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Article

Analysis of Update Mapping in Science Learning Media Research: Bibliometric Analysis Based on Google Scholar Data

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Abstract. This article presents a review of bibliometric analysis on the topic of science learning media research. The aim of this research is to identify relevant research and the latest research on the research topic being analyzed. The method used in this research is descriptive quantitative with bibliometric data approach. Research data collection is carried out on the Google Scholar page with the help of Publish or Perish (PoP) software using the keyword "science learning media". Search is limited to the 2019-2021 range and the number of search results is limited to 100. Data analysis and visualization using VOSviewer software. The result is the number of article citations is 328 citations with an average of 164 citations/year and 3.64 citations/articles. IOPSCIENCE is the most productive publisher with the highest number of articles, which is 23 articles. Bibliometric visualization of network maps based on text-mining analysis resulted in 24 interconnected words grouped into 4 clusters and network maps based on the authors of the Co-authorsip showed that Alpusari and Hermita were the authors who had the most related with other authors in the topic of science learning media research.

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1. Introduction

Learning is an activity undertaken with the aim of acquiring knowledge, mastering certain competencies and forming student attitudes. The success of learning can be seen from the changes in behavior and student learning outcomes. Learning activities will run smoothly when students have

the motivation to learn [1]. The learning process is an activity carried out by two parties, namely the teacher as a facilitator and students as learning that involves intermediaries to convey messages in the form of knowledge (cognitive), psychomotor skills, and positive attitudes and values. Learning is the process of changing behavior due to interactions among individuals and the environment [2]. According to [3] states that, "Learning outcomes are measures of success or failure of students after taking teaching and learning activities both in terms of effective, psychomotor, and cognitive which includes knowledge (memory, understanding, application (application)". The medium (plural, media) is a means of communication used by the sender to convey information to the recipien. The word media comes from Latin which means "between", this term refers to anything that carries information between the source and the recipient. Examples of media include video, television, diagrams, print materials, computer programs, and instructors [4]. Learning media is used as a means of supporting the learning process for learning objectives can be achieved [5]. According to [6] view learning media as physical equipment to present learning to students. This understanding focuses on the physical equipment used to present learning whether textbooks, visual equipment, audio, computers, or other equipment are grouped as learning media.

The research topic of using instructional media as a way to maximize the learning process is one of the most researched topics, research comes from many disciplines and the author's background. Such as Teaching for scientific literacy with an interactive whiteboard [7], Development of Booklet Based Science Learning Media for Junior High School [8], The Effects of "Science-on-Web" Learning Media on Junior High School Students' Learning Independence Levels and Learning Outcomes [9], The Effectiveness of the Planetarium Android Learning Application Virtual Observatory on Solar System Material [10], etc.

Bibliometrics is analysis of quantitative method that uses statistical and mathematical tools to measure the interrelationships and impacts of publications within a given area of research [11]. Recently, a network analysis that employed bibliometric tools identified established and emerging research areas more intuitively by mapping social networks using co-word, co-authorship, and co-citation analyses [12]. Bibliometric analysis is a useful analysis to find research gaps for further researchers in a research topic [13].

Considering these reasons, this article aims to look at research gaps with bibliometric analysis of the literature on the topic of science learning media research. Bibliometric studies are commonly used to evaluate the performance of universities, research institutes, or researchers. However, this study can also be used to understand how the structure of a field of science is, or how research develops on certain topics [14]. The data sources in this research are published articles indexed by Google Scholar which are analyzed and categorized based on the distribution of keywords, authors and affiliations among them. This analysis can see what research topics are more widely published as research subjects. And provide opportunities for further research on the topic of science learning media. The methodology used is bibliometric analysis with the implementation of Publish or Peris (PoP) software based on google Scholar data. Then the visualization of the results using VOSviewer is then carried out a discussion of the results of the data visualization and the final conclusions of the study are made.

2. Experimental Section

This review of the bibliometric literature is based on a systematic and explicit [15]. The method used in this research is descriptive quantitative with bibliometric data approach. The research data are scientific articles with the topic of science learning media research. The data sources are obtained from scientific article publications indexed by Google Scholar. Google scholar was chosen because it is the largest and most effective database in searching scientific journal articles and can be accessed for free [16]. Search articles using Publish or Perish software, then the results obtained are visualized with VOSviewer software. VOSviewer is software developed by Nees Jan van Eck and Ludo Waltman

from Leiden University (12). The use of Publish or Perish and VOSviewer was chosen because the two softwares can quickly, efficiently and accurately harvest data and visualize the analysis results according to analysis needs [17].

The sample of this research is scientific articles about science learning media indexed by Google Scholar published in the last 2 years, namely 2019-2021, data collection was carried out on October 20, 2021. In the data collection, 90 articles were obtained. While the research population is scientific articles about science learning media indexed by Google Scholar in scientific journals, proceedings, books, or other forms of publication.

The data collection technique is carried out on the Google Scholar page with the help of Publish or Perish (PoP) software using the keyword "Science Learning Media". The search is limited to the 2019-2021 range, articles are journals and the number of search results is limited to 100. The articles are then re-elected, only journals with titles that match the keywords and areas of analysis. The search results are then stored in the Research Information System (RIS) format. Furthermore, the data is analyzed and visualized with VOSviewer software.

The bibliometic analysis in this study employed PoP software [18]. The data analysis technique used is analysis with VOSviewer. The analysis is carried out with two types of analysis, namely Co-authorship and Text-Mining, both of which produce Bibliometric visualization maps. The Co-Authorship analysis looks at the relationship between journals by author and the number of journals co-authored. The closer the point between the authors, the more these authors write a joint journal. Text-mining analysis is an analysis of the occurrence of words visualized in a word emergence map. The results of the two analyzes are then compared and the important journals in each cluster of analysis results are then reviewed and used as literature review material. And the most important thing is to see the research gap/ Research Gap in the analyzed domain.

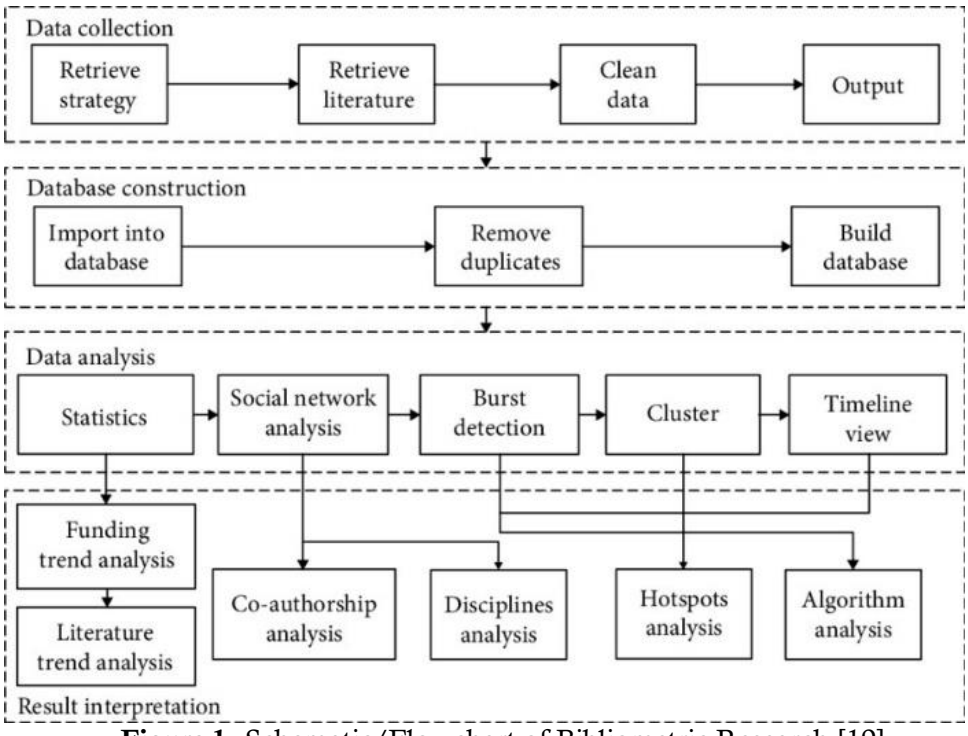

Figure 1. Schematic/Flowchart of Bibliometric Research [19]

3. Results and Discussion

Initial data collection (initial search) in the form of articles using Publish or Perish and after the search results data through refinement (refinement search) produces different metric data. Before perfecting the search results, 100 articles were obtained through the goggle scholar database. After the refinement, 90 articles were obtained which were selected based on the criteria required for analysis. This data was obtained in the GS database from 2019-2020 with the keyword "Science Learning Media". Initial data with 100 articles obtained 330 citations with an average of 165 citations/year and 3.3 citations per article. Then on the data of the improvement results obtained 328 citations with 164 citations/year and 3.64 citations/article. The complete results of the comparison of metric data from the initial search and the refined search can be seen in Table 1.

Table 1. Comparison Matrices

Metrics Data	Initial Search	Refinement Search
Source	"Science Learning Media"	"Science Learning Media"
Publication year	2019-2021	2019-2021
Citations year	2(2019-2021)	2(2019-2021)
Papers	100	90
Citation	330	328
Cites / year	165.00	164.00
Cites / paper	3.30	3.64
Authors/paper	2.76	2.76
h_index	7	7
g_index	16	16
hI_norm	5	5
hI_annual	2.50	2.50
Ha_index	6	6

Based on the table, it is known that the most scientific article publishers who publish articles on science learning media are IOPSCIENCE with 27 articles, then Scientific Journal of UNNES with 8 articles, DergiPark with 4 articles, JES 4 articles and ERIC 3 articles, meanwhile the other publishers on average published 1 article related to the topic .

Table 2. Top 5 Publisher Who Publish Science Learning Media

No	Publisher	Article
1	IOPSCIENCE	27
2	Scientific Journal of UNNES	8
3	DergiPark	4
4	JES	4
5	ERIC	3

From the 90 data articles that have been refined, here are the top 5 articles with the highest number of citations on the topic of science learning media:

Table 3. Top 5 Cited Articles

No	Publication Year	Author	Title	Journal	Cites	Publisher
1	2019	Mercer, N; Hennessy, S; Warwick, P	Dialogue, thinking together and digital technology in the classroom: Some educational implications of a continuing line of inquiry	International Journal of Educational Research	127	Elsevier
2	2019	Syahrin, A; Suwignyo, H	Creative thinking patterns in student's scientific works	Eurasian Journal of Educational Research	18	DegiPark
3	2019	Mabruri, H; Ahmadi, F; Suminar, T	The Development of Science Mobile Learning Media to Improve Primary Students Learning Achievements	Journal of Primary Education	16	Scientific Journal of UNNES
4	2020	Pratiwi, M	Student Tutoring, Facilitator and Explaining Models: A Problem Solving Metacognition towards Learning Achievements of Informatics Students	Journal of Educational Sciences	15	JES
5	2019	Irfan, I;Muhiddin, M; Ristiana, E	Pengembangan Media Pembelajaran IPA Berbasis Powerpoint di Sekolah Dasar	Indonesian journal of primary education	10	IJPE

Data search results and refinement in Publish or Perish are then analyzed and visualized using VOSviewer, there are 3 visualizations displayed for text-mining analysis, namely Network Visualization (Figure 2), Overlay Visualization (Figure 3), and Density Visualization (Figure 4) .

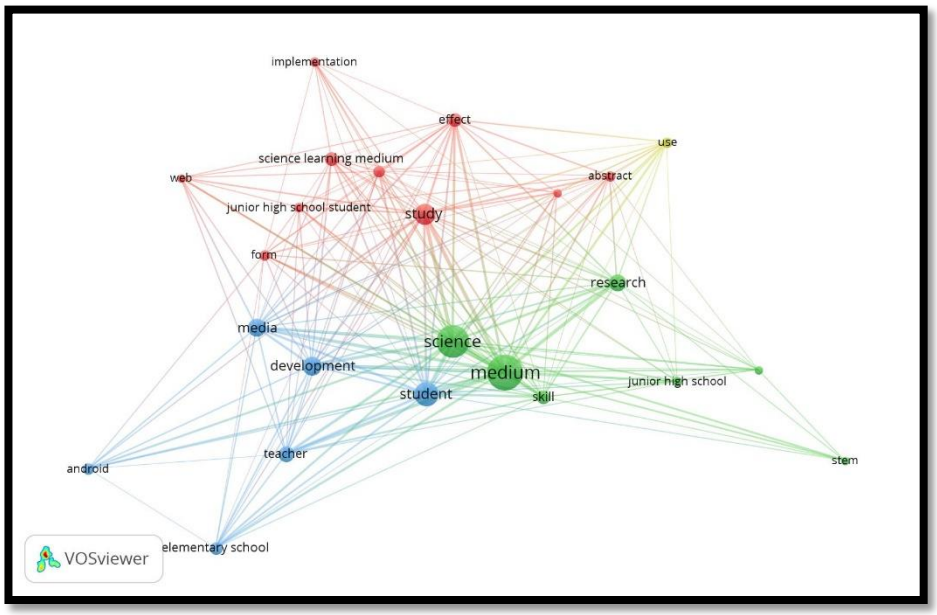

Figure 2. Network Visualization on the GS Database

The visualization above is the result of text-mining analysis by extracting titles, keywords and abstracts on articles using the full counting method, which results in 619 appropriate words. Then the minimum word limit is set 5 times and the results are 24 words which are grouped into 4 clusters. The keywords in each of the same clusters indicate that these keywords are closely related because they are both used in different publications. The first cluster (red) consists of 9 members with the keywords Study, science learning medium, effect, form, abstract, junior high school student, implementation, web, and scientific approach. The second cluster (green) consists of 7 members, namely medium, science, research, skill, junior high school, effectiveness and stem. The third cluster (blue) consists of 6 members, namely Development, media, student, teacher, android, elementary school. The fourth cluster (yellow) consists of 1 member, namely use.

From the data, it is known that the largest cluster based on keywords is the red cluster with 9 keywords, namely study, junior high school student, science learning medium, abstract, effect, form, web, scientific approach and implementation. The smallest cluster is yellow with only one keyword, namely use.

Table 4. Keywords Representing Each Cluster.

No	Cluster	Element
1	Cluster 1 (Red)	Study (28), science learning medium (12), effect (12), form (8), abstract (7), junior high school student (6), implementation (6), web (5), scientific approach (5)
2	Cluster 2 (Green)	Medium (79), Science(68), research (18), skill (13), junior high school (6), effectiveness (5), stem (5)
3	Cluster 3 (Blue)	Development (23), media (21), student (38), teacher (17), android (9), elementary school (10)
4	Cluster 4 (Yellow)	Use (7)

In the picture is a visualization of text-mining analysis based on the novelty of the research. The brighter the color of the cluster, the more the topic is discussed at this time. It can be seen that the brightest cluster is yellow which consists of Implementation, effect, use and teacher.

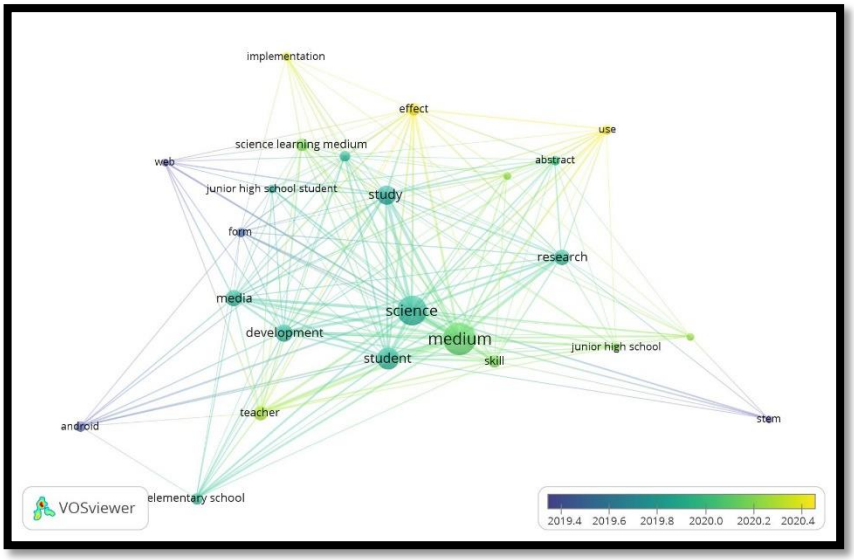

Figure 3. Visualization of Overlays in the GS Data Base

In the picture is a visualization of text-mining analysis based on the density of the research. The clearer the density of the keywords, the more often these words are discussed in the research topic. On the other hand, the less dense the word is, the less often it is discussed in the research topic. This visualization is very important to see research gaps on the research topic. In the picture the words science, student and medium are the words with the highest density, while the others have a lower density.

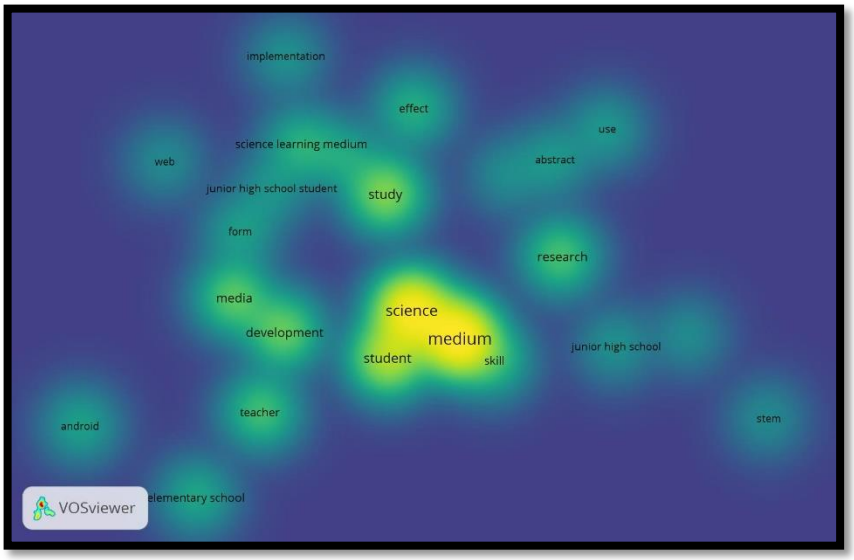

Figure 4. Visualization of Density in GS Data Base

Based on data processing on VOSviewer from 90 science learning media research articles published in Google Scholar indexed articles in 2019 - 2020, it is known that there are 203 author names.

Table 5. Number of Network Authors (Co-authorship) Science Learning Media Research

Minimum number of documents that have been published by one person author (scientific article)	Number of authors	Co-authorship (number of people who form a network of interconnected writers)
1	203	5
2	12	3

Source: VOSviewer Data Output

Based on Table 5, the number of authors who publish at least 1 article are 203 people, and the author has published at least 2 articles is 12 people. The figure shows a co-authorship network, i.e. a network between article authors who are connected to each other based on the number of publications they co-authored. It is known that at least one author has published one article, so the co-authorship formed are 5 people

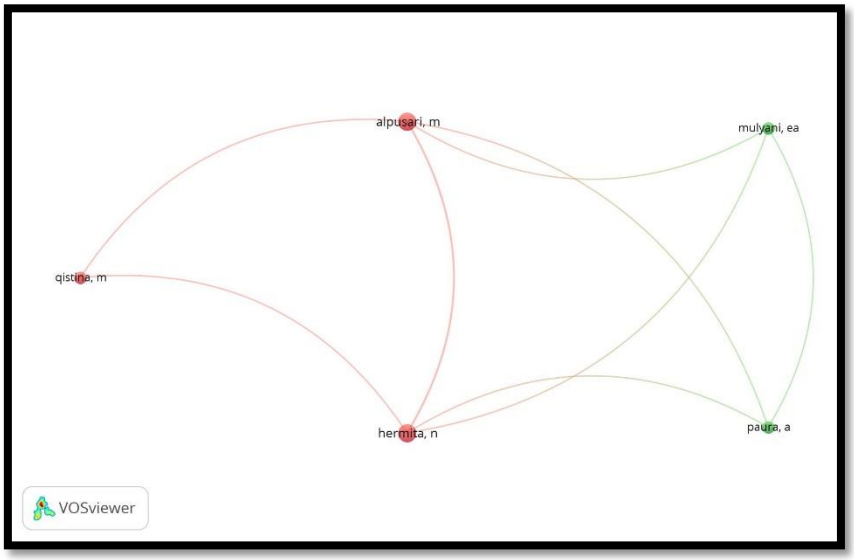

Figure 5. Visualization of Overlay Authors and Co-authorship Relations on the GS Database

The co-authorship as shown in Figure forms two clusters, namely red and green. The names of the cluster members are shown in Table 6.

Table 6. Cluster of Author Network (Co-authorship) Science Learning Media Research

Cluster	Color	Authors
1	Red	Alpusari,m., hermita,n., qistina,m
2	Green	Mulyani,ea., paura, a

Source: VOSviewer Data Output

In the visualization it can be seen that alpusari and hermita are the authors who have the most connections with other writers.

The number of citations makes the most relevant contribution to this research topic. Based on the data in table 3, the highest citation indexed by Google Scholar is Dialogue, thinking together and digital technology in the classroom: Some educational implications of a continuing line of inquiry written by Mercer, N et al in 2019. The article discusses research that develops and tests methods to improve the quality of classroom interactions between teachers and students, seeking to increase the level of collaboration, reasoning, and academic achievement as desired outcomes by using digital technology-based learning media [20].

Overlay visualization analysis and density visualization are used to identify key themes in each study or scope of knowledge. This result was carried out by measuring the co-occurrence of keyword pairs [21-22]. The analysis was carried out with the help of VOSviewer software. It can be identified that each cluster is connected to other keywords. This can be indicated that the development of research on this subject is related. Network analysis also allows identification of author authority [23]. Co-author analysis is a widely used bibliometric research technique that investigates co-authors conducting research from a particular field. Based on Co-authorsip in this research topic analysis can be grouped into 2 clusters that have a relationship. Alpusari and hermita are the authors who have the most connections with other authors on the research.

This study has limitations, namely the research was carried out by collecting metadata derived from a limited set of keywords and also potentially limited by the software used in the analysis and data retrieval techniques. The use of such software also has the opportunity to cause errors due to its limitations. Some subjective assessment of the author is also very likely to cause errors. Future studies are recommended to use a larger sample by expanding the keywords used and a more accessible database. It is recommended that further related research provides a more detailed explanation for that there are a number of studies that discuss science learning media.

4. Conclusion

The number of citations makes the most relevant contribution to this research topic. Based on the data in table 3, the highest citation indexed by Google Scholar is Dialogue, thinking together and digital technology in the classroom: Some educational implications of a continuing line of inquiry written by Mercer, N et al in 2019. Meanwhile, IOPSCIENCE is the most productive publisher with the highest number of articles, which is 23 articles, Scientific Journal of UNNES 8 articles, DegiPark 4 articles, JES 4 articles and ERIC 3 articles. While other publishers mostly publish 1 article on this research topic.

The current study reviews journal articles whose themes are related to the keyword "science learning media". Articles are collected from Google scholar database by PoP software. Then these 90 articles were selected from the original collection of 100 articles, the articles were published in the period 2019 to 2021. To fulfill the purpose of this study, all articles found were classified based on: author, year of publication, name of publisher journal, citation, author and relationship co-author and statistical affiliation.

References

[1] Puspitarini YD, Hanif M. (2019). Using Learning Media to Increase Learning Motivation in Elementary School. *Anatol J Educ.* 4(2):53–60.

[2] Resien R, Sitompul H, Situmorang J. (2020). The Effect of Blended Learning Strategy and Creative Thinking of Students on the Results of Learning Information and Communication Technology by Controlling Initial Knowledge. *Budapest Int Res Critics Linguist Educ J.* 3(2):879–93.

[3] Sitorus LS, Mardianto M, Matsum H. (2020). Development of Powerpoint-Based Learning Media on Learning Aqeedah Morals. *Budapest Int Res Critics Linguist Educ J*. 3(2):958–64.
[4] Marpanaji E, Mahali MI, Putra RAS. (2018). Survey on How to Select and Develop Learning Media Conducted by Teacher Professional Education Participants. *J Phys Conf Ser.* 1140(1).
[5] Puspitarini YD, Hanif M. (2019). Using Learning Media to Increase Learning Motivation in Elementary School. 4(2):53–60.
[6] Yusuf R, Sanusi, Razali, Maimun, Putra I.(2020). Critical thinking and learning outcomes through problem based learning model based on LBK application. *Int J Innov Creat Chang.* 12(12):907–18.
[7] Murcia K. (2008). Teaching for scientific literacy with an interactive whiteboard. *Teach Sci.* 54(4):17–21.
[8] Aini CN, Habibi MW.(2020). Development of Booklet Based Science Learning Media for Junior High School. *INSECTA Integr Sci Educ Teach Act J.*1(2):155–67.
[9] Ikhsan J, Akhyar M, Nais MK. (2019). The effects of science-on-web learning media on junior high school students' learning independency levels and learning outcomes. *J Turkish Sci Educ*.16(2):231–9.
[10] Imronah I, Parmin P. (2021). The Effectiveness of the Planetarium Android Learning Application Virtual Observatory on Solar System Material. *J Innov*. 2021;(37).
[11] Zhang F, Zhang H.(2021).Bibliometric analysis of research trends on acupuncture for neck pain treatment over the past 20 years [letter]. *J Pain Res*.14:3553–4.
[12] van Eck NJ, Waltman L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics.* 84(2):523–38.
[13] Hanief YN.(2021). Bibliometric analysis of sports studies in the "Journal Sport Area." *J Sport Area*. 6(2):263–74.
[14] Waaijer CJF, Palmblad M. (2015). Bibliometric mapping: Eight decades of analytical chemistry, with special focus on the use of mass spectrometry. *Anal Chem*.87(9):4588–96.
[15] Garza-Reyes JA. (2015). Lean and green-a systematic review of the state of the art literature. *J Clean Prod.* 102:18–29.
[16] Rafika AS, Putri HY, Widiarti FD. (2015). Analisis Mesin Pencarian Google Scholar Sebagai Sumber Baru Untuk Kutipan. *J CERITA.* 3(2):193–205.
[17] Aulianto DR, Yusup PM, Setianti Y. (2020). Pemanfaatan Aplikasi " Publish Or Perish " Sebagai Alat Analisis Sitasi Pada Jurnal Kajian Komunikasi Universitas Padjadjaran. *B Chapter Semin Nas MACOM III "Communication Inf Beyound Boundaries*, 873–80.
[18] Parmar A, Ganesh R, Mishra AK. (2019). The top 100 cited articles on Obsessive Compulsive Disorder (OCD): A citation analysis. *Asian J Psychiat*, 42:34–41.
[19] Yan K, Zou D, Yan G, Fang H, Weiss M, Rautiainen M, et al. (2021). A Bibliometric Visualization Review of the MODIS LAI/FPAR Products from 1995 to 2020. *J Remote Sens,* 1–20.
[20] Mercer N, Hennessy S, Warwick P. (2019). Dialogue, thinking together and digital technology in the classroom: Some educational implications of a continuing line of inquiry Journal of Educational Research. Elsevier.
[21] Liu Z, Yin Y, Liu W, Dunford M. (2015). Visualizing the intellectual structure and evolution of innovation systems research: a bibliometric analysis. *Scientometrics.*103(1):135–58.
[22] Nagy G. (2018). Text mining-based scientometric analysis in educational research. *Eur Conf Educ 2018,* 129–42.
[23] Bilik O, Damar HT, Ozdagoglu G, Ozdagoglu A, Damar M. (2020). Identifying trends, patterns, and collaborations in nursing career research: A bibliometric snapshot (1980–2017). *Collegian.* 27(1):40–8.