries that published on the topic of teaching materials and the top 10 publication countries were taken as shown in Figure 3. Among them, Indonesia published the most articles ($n = 62$), USA was the second with the number of articles ($n = 59$), and Germany was the third with the number of articles ($n = 46$).

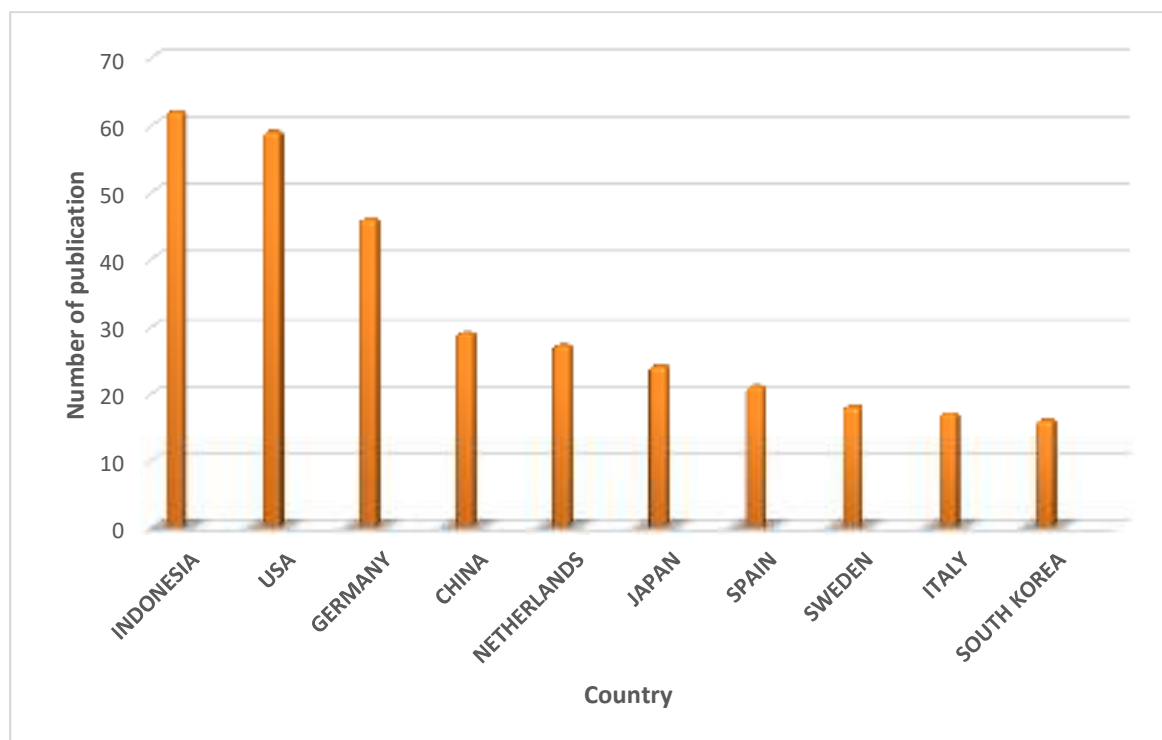


Figure 3. Distribution of top 10 countries



Indonesia is the country that publishes the most articles related to teaching materials because it has an education system that continues to develop and transform. This is evidenced by changes in the education curriculum from time to time (Ananda, 2021). In addition, the availability of literacy infrastructure and access to reading materials has not met the standards (Laksono, 2018). Therefore, research related to teaching materials is needed to support this. Although the quantity of Indonesian publications is the highest, it does not guarantee the quality of the published articles.

Most Relevant Journal

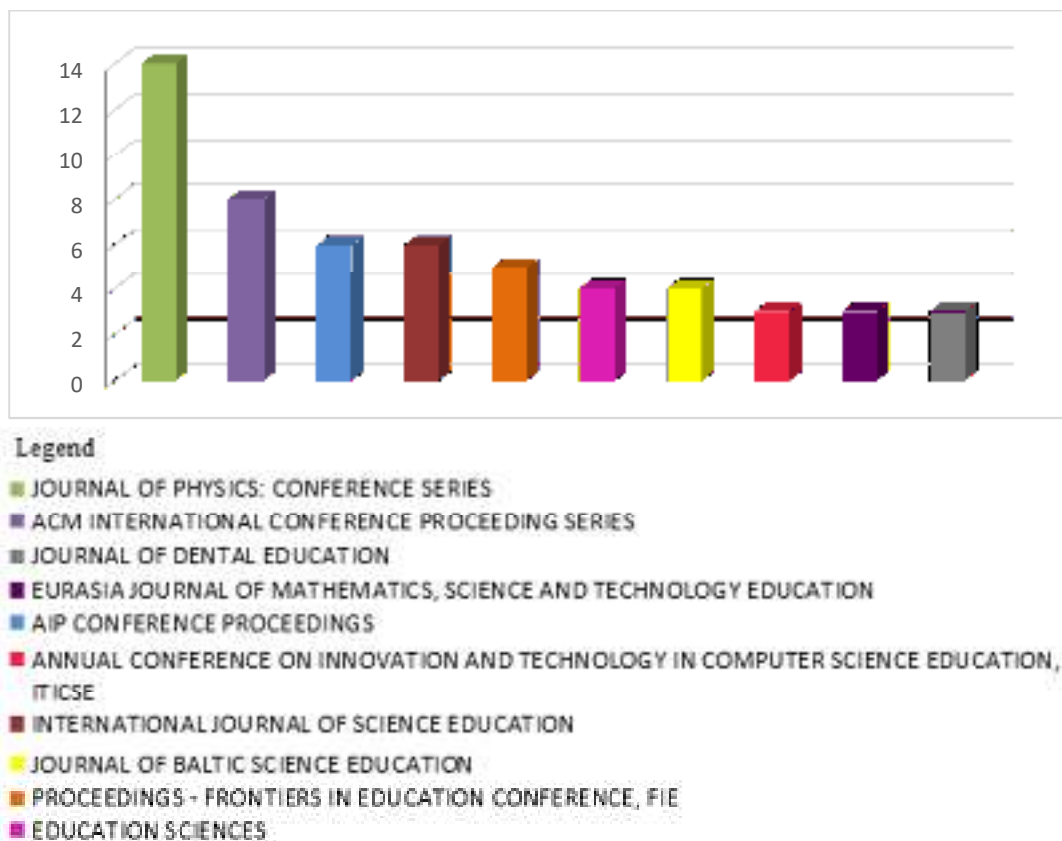


Figure 4. Most Relevant Journal

In Figure 4, there are 10 journals with the most publications out of a total of 111 journals. The top five journals are Journal of Physics: Conference Series (n=14), Acm International Conference Proceeding Series (n=8), AIP Conference Proceedings (n=6), International Journal Of Science Education (n=6), Proceedings - Frontiers In Education Conference, Fie (n=5). The quartile ranges of the top 10 journals are Q1, Q3 and Q4. Journal of Physics: Conference Series ranks first because of its all-encompassing scope.

Publication Author

Figure 5 shows the top 10 publication authors. Divided into two ranks, four authors occupy the first rank, namely Barendsen E, Eilks I, Grgurina N, and Zwaneveld B. The four authors both published three articles. In the second rank, there are six authors, namely Bell T, BrindA T, Deveci T, Fraiman Z, Gal-Ezer J, and Garner N.



Figure 5. Publication Author

Cluster Analysis and Related Topics

The results of the content analysis are shown in Figure 6, which explains the relationship between one topic and another. The topics consist of 5 clusters that can be seen from the different colors of the circles and their connecting lines. The first cluster is marked in red. The second cluster is marked in green the third cluster is marked in blue. The fourth cluster is marked in yellow. Finally, the sixth cluster is marked in purple.

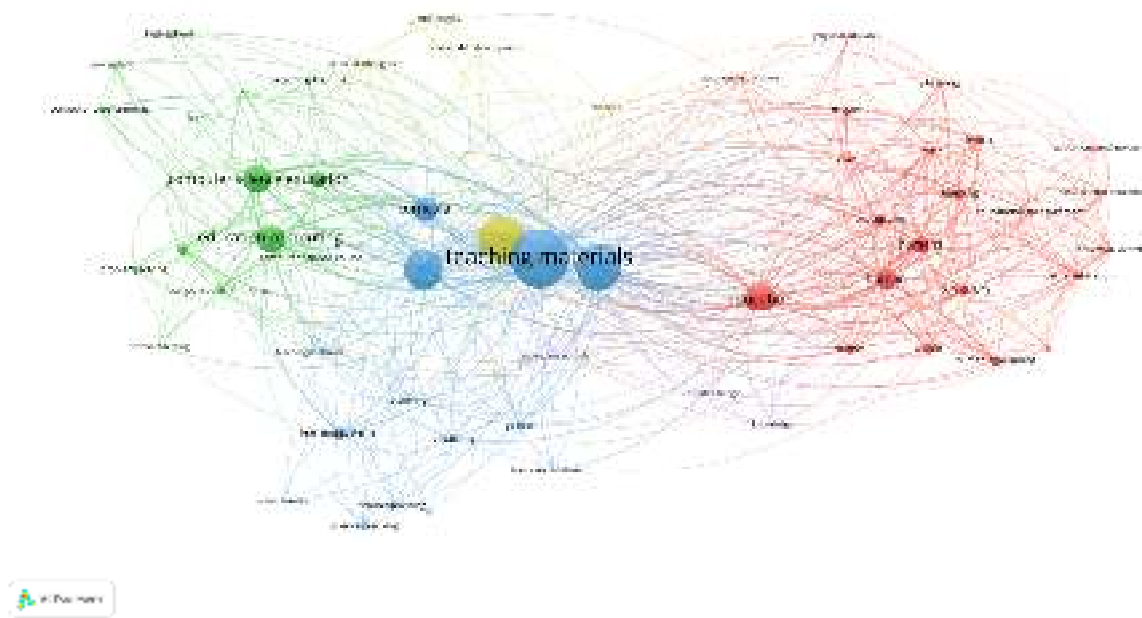


Figure 6. Network visualization of teaching materials



In addition to the topic "teaching materials" and "science education", there are several other topics that are also widely discussed, which is indicated by the size of the circle of the topic. The larger the circle of the topic, the more the topic is most discussed. There are three representatives of the largest circles, which are believed to be closely related to the main topic of teaching materials and science education. Among them are teaching, education, and curricula. Then there is also the smallest circle, namely secondary schools, which indicates that the topic is rarely discussed.

The link between the topics of "teaching" with "teaching materials" and "science education" lies in the role of teaching materials in supporting the process of teaching and science education. Good teaching materials can help teachers convey science concepts more effectively to students (Fatimah, 2014; Wenno, 2010). Thus, teaching, teaching materials, and science education complement and support each other to improve the quality of science education and students' understanding of science education. Education is a process that involves the transfer of knowledge, such as science education, which requires teaching materials. Based on the curricula, teaching materials are organized to support student learning. This is also explained by Anwar & Sumarna (2022) that the development of teaching materials must meet the demands of the applicable curriculum. There should also be a lot of discussion of publications on the topic of secondary schools. Because many publications related to teaching materials in science education in secondary schools are designed to develop various skills (Jannah, 2013; Setiawati, 2023; Wahyuni, 2015). A suggestion from this research is that there should be more publications related to teaching materials in secondary schools indexed by Scopus.

4. CONCLUSION

Research on teaching materials is very important because it can improve the quality of learning. Based on bibliometric analysis, it shows that the annual recording of publications on teaching materials has increased from 2013 to 2023. Indonesia published the most articles. Journal of Physics: Conference Series ranked first because of its comprehensive coverage. four authors ranked first, namely Barendsen E, Eilks I, Grgurina N, and Zwaneveld B. There are three representatives of the largest circles, which are believed to be closely related to the main topic of teaching materials and science education. Among them are teaching, education, and curricula. Then there is also the smallest circle, namely secondary schools, which indicates that the topic is rarely discussed.

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