

Mapping the Trends in Lecture Productivity Research Through Vosviewer-Based Bibliometric Analysis

Juliastuti ¹, Syadeli Hanafi ², Aceng Hasani ³

¹Universitas Cendekia Abditama & Doctoral Program in Education Universitas Sultan Ageng Tirtayasa, Banten, Indonesia.

^{2,3}Universitas Sultan Ageng Tirtayasa, Banten, Asia, Indonesia

Orchid ID: <https://orcid.org/0000-0002-7700-0207>¹

E-mail: juliastuti@uca.ac.id and 7782220023@untirta.ac.id¹, syadeli@untirta.ac.id², aceng.hasani@untirta.ac.id³

Correspondence Authors: juliastuti@uca.ac.id

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Abstract

Objective: This research aims to map the trends in lecturer productivity research through VOSViewer-based bibliometric analysis. Theoretical Framework: This research explains the data analysis on the topic of lecturer productivity and its development using mapping tools on VOSViewer over five years. (2019–2024). Method: This method uses qualitative descriptive analysis to illustrate the performance of bibliometric analysis in forming a network visualization of the chosen theme. Results and Discussion: From the research results over five years (2019–2024), 1000 relevant published journals were found and classified into four clusters according to their publication years. Then, through the classification of journal data, a total of 66 articles published on the theme of lecturer productivity from 2019 to 2024 were identified. From the search results, there are 10 articles with the most or highest citations. It can be concluded that lecturer productivity is a field that can be combined with other fields to be studied. Research Implications: In the era of the Industrial Revolution 4.0, bibliometric analysis is necessary to visually display mapping tools, especially in the education sector. The VOSviewer software application serves as a mapping tool to discover new items or trends, keywords, and the evolution process of the frequency of specific themes in research to obtain various information about scientific developments. Originality/Value: This analysis step is used to facilitate first-time users in accessing and utilizing VOSViewer. This research explains the data analysis on the topic of lecturer productivity and its development using mapping tools on VOSViewer over five years. (2019–2024). Thus, this research is expected to serve as a resource for researchers conducting studies and determining research titles.

Keywords: Bibliometrics, Lecturer Productivity, Scientific work, VOSViewer.

I. INTRODUCTION

In the era of the Industrial Revolution 4.0, bibliometric analysis is necessary to visually display mapping tools, especially in the education sector. As a result, in the 21st century, the use of technology is very important in many aspects of life. Education is one of the places where technological capabilities were first established. Scientists use the VOSviewer software application as a mapping tool to discover new items or trends, keywords, and the evolutionary process of the frequency of certain themes in research to obtain various information about scientific developments. According to Mustafa, the VOSviewer software plays a crucial role in managing related data in data collection, formation, management, analysis, simulation, and more (Mustafa, 2020). The use of this software can uncover new things for researchers in their studies. In research, VOSviewer functions to analyze bibliometrics, identify research areas with opportunities for investigation and connection to obtain novelty, as well as discover libraries. The topic of bibliometric analysis of lecturer productivity using VOSviewer has never been conducted, so no article on this topic can be provided as an example. The novelty of this research is the bibliometric analysis using the VOSviewer software to determine the extent of the development of articles on lecturer work productivity from 2019 to 2024. One of the software applications that can

assist scientists as a mapping tool is VOSviewer. According to Karim,(2022), VOSViewer is a software used for visualizing bibliometric maps or data sets about bibliographic fields such as titles, authors, writers, journals, and others. VOSViewer is used in research for bibliometric analysis, mapping the latest research topics, and finding the most frequently used references in a particular field. In this case, mapping tools are useful for obtaining various information regarding the developments in scientific knowledge that have been made. According to Al Husaeni et al., they stated that in this situation, mapping tools are useful for gathering a lot of details about the progress of science that has been made (Nandiyanto & Al Husaeni, 2021).

One of the main issues in improving faculty productivity is the lack of comprehensive mapping of research trends in this field. Lecturers at universities are faced with the demand to increase scientific publications to meet academic standards. However, the researchers' initial observations reveal that 1) there is a lack of awareness among lecturers to keep up with the latest trends in lecturer productivity research, as they still use conventional research methods and do not utilize new approaches such as bibliometric analysis, which can help map developments and new research opportunities, and 2) there is a low mastery of bibliometric analysis technology, with some lecturers never having used analysis tools like VOSviewer. This indicates limitations in the utilization of technology to review trends and global collaboration in research productivity. 3) Limited access to bibliometric data, as some lecturers still find it difficult to access scientific databases and the resources needed to conduct bibliometric analysis. With these issues, a more strategic approach is needed in integrating bibliometric analysis using tools like VOSviewer to help lecturers map trends and enhance productivity in scientific publications.

Productivity is a measure to assess the quality and quantity with the costs and resources used for the work (Walid et al., 2018). Experts have conveyed various factors that influence the productivity of lecturers. The most important factor in productivity is the person or the lecturer themselves, which includes attitude, motivation, work ethic, and various aspects that emerge within them as a whole human being, both from within and from outside (Aprison, 2018). According to Suharto, to measure a lecturer's productivity, one way is to look at how many scientific works are produced based on their field of expertise (Muis, 2015). Scientific writing, especially in the form of journal articles, is currently entering a new phase. Scientific works that were originally published only in print format can now be published and accessed in electronic format (Mujabuddawat, 2017). Basically, many studies have been conducted on faculty productivity. Research (Hayati & Lolytasari, (2017); Batubara & Noviyani Br (2020) used bibliographic analysis to study faculty productivity, and the results showed that faculty productivity based on observation and Lotka's law theory did not show significant differences and did not use the VOSviewer application for bibliometric analysis. In that context, bibliometric analysis can be an effective approach to understanding trends and patterns in the research productivity of lecturers that have been conducted by researchers. Bibliometric analysis can involve the collection, processing, and analysis of bibliographic data or scientific publications, including the identification of leading contributors in the field, the identification of relationships between concepts or keywords used in scientific publications, and the visualization of analysis results to aid better understanding. In bibliometric analysis, the VOSviewer application can be a popular choice because it has user-friendly visualization features and can produce attractive graphical representations to understand the patterns of relationships between concepts or keywords in scientific publications. Hu, Y et al., (2019) conducted research using the VOSviewer software application. VOSviewer is a popular software tool used to analyze research novelty and can help visualize bibliographies (containing titles, authors, journals, etc.). Nandiyanto et al., (2021); van Eck & Waltman, (2017); Hamidah et al., (2020). VOSviewer plays a crucial role in data processing, including data collection, formation, management, analysis, simulation, and more.

Several previous studies have used VOSviewer to analyze trends in various disciplines, such as technology, education, business, and social sciences, including the research results of Hsieh et al., (2013); Dervis, (2019); Hamidah et al., (2020); Donthu et al., (2021); Nandiyanto & Al Husaeni, (2021); Baber et al., (2022); Karim, (2022). However, research focusing on lecturer productivity using a bibliometric approach is still relatively scarce, especially in Indonesia. Previous research has focused more on internal factors that influence faculty productivity, such as motivation, institutional policies, and access to resources. However, there has not been much research that maps trends comprehensively through bibliometric analysis to see how the topic of faculty productivity research has developed over time. The VOSviewer application can be used to identify leading contributors in the field of faculty

productivity based on the number of publications, collaborations, or citations they receive. Thus, bibliometric analysis using the VOSviewer application can be an effective approach to understanding trends and patterns in work productivity research visually and can provide valuable insights for researchers, practitioners, and decision-makers in this field. VOSviewer is one of the popular applications used for visualization and network analysis in bibliometric studies. In this analysis, the researchers used the Publish or Perish software, which retrieves its metadata from Google Scholar and Scopus. Publish or Perish (PoP) is a free software used as a tool to facilitate the process of searching for articles that are neatly organized and connected across various publication sites (the metadata accessible in Harzing's Publish or Perish includes Google Scholar, PubMed, Scopus, Crossref, Semantic Scholar, and Web of Science) and provides researchers with an easy way to find articles as reference materials in literature studies (Asy'ari et al., 2021).

Referring to various receptions and successes of scientific publications using bibliometric research on nationally indexed and internationally reputable journal databases, the utilization of bibliometric research with the Publish or Perish and VOSviewer applications becomes urgent and rationalized as follows: First, bibliometric studies rely solely on secondary data (e.g., journal articles) to determine main topics, authors, sources, the number of published articles, the most cited articles, and contributors based on affiliations, with the necessary data collection and data analysis time being very short (Susan Varghese et al., (2022); Rojas-Sánchez et al., (2023). Second, it facilitates researchers in searching for and collecting various scientific publications to be used as references (Arianto, 2022); Mahsusi & Hudaa, (2022). Third, it helps researchers track current information. Research trends also aim to better utilize the VOSviewer application so that the resulting research is more focused and impactful on the advancement of science in the future (Rofik et al., 2022). Finally, researchers should find it easier to prepare bibliometric research articles for publication in reputable national and/or international journals.

This article aims to analyze trends in faculty productivity research using VOSviewer, highlighting key topics, leading authors, and the most influential publications in this field. This research will focus on analyzing publication trends, authorship patterns, and the thematic structure of the research field. The results of this analysis will provide a comprehensive understanding of the current state of faculty productivity research and offer insights into future research directions. Additionally, these results are expected to identify novelty and research gaps in faculty productivity studies, thereby highlighting topics that are still worth investigating.

II. THEORETICAL FRAMEWORK

1. BIBLIOMETRICS

Initially, bibliometrics was known as statistical bibliography and was one of the branches of library science. (Prytherch, 2005) is a writer in the field of librarianship from the Department of Meteorology, Stockholm University, and of Swedish nationality; the terminology was replaced with bibliometrics. Bibliometric comes from the Latin and Greek words *biblio* and *metrics*. The word *biblio* means book, and *metrics* means measurement, referring to the application of mathematics to study a bibliography (Rattan & Kamini, 2012). According to (Prytherch, 2005), bibliometrics is the application of mathematical and statistical methods to books and other communication media. Prytherch attempts to clarify the confusion often caused by the use of the previously employed term, namely statistical bibliography, which is often referred to as bibliography of statistics. Prytherch seeks to explain the errors that frequently occur when using the previously used term, "bibliography of statistics." This term is often misinterpreted as "bibliography of statistics". There are two main bibliometric studies: 1) descriptive studies that describe the characteristics or features of literature and 2) behavioral studies that examine the relationships formed between components of the literature (Tambunan, 2013). According to (Pattah, 2013), bibliometric studies consist of descriptive studies and evaluative studies. Descriptive studies are those that measure productivity by counting the number of articles, books, and other communication formats, while evaluative studies measure the use of literature by counting references or citations in research articles, books, and other communication formats. Bibliometric analysis is useful for identifying research problem trends, mapping research objects, and understanding the relationships between objects in research. Bibliometrics is based on the analysis of the metadata of a scientific publication that can be accessed from various databases. The databases that can be used as sources include Google Scholar, CrossRef, Garuda, DOAJ, PubMed, Scopus, and Web of Science.

Determining the database is done by adjusting to the needs and is highly determined by the purpose, subject, and object of the analysis (Suntoro & Setyaningsih, 2022). Software that can be used in analyzing bibliographies, namely Publish or Perish, BibExcel, CiteSpace, Bibliometrix, and VOSviewer.

2. VOSVIEWER

VOSviewer is software for building and visualizing bibliometric networks. The networks are journals, researchers, or individual publications (Aribowo, 2021). The network will show the network between the visualized keywords, and the network explains the relationship between one research topic and another, and what variables are connected. Overlay will show the historical footprint of the research. Through this historical footprint, it is possible to map trending research topics in recent years. Density will show the density/emphasis of the research group. The denser it is, the more studies on that topic have been used (Suntoro & Setyaningsih, 2022). In line with that, Karim, (2022) revealed that VOSViewer is a software used to visualize bibliometric maps or data sets containing bibliographic fields such as titles, authors, writers, journals, and others. In research, VOSViewer is used for bibliometric analysis, mapping topics for recent research, finding the most frequently used references in certain fields, and more.

According to van Eck & Waltman, (2010) Examples of applications using VOSviewer include creating maps of authors or journals using cocitation data and creating maps of keywords using co-occurrence data. The application provides a viewer that enables bibliometric maps to be thoroughly analyzed. A map can be shown in VOSviewer in a number of ways, each of which highlights a distinct feature. With its zooming, scrolling, and searching features, it makes it easier to examine a map in detail. VOSviewer's viewing features are particularly helpful for maps with at least a relatively high number of elements

III. METHODOLOGY

The research method is descriptive-qualitative using Publish or Perish (PoP) in bibliometric analysis through mapping the metadata of the topic of lecturer productivity taken from the Google Scholar and Scopus sites. The reason for using bibliometric studies is that they provide information in the field of library science easily and cost-effectively. Hakim (2020) states that bibliometrics is a study that measures the development of research, literature, books, or documents in a specific field both quantitatively and qualitatively using statistical methods. Bibliometric analysis is a popular and rigorously used method to explore and analyze large amounts of scientific data within a specific database (Donthu et al., 2021). Bibliometric data is processed based on a workflow, namely study design, data collection, data analysis, data visualization, and interpretation (Dervis, 2019).

This research step was carried out by searching for the topic "lecturer work productivity" using the Publish or Perish software with Google Scholar and Scopus metadata as the article search locations. The next step is to filter and select the articles from Google Scholar and publish or perish that were not chosen; then the filtered data is saved in the form of RIS files. (Research Information System). The selected articles are then mapped and analyzed using the VosViewer software. VosViewer is software for displaying visualizations of bibliometric networks and providing visually appealing analysis and evaluation. Vos Viewer provides an overview in the form of a network of terms (network), research history (overlay), and density or emphasis (density) according to the terms of keyword collaboration in the network. The final step is to conduct an analysis using the Vos Viewer software.

IV. RESULTS AND DISCUSSIONS

Based on the search using the Publish and Perish software with the topic of faculty productivity and data obtained from Scopus from 2019 to 2024, 34 articles were found.

Table 1. Top Ten Faculty Productivity Articles from Scopus

No	Cites	Title	Year	Source Year
1	H 11	A new integrated MCDM approach for lecturers' research productivity evaluation. (Tuan, 2020).	2020	<i>Decision Science Letters</i>

2	H 10	Focused Research on the Challenges and Productivity of Researchers in Nigerian Academic Institutions Without Funding. (Igiri, 2021)	2021	<i>Frontiers in Research Metrics and Analytics</i>
3	H 10	Research productivity and impact of Canadian academic ophthalmologists: trends in H-index, gender, subspecialty, and faculty appointment (Tanya et al., 2022).	2022	<i>Canadian Journal of Ophthalmology</i>
4	H 10	Trends, patterns and determinants of research productivity at the Technical University of Kenya. (Atieno et al., 2021)	2022	<i>Information Development</i>
5	H 9	The impact of knowledge sharing towards higher education performance in research productivity (Aulawi, 2021).	2021	<i>International Journal of Sociotechnology and Knowledge Development</i>
6	H 8	Prioritization of Factors Impacting Lecturer Research Productivity Using an Improved Fuzzy Analytic Hierarchy Process Approach (Hue, 2022).	2022	<i>Sustainability (Switzerland)</i>
7	H 8	Scholarly productivity and citation impact of Australian academic psychologists (Mazzucchelli et al., 2019).	2019	<i>Australian Journal of Psychology</i>
8	H 7	Management factors influencing lecturers' research productivity in Vietnam National University, Hanoi, Vietnam: A structural equation modeling analysis (Tuan et al., 2022).	2022	<i>Heliyon</i>
9	H 6	The Nexus of Social Media Use and Research Productivity of Lecturers in Private Universities in Ogun State, Nigeria (Adetayo, 2021).	2021	<i>Library Philosophy and Practice</i>
10	H 6	Motivation of work, organizational culture, and organizational commitment towards work productivity lecturers and employees of economics college AAS Surakarta (Budiyo, 2019).	2019	<i>Humanities and Social Sciences Reviews</i>

Source: data processed by Publish and Perish 2024

Table 1 above shows that the 10 most cited articles are the research by Tuan, N.A. (2020) with 11 citations; the research by Igiri, B.E. (2021), Tanya, S.M. (2022), and Atieno, A.V. (2022) with 10 citations each; the research by Aulawi, H. (2021) with 9 citations; the research by Hue, T.T. (2022) and Mazzucchelli, T.G. (2019) with 8 citations each; the research by Tuan, N.A. (2022) with 7 citations; and the research by Adetayo, A.J. (2021) and Budiyo (2019) with 6 citations each.

1. Number of Studies

Based on the results of the Publish and Perish software and Google Scholar search, 66 articles with the title "Lecturer Productivity" published in journals between 2019 and 2024 can be seen in Table 2 below:

Table 2. Number of articles per year

No	Publication Year	Number of Articles
1	2019	9
2	2020	17
3	2021	7
4	2022	14
5	2023	13
6	2024	6
Number		66

Source: data processed Publish and Perish 2024

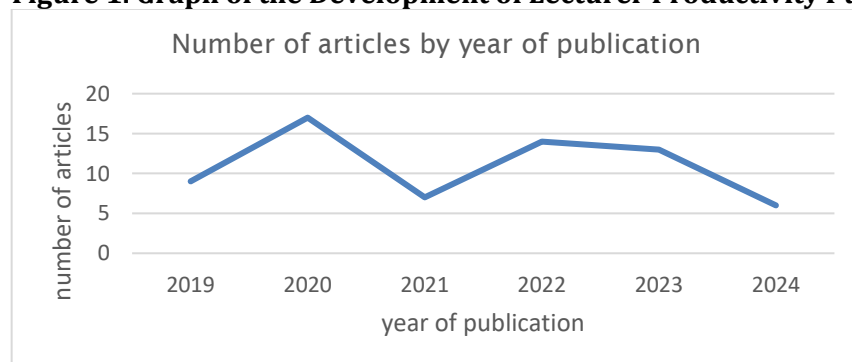
Figure 1. Graph of the Development of Lecturer Productivity Publications

Figure 1. The graph above shows that the number of articles published each year fluctuates. The highest peak occurred in 2020 with 17 articles, but after that, there was a significant decline in 2021. Although there was a slight increase again in 2022 and 2023, a downward trend occurred again in 2024. This indicates instability in publication productivity, which is likely influenced by certain factors, such as changes in conditions or priorities within the academic or research environment.

2. International Publication Journal on Lecturer Productivity Research

Based on the search in Publish or Perish through Google Scholar and Scopus, it was found that there are 7 publishers with the highest publications on the topic of faculty productivity. The top three rankings are from the publishers Elsevier, Researchgate.net, and atlantis.press.com.

Table 3. International Publisher productivity of lecturers

Publisher	Number
Elsevier	20
ajemates.org	3
atlantis.press.com	4
Researchgate.net	6
bwjournal.org	3
Ajol.info	2
Articlearchives.co	2

Source: data processed Publish and Perish 2024

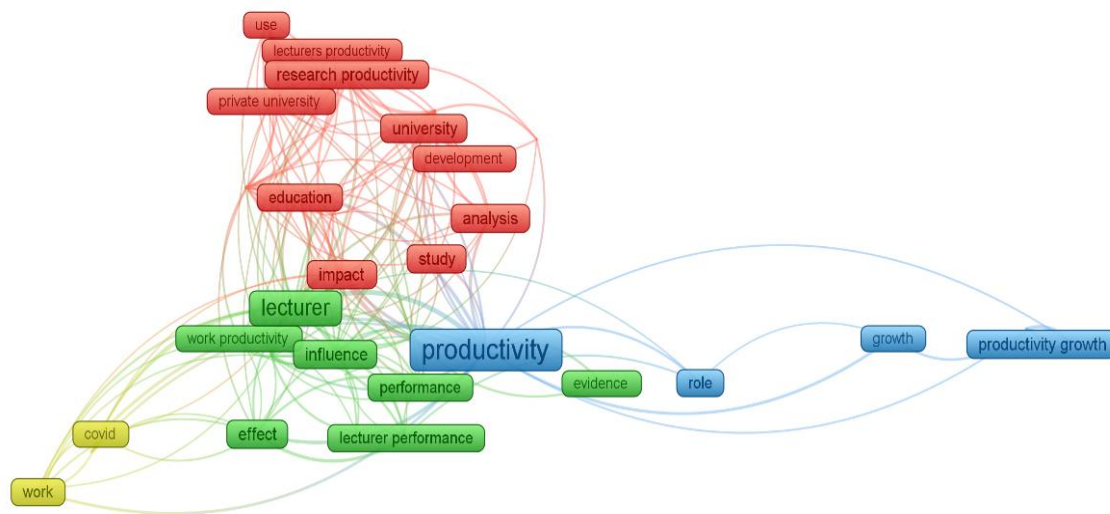
Table 3 shows the ranking of publishers with publications related to the topic. Publisher Elsevier with 20 articles, publisher Researchgate.net with 6 articles, publisher ajemates.org with 3 articles, publisher atlantis.press.com with 4 articles, publisher bwjournal.org with 3 articles, and publisher Ajol.info with 2 articles.

3. Map of the Development of Research Trends in Lecturer Productivity

Mapping the development of research trends in lecturer productivity through visualization using VOSViewer. Selection of the type of data, the researcher chose to create a map based on text data. In the data source, they selected read data from reference manager files with supported file types RIS, then

chose the field as title and in the counting method selected full counting. Minimum number of occurrences of the term is 10 and the number of terms to be selected is 38, so not too many keywords are shown in the visualization. There are three types of visualizations shown by VOSViewer, namely network visualization, overlay visualization, and density visualization, as seen in figures 2, 3, and 4.

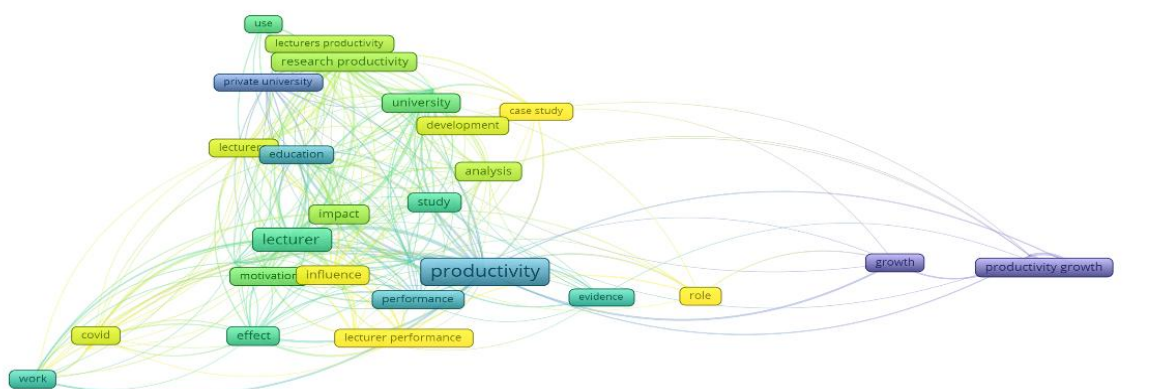
Figure 2. Network Visualization



Source: VosViewer 2024

Network visualization displays the relationships of each keyword related to the productivity of lecturers in producing scientific works. Items are divided into several clusters. There are 4 different clusters, but they are interconnected. The visualization shows 4 different colors. (merah, kuning, hijau, biru). The same color means having the same network or connection. Network visualization in cluster 1 is colored red and contains 10 items, consisting of lecturers' productivity, research productivity, use, private university, university, development, analysis, study, impact, and education. Cluster 2 is colored green and contains 7 items, consisting of lecturer, work productivity, influence, performance, lecturer performance, evidence, and effect. Cluster 3 is colored blue and contains 4 items, namely productivity, role, growth, and productivity growth. Meanwhile, cluster 4 is colored yellow and contains 2 items, namely covid and work.

Figure 3. Overlay Visualization



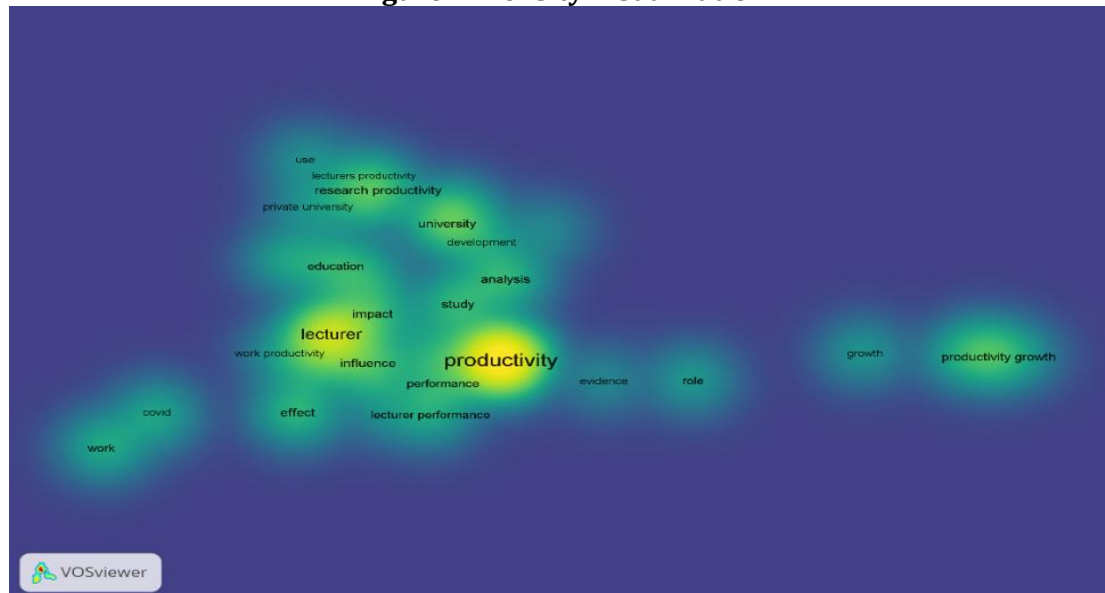
VOSviewer

Source: VosViewer 2024

Figure 3. Overlay visualization showing novelty based on the year of publication. The year 2022 is colored yellow and 2020 is colored blue, so the brighter the color (yellow), the more research there is on that topic. The dominant visual representation in green means that the

topic of lecturer productivity in producing scientific works is still limited. In 2020, the topic of lecturer productivity had not yet been discussed, but it became a hot topic around 2021, as seen in the network map. The COVID-19 pandemic in 2020-2021 had a significant impact on research and scientific publications. This drew the attention of researchers on how to maintain lecturer productivity in producing scientific works even during the COVID-19 pandemic.

Figure 4. Density Visualization



Source: VosViewer 2024

Figure 4. Density visualization shows how often the theme of lecturer productivity is discussed. The brighter the displayed color, the more frequently the theme is discussed. It can be seen that the themes of productivity and lecturer are the most discussed, and those that are quite frequently discussed are related to performance, work productivity, and study. The themes or items that are still less discussed are related to lecture productivity, research productivity, development, and others. The themes that are still rarely discussed present a great opportunity for new or updated research.

This research aims to map the trends in lecturer productivity research through bibliometric analysis based on VOSViewer. The search process in Publish or Perish used the keyword "faculty productivity" based on the topic area with titles, keywords, and abstracts. Publish or Perish (PoP) is software used to retrieve metadata of scientific works from all fields of study for free. PoP offers free access to metadata for websites such as CrossRef, Google Scholar, Google Scholar Profiles, Microsoft Academic*, PubMed, Scopus*, and WoS. According to Asy'ari et al., (2021) Harzing's Publish or Perish is a free software tool that facilitates the process of searching for articles in an organized manner and is connected to various publication sites (as of now, the metadata covered by Harzing's Publish or Perish includes Google Scholar, Microsoft Academic, Scopus, and Web of Science). Therefore, it provides convenience to researchers in searching for articles as reference materials in literature studies. Then, the collected data were analyzed using the literature review method through the traditional review technique. In the research, VOSViewer functions as a bibliometric analysis tool, mapping topics for the latest research, finding the most frequently used references in specific fields, and more. Van Eck & Waltman, (2010)" By using VOSviewer, you can create journal or author maps based on co-citation data or keyword maps based on co-occurrence data. Bibliometric maps can be thoroughly examined through the views provided by this program. VOSviewer can display maps in various ways, emphasizing different aspects of them. It has search, zoom, and scroll features, which make it easy to examine map details. For maps with at least many items, VOSviewer's display capabilities are very helpful". VOSviewer can read datasets from various online journal sites such as Google Scholar, Web of Science, Scopus, Dimensions, and PubMed. Dataset formats RIS, Endnote, and RefWorks can also be read by

VOSviewer. Through the API feature, VOSviewer can also read/retrieve data from Crossref, Pubmed PMC, Semantic Scholar, OCC, COCI, and Wikidata.

V. CONCLUSION

It can be concluded that 66 relevant articles were found. The mapping procedure was completed using VOSviewer. The search results included 10 articles with the most or highest citations. Based on the mapping results and bibliometric analysis using VOSviewer, research on lecture productivity and research productivity with the term study is identified as still being limited from 2019 to 2024. Meanwhile, the themes of productivity and lecturer are the most researched. VOSviewer analysis identified four keyword clusters related to the topic of lecturer productivity research. Each cluster contains main terms linked to other terms, namely Network visualization in cluster 1, colored red, which has 10 items, consisting of lecturers' productivity, research productivity, use, private university, university, development, analysis, study, impact, and education. Cluster 2, colored green, has 7 items consisting of lecturer, work productivity, influence, performance, lecturer performance, evidence, and effect. Cluster 3, colored blue, consists of 4 items, namely productivity, role, growth, and productivity growth. Meanwhile, cluster 4, colored yellow, consists of 2 items, namely covid and work. It can be concluded that lecturer productivity is a field that can be combined with other fields to be studied

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