



Practical Steps for Bibliometric Analysis: Mapping Trends in Scientific Articles on Digital Literacy Using VOSviewer from the Google Scholar Database

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Abstract

The Google Scholar database has become an indispensable resource for article search in the digital age. The purpose of this study was to examine articles from the Google Scholar database and demonstrate how to use VOSviewer to analyze bibliometric data. Users are given an initial explanation of step-by-step analysis using VOSviewer to make it easier to map research trends. The study offers analytical findings from the growing digital literacy research and explains how simple it is to evaluate data using mapping tools. As a starting point for future research, bibliometric analysis is used in this research to uncover trends and patterns in the development of science. For example, concrete publications on digital literacy involve the collection of 204 published documents from 2018 to 2022. The results of mapping with VOSviewer can be used to offer recommendations in the results of data analysis to identify research trends. Some keywords that become opportunities for future research trends related to digital literacy are models, PBL, children's digital literacy, hoaxes.

Keywords: Article Analysis, Digital Literacy, Publish or Perish, VOSviewer

Introduction

In today's rapidly developing technological era, analysis of bibliometric data presented visually through mapping tools is needed (Maryono, 2020). Learning about previous study developments becomes easier with the help of mapping tools. One tool for mapping knowledge about previous research into an understandable image format is VOSviewer (Tupan, 2016). A software called VOSviewer is used to create and display bibliometric networks (Liao et al., 2018). Free software called VOSviewer was created by Eck and Waltman (van Eck & Waltman, 2010a). VOSviewer can display a map of publications based on keywords by researcher, individual publications, citations, bibliographic coupling, shared citations, or author

Practical Steps for Bibliometric Analysis: Mapping Trends in Scientific Articles on Digital Literacy Using VOSviewer from the Google Scholar Database

relationships. Publication maps can be viewed in a variety of ways and include features such as zooming, scrolling, visualization, and search engines. As a result, articles can be mapped more precisely. Specific data regarding bibliometric visual maps are presented and displayed by VOSviewer (Baier-Fuentes et al., 2019). Recently, VOSviewer has become famous for evaluating the context of the research to be carried out and measuring its uniqueness (Herawati et al., 2022). Large bibliometric maps can be displayed using the VOSviewer mapping tool in an easy to understand way. VOSviewer has the ability to map different types of bibliometric analysis, supports a number of important bibliographic databases, ignores the time dimension, can only analyze small to medium-sized data, is designed for text processing functions, uses layout and cluster techniques, and uses overlay and density visualization features, among other features (Sidiq, 2019).

VOSviewer has been the subject of numerous studies, such as the VOSviewer manual study (van Eck et al., 2013). Other research on the use of VOSviewer in keyword search, COVID-19 study mapping research, soil improvement study mapping research, analysis, and use of VOSviewer software as a bibliometric mapping computer program (van Eck & ; Waltman, 2010b; Yu et al., 2020; Hu et al., 2019; Jeong & ; Koo, 2016;). However, it is still rare for studies to explain how VOSviewer is used as a research mapping tool. Therefore, this study aims to show bibliometric analysis of research related to digital literacy in detail with image display and analysis process.

Research Method

- **Preparation of Analytical Tools**

VOSviewer data analysis requires the preparation of various programs. The first program is the Mapping tool, which can be downloaded from the official website of the open-source VOSviewer program. The data to be mapped is visualized using VOSviewer. The reference manager application should be set up as a second tool. Applications for reference managers that can be used are Mendeley and Publish or Perish. Utilizing VOSviewer, this reference manager program collects research data for bibliometric analysis.

- **Data Collection**

Publication data of digital literacy journals in Indonesia was collected using a reference management program with the help of the Publish or Perish application. The selected themes are reviewed in the literature from the Publish or Perish search according to the relevant research topic. Data is collected based on bibliometric records of each research study used, and determines the most cited research and the oldest and most recent years of an article. There are many choices of research data sources that can be used with Publish or Perish, including Crossref, Google Scholar, Google Scholar Profile, PubMed, Microsoft Academic, Scopus, and Web of Science. Data from the Google Scholar database was used in the study.

- **Data Mapping**

VOSviewer, a digital mapping program, was used in the study. The collected data is then processed using targeted keywords. The information is then fed into the VOSviewer program, which converts it into a map of connected information.

Result and Discussion

The approach to using VOSviewer to analyze data mapping for the main topics of digital learning media according to Google Scholar from 2018 to 2022 is discussed in this section.

- Data Used

As an illustration, the information for this study was collected using Google Scholar, where the data of each article corresponds to the theme In a file that can be used with VOSviewer, the search will be saved. The following are the steps to get this information.

- Start the Publish or Perish app.

Opening the app is the first step in using Publish or Perish to acquire data, as seen in Figure 1. The first window of the Publish or Perish application appears when the program has been launched, as illustrated in Figure 2.

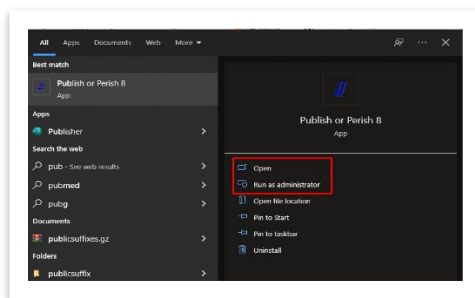


Figure 1. Icon appsi Publish or Parish

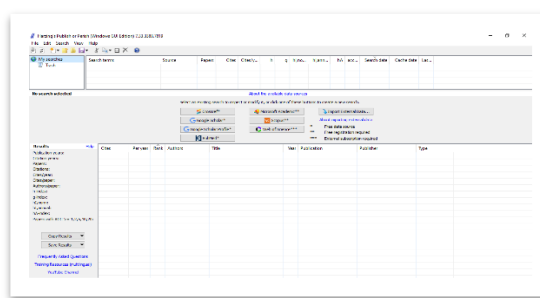


Figure 2. Paris Publication or Application Start

- Selecting a Database Source

The Google Scholar database was used in this research data search. The Google Scholar button, as seen in the image, must be clicked first.

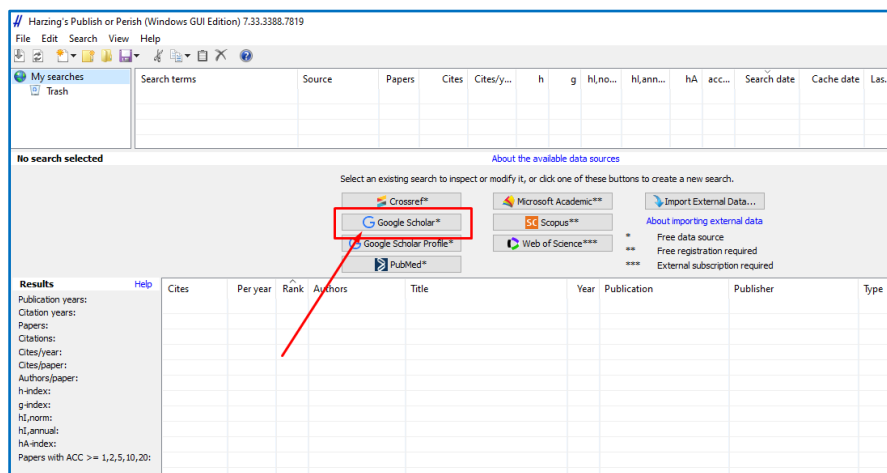


Figure 3. Selection of data sources in Google Scholar or Google Scholar

1) Filling in Google Scholar Search Keywords

A Google Scholar search has various components, including author, title, keyword, and publisher name, as seen in Figure 4. The theme studied in this study is digital teaching

Practical Steps for Bibliometric Analysis: Mapping Trends in Scientific Articles on Digital Literacy Using VOSviewer from the Google Scholar Database

furniture media, with a time frame of 2018-2022, or research conducted five years ago. "Journal" is typed in place of the word "publication." Set the maximum number of results to be displayed after that. The highest number of articles produced for this study was 200. If all required Google Scholar search form fields have been filled in, In the upper-right corner, select the search icon and wait for the search to complete. Some of the lookup columns can be seen in Figure 5.

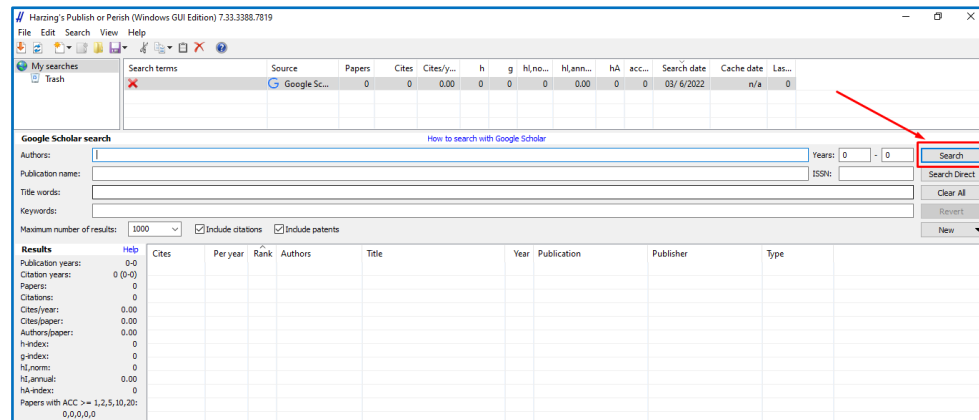


Figure 4. The process of filling search keywords in Google Scholar

2) Search Results

The search result "Publish or Perish" is shown in Figure 5. Figure 5 shows some data from the collected data if you are on the left side of the screen, peek at the results area. . According to this study, the publication year is 2018–2022, and the citation year is for a five-year period, or 2018–2022.

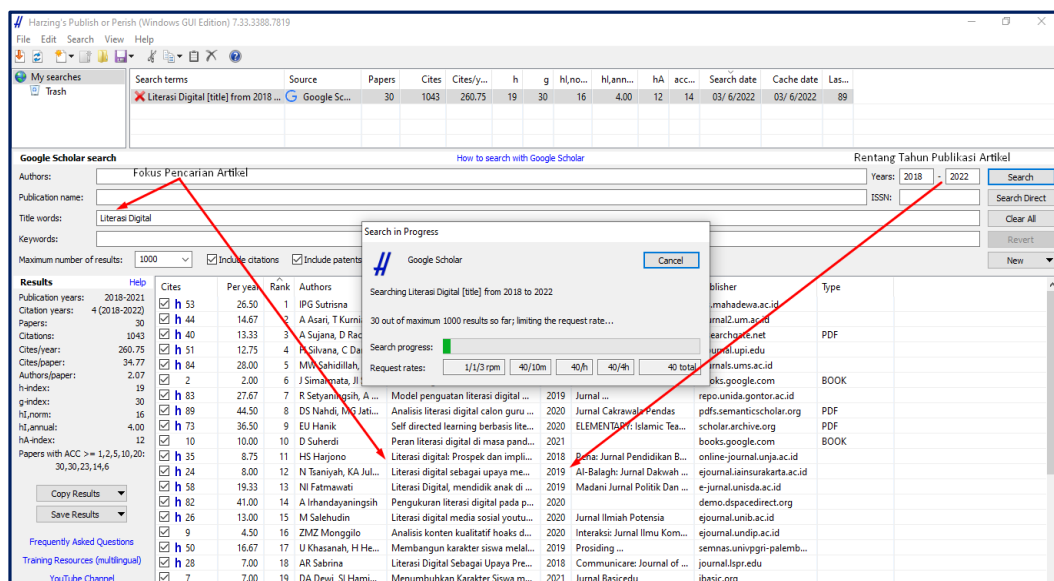


Figure 5. Data Search Process Based on Time Range 2018-2022

3) Saving Data from Publish or Perish

The next step is to select the Save Results option to save the search results. Save the next result in RIS format (Fig 6). The reason why search results are saved as RIS files is so that the VOSviewer program can read them.

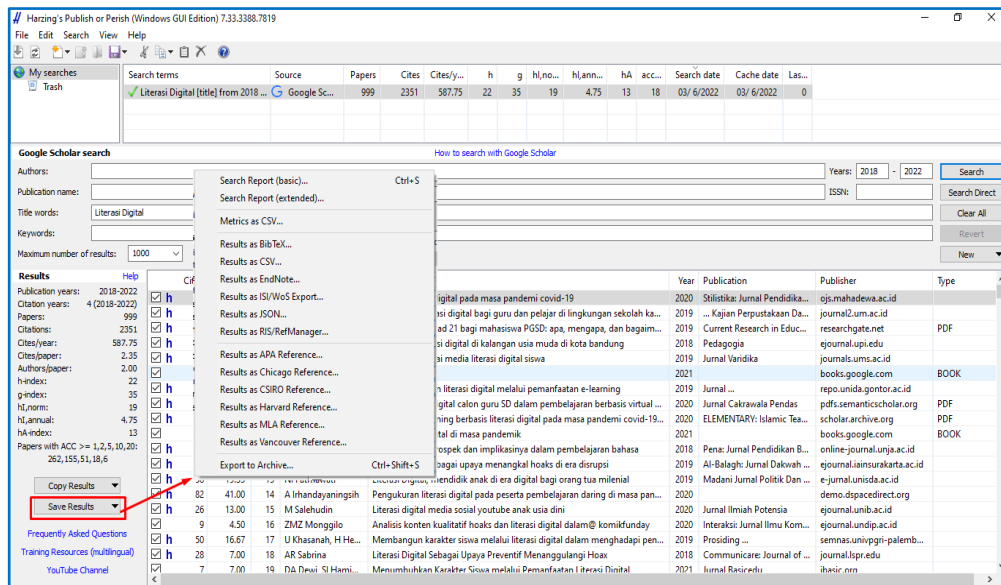


Figure 6. Save search results and data in RIS format

Next, articles from "Publish or Perish" are mapped with the help of the VOSviewer program. In article form, the data displayed in Publish or Perish is not full text. However, only metadata containing details such as author name, article title, year of publication, journal that did so, and publisher were found. Search results revealed information on up to 204 publications using the keyword "digital literacy," with 396 citations, 44 citations per year, h-index 8, and g-index 177.

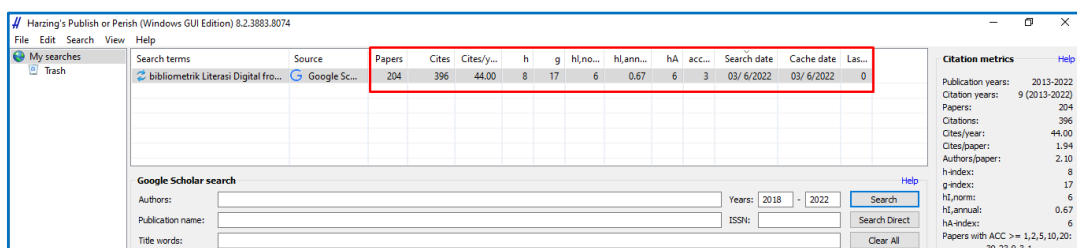


Figure 7. data search result information from Publish or Parish

a. Bibliometric Digital Literacy Research Map

204 research papers on digital literacy were found from Google Scholar database search results. The paper is then loaded into VOSviewer, converted to RIS format, and then checked. The following are some of the steps carried out to map research using VOSviewer:

1) Launch VOSviewer App

VOSviewer application that is already installed on a laptop or computer device must be opened first. When the program is launched, the VOSviewer start window will appear as depicted in Figure 8.

Practical Steps for Bibliometric Analysis: Mapping Trends in Scientific Articles on Digital Literacy Using VOSviewer from the Google Scholar Database

2) Get started: Create a new mapping

To create a new mapping, press check after the VOSviewer application is opened, as illustrated in Figure 8. Press the "create" button to generate a map from text information. Figure 8 offers three different ways to construct maps: using network data, using bibliographic data, or using text data. Since the research mapping for the study was predicated on the study's title, text data was used to build the map. After that, click the next button.

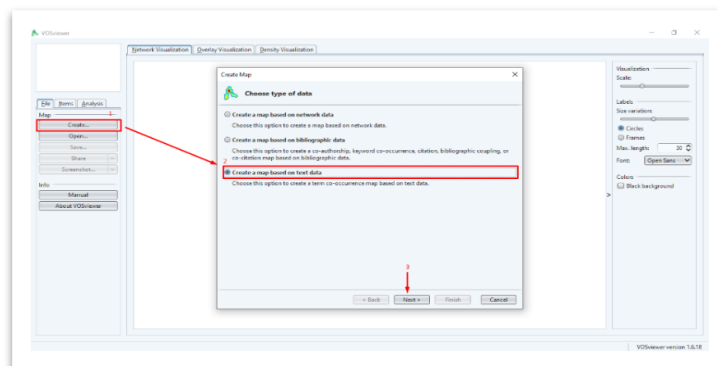


Figure 8. Choose the type of research map based on

3) Specify the data source type.

The types of data sources to map are determined at the following stages: Figure 9 shows four options for data sources: downloading data using APIs, reading data from VOSviewer files, and files from bibliographic databases, reference managers, and other databases. The Publish or Perish program is one of the reference manager applications utilized in the data retrieval process, and the type of data that was previously stored is RIS. As a result, the option to read information from the reference management file is selected here. Next, click the Next button. Use the Publish or Paris application to search for search result files previously saved in RIS format in the region shown in Figure 10, then to move on to the following phase, click the next button.

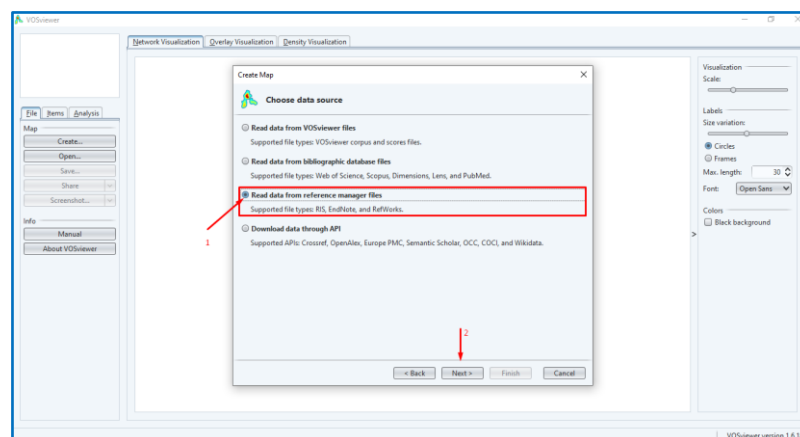


Figure 9. Select the type of data source to map

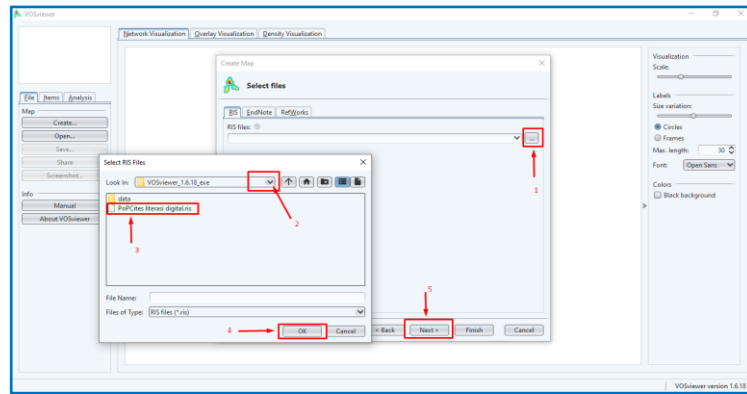


Figure 10. Find and enter the Publish or Parish search result file to be mapped by VOSviewer

4) Select the fields to extract

The types of data sources to be mapped are the following stages. Figure 9 shows four options for data sources: downloading data using APIs, reading data from VOSviewer files, and files from bibliographic databases, reference managers, and other databases. One of the reference manager programs used in the prior data retrieval step was the Publish or Parish application, and the data type that was previously stored was RIS. Therefore, in this section, the option to read data from reference management files is selected. Click the Next button after that. Press the 3-dot button to search for search result files in the region shown in Figure 10 using the Publish or Parish program that was previously stored in RIS format. Click the next button to move on to the next phase.

5) Select a calculation method.

The option of counting methods is displayed in Figure 11. Binary counting and complete counting are the two techniques. When a word appears in the title more than once, it counts as one since binary counting shows data as either 0 or 1. In addition, the full counting approach ensures that the amount looks to be tallied exactly as much as it appears to be.

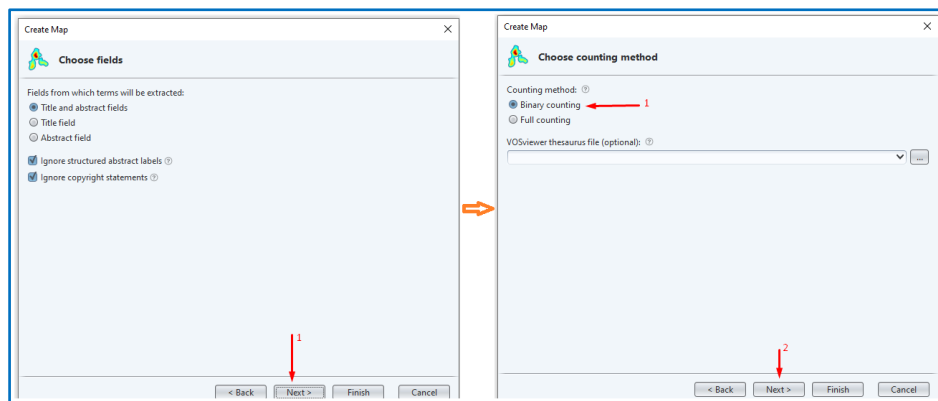


Figure 11. Select fields to extract data from

6) Choose a threshold

Practical Steps for Bibliometric Analysis: Mapping Trends in Scientific Articles on Digital Literacy Using VOSviewer from the Google Scholar Database

The Select Threshold page is depicted in Figure 12. The minimum number of words that should appear in a folder is set on this page. The corresponding keywords and the number of occurrences of three or more times were included in the mapping because there were at least three terms that appeared in the study. When 236 words are found, the part depicted in Figure 12 is created by maximizing the data display by 236. then click Next button to go ahead.

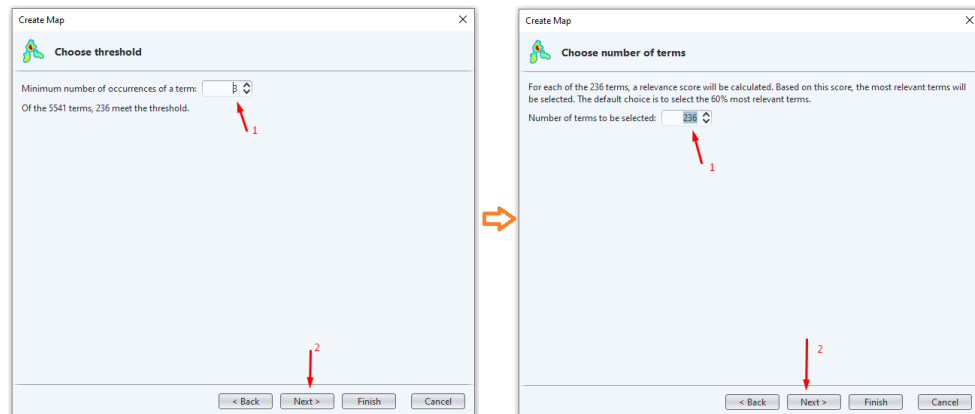


Figure 12. Select a threshold for data extract

The last page of the data extraction procedure shown in Figure 13 will be displayed in the following view. Click Finish to complete the data extraction procedure.

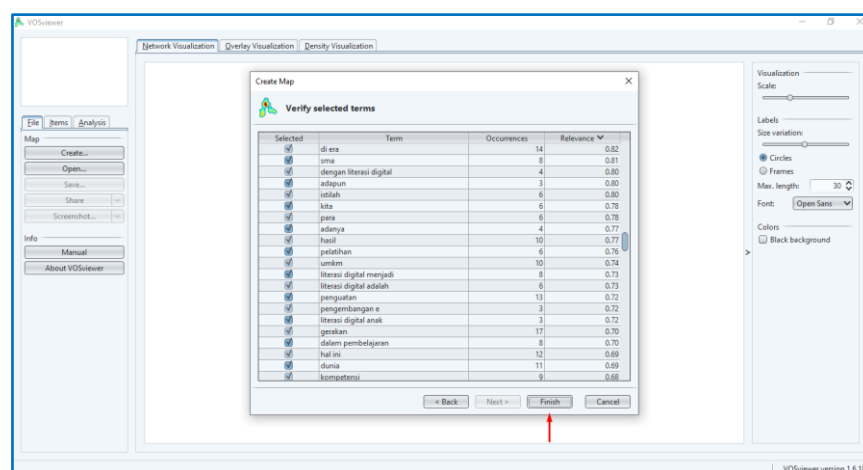


Figure 13. Final view of data extraction

7) Network visualization Shared Word Map

Figure 14 illustrates the results of the VOSviewer application's display of digital literacy. Depending on the data source used to extract data from the Publish or Parish application, this view will change with each data extraction procedure. The horizontal view of VOSviewer mapping displays a number of large, different-sized, colored circles connected by lines. It displays words or phrases that fit circles in previous studies that examined or talked about subjects connected to other words or phrases in the network.

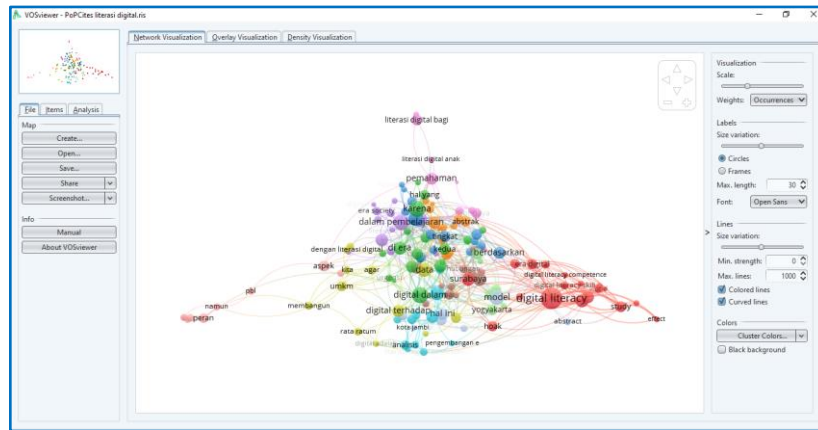


Figure 14. Display of data visualization of digital literacy research results in 2018-2022

The map of digital literacy networks in the last five years of research discussed in this study, for example, will be sharpened when the number 15 digital literacy words or phrases are clicked on a red circle. Figure 15 shows the relationship between the digital literacy debate and computer literacy; The digital era, model, and a number of other terms have even been studied in Surabaya and Yogyakarta.

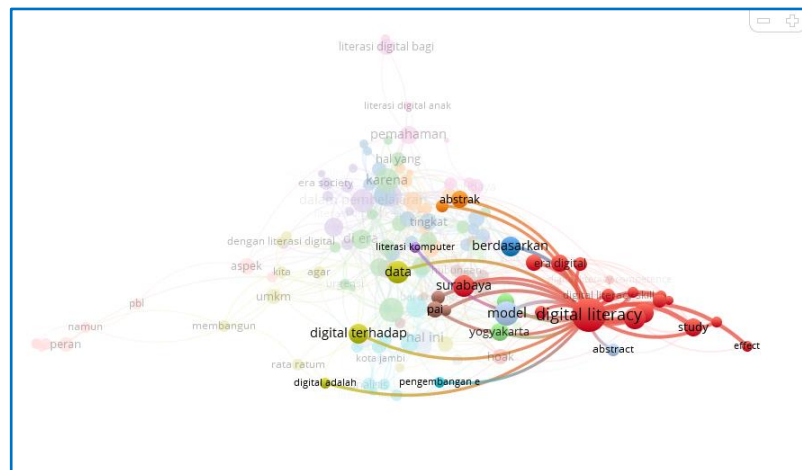


Figure 15. Digital literacy network visualization display

Co-Word Map Density Visualization

VOSviewer can display density maps from previous studies in addition to network maps. This density map shows that the larger the circles typed in a shared word density map, the more words or phrases scholars have previously discussed. Each word or phrase is marked with a specific colored circle with a different circle magnitude. Conversely, a smaller color circle in a word or phrase can mean that not many people are doing research on a particular word or phrase.

The co-word density map provides an overview of the basic organization of the bibliometric map by highlighting elements considered important to study (Farida & Firmansyah, 2020). The density map in Figure 16 is the final result of the analysis of all articles on digital learning media from 2018 to 2022. According to the density map, keywords will

Practical Steps for Bibliometric Analysis: Mapping Trends in Scientific Articles on Digital Literacy Using VOSviewer from the Google Scholar Database

show less yellow colors with the largest circle diameter, while keywords will appear more often if the color fades along with a green background (Tupan et al., 2018).

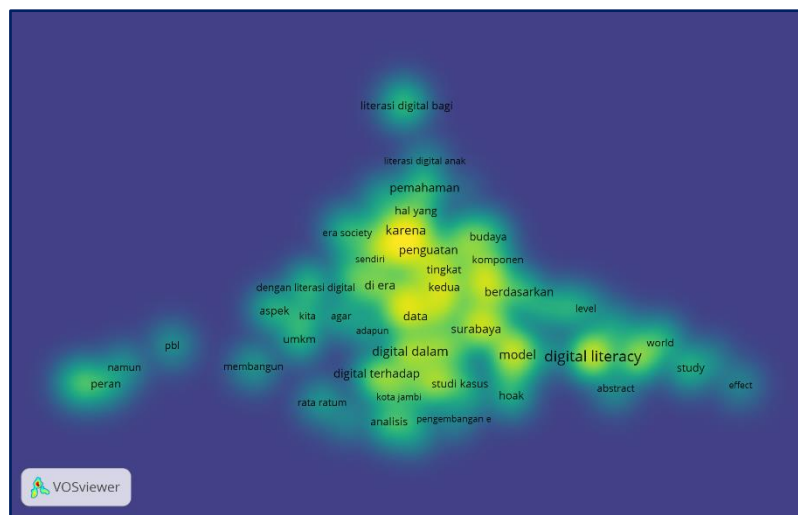


Figure 16. Display visualization of word density with digital literacy

Research potential or trends with keywords related to digital literacy are keywords that are still rarely used in research related to the articles studied. Shared word display Figure 16 for digital literacy includes a number of terms highlighted in bright colors, including the word "reinforcement". In the previous five years of study, the terms "reinforcement" and "case study" have been used frequently. Meanwhile, terms with a fading yellow color, such as PBL, children's digital literacy, hoaxes, and MSMEs, are opportunities for future research.

Conclusion

Based on the results and discussion above, it is clear that VOSviewer can be used as a mapping tool for bibliometric data analysis. The digital literacy research used in this study was taken from the Google Scholar database and analyzed with VOSviewer. There were 204 papers found related to the topic and ranged from 2018 to 2022. Although there have been erratic changes in the number of publications during this time, they tend to increase rapidly. Maps depicting the growth of the field of digital literacy studies based on relationships between words can be visualized through network visualization. The frequency and rarity of keyword use in research can be seen using density visualization. By looking at terms that were often underutilized in previous research, this data can be used to select additional research topics. Children's digital literacy, period society, PBL, and hoaxes are some of the underutilized keywords that might be used for the following study map.

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