

COMPUTATIONAL BIBLIOMETRIC ANALYSIS OF ENGLISH RESEARCH IN SCIENCE EDUCATION FOR STUDENTS WITH SPECIAL NEEDS USING VOSVIEWER

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Abstract

This study aimed to determine the bibliometric data analysis of English language research in science education for students with special needs using VOSviewer. The research data was obtained through a reference management application. We used the keywords "English language, science education, and students with special needs" to search for data. Search data was taken from 2012 to 2022. The results showed that research data for 11 years obtained 993 articles. The number of studies every year seems to fluctuate with a tendency to decrease. Most of the research took place in 2013 as many as 195 articles and in at least 2022 as many as 12. However, until now the main factor that causes research on the theme in question is unknown. The Covid-19 pandemic may be one of the factors causing this decline because since 2019 the number of studies that have taken place has been less than 50. The results of this study explain how important it is to use bibliometric analysis to find out the phenomena that occur regarding the development of English language research in science education for students with special needs. This is expected to trigger the enthusiasm of researchers to continue to develop research on this topic.

Keywords: Bibliometric, Data analysis, English language, Science education, Students with Special Needs, VOSviewer.

1. Introduction

English is an international language used to communicate around the world [1]. The Declaration of English as an international language has a long history. Since ancient Roman times, it was necessary to have a language that many people could understand. Thus, people from different countries could understand when communicating [2]. The language has the designation *lingua franca*. *Lingua franca* is the language used to communicate between people from various backgrounds [3]. Initially, each region had a different *lingua franca* before it was agreed that English would be a common language. English is the oldest language in the world and appeared around 8 AD [4]. English has experienced rapid development and has become an international language. Several countries make English the official or main language. Mastering English is one of the needs to face globalization [5]. One of the efforts of the government in Indonesia is to make it mandatory for every level of education to have an English subject [6]. However, not only that, but many schools also use English in every learning process. This makes research on how to improve language [7-11], especially English, become popular.

One of the subjects that become mainly reported is in the science learning process. Science subject is a part of the learning subject of natural phenomena around us [12-14]. Science education is important for all of us to understand and learn, especially for students in schools [15-24]. Science education is not only important for students in general, but for students with special needs as well. Students with special needs have the same rights in education [25-27]. Important science education is taught to them, both in English and Indonesian. Research on the use of English in science education must continue to be developed, especially those that are closely related to students with special needs.

To find out research on English related to science education and students with special needs, researchers need tools to interpret research data that has already occurred. The reference manager application is one of the tools that can be used for data collection. The application is used as a tool to collect bibliometric data [28]. After that, VOSviewer is needed to map the required data related to the keyword themes being searched for. VOSviewer is a program that has a function to visualize the required data set from the search results of reference management applications [29-39].

Currently, there are many studies on VOSviewer in the field of Education [40], Sports [41], Engineering [42], Economics [43], Information Technology [44], and other disciplines [45-81]. However, until now there has been no research discussing "computational bibliometric analysis of English research in science education for students with special needs using VOSviewer".

This research aimed to engineer a bibliometric mapping of English language research in science education for students with special needs by combining mapping analysis with VOSviewer software. We use the resulting data visualization analysis method. The results of the study show that the development of research on the English language research in science education for students with special needs has decreased. This can be seen from the data taken from 2012 to 2022. This research is also intended to assist researchers in identifying the research themes taken. The novelty of this research is the theme of the keywords taken for analysis, namely English, science education, and students with special needs.

2. Method

In this study, we took data from sources obtained by search results using three keywords, namely English, science education, and students with special needs. Articles indexed in Google Scholar data are used as the basis for retrieving article data. The reason we used Google Scholar for data search in this study is that Google Scholar is free, while Scopus has to pay. However, we try to develop it in further research using the Scopus database. The reference management application program was used to obtain data in this study. We use Publish or Perish. The Publish or Perish function is to conduct a literature review, especially on the keyword topics chosen by us. After that, the article data with the topic we specified and indexed by Google Scholar is backed up into a file using VOSviewer.

We analysed each data item obtained. The data retrieved is only data related to keywords. We used article data published from 2012 to 2022. After that, the article data set is stored in *.ris format. On bibliometric maps, VOSviewer was used by us to analyse and visualize trends. We also create an article data mapping from a database source that has been prepared. There are three types of mapping forms, namely: network, density, and overlay visualization. Next, we filtered the terms that will appear in the VOSviewer network mapping view.

3. Results and Discussion

3.1. Developments on various English language research in science education for students with special needs

In this study, we analysed developments regarding English language research in science education for students with special needs. Data were obtained using the Publish or Perish program. Publish or Perish is software that is used to harvest bibliographical metadata of scientific works in all fields of science for free [28]. We obtained research data from 993 articles over 11 years.

Figure 1 shows the number of studies on English themes in science education for students with special needs which are outlined in the form of articles and have been published annually from 2012 to 2022. In 2012 there were 179 studies, in 2013 there were 195, in 2014 there were 174, in 2015 there were 87, in 2016 there were 82, in 2017 there were 90, in 2018 there were 67, in 2019 there were 27, in 2020 there were 49, in 2021 there were 31, and in 2022 there were 12. From these data, during the 11 years of research development, the most occurred in 2013 and the fewest research occurred in 2022. The results showed that research development was fluctuating but tended to decline. That can be seen significantly from 2020 to 2022. The number of studies looks to be less than 50. Until now, the exact cause of the decline in the number of studies is unknown. However, the impact of the CoVID-19 pandemic is thought to be one of the factors causing the decline in research on English in science education for students with special needs. The CoVID-19 pandemic has had an impact on various aspects of life, one of which is the world of research. One of the reasons for the decrease in the number of studies could be the impact of the COVID-19 pandemic [28].

Table 1 shows the number of studies and the number of citations. Most research took place in 2013. The lowest number of citations occurred in 2018 and 2020, namely 1 citation. While the highest number of citations occurred in 2012 with 51344. The highest total number of citations occurred in 2013 with 1806485 while

the least in 2022 was 1527914 citations. On average, the most citations of each article occurred in 2019, while the least occurred in 2013.

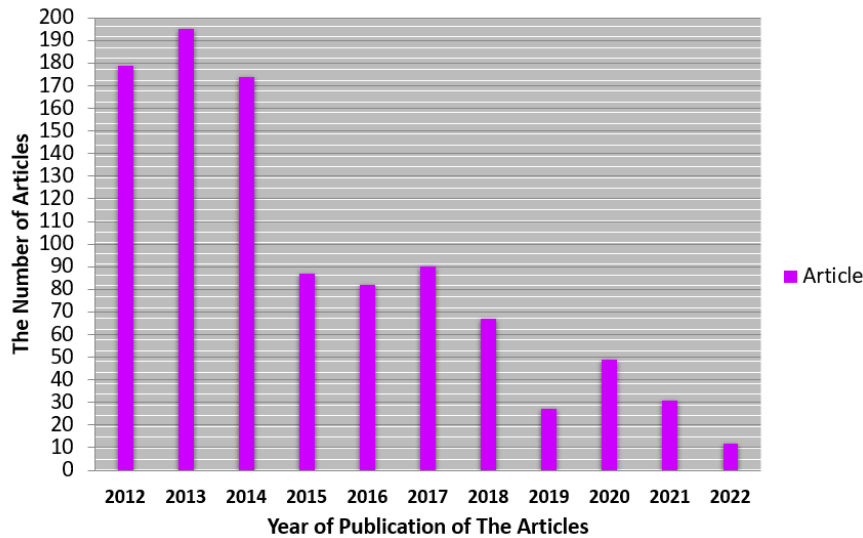


Fig. 1. Development of the research.

Table 1. the number of studies and the number of citations.

No.	Year	Articles	Lowest citation	Highest citation	The total number of citations	Average citation of each article
1	2012	179	37	51344	1786874	9982.54
2	2013	195	56	13612	1806485	9264.03
3	2014	174	51	23162	1799735	10343.30
4	2015	87	11	27084	1785070	20518.05
5	2016	82	41	29869	1797443	21920.04
6	2017	90	50	35785	1790017	19889.08
7	2018	67	1	15155	1745600	26053.73
8	2019	27	29	16654	1718249	63638.85
9	2020	49	1	18596	1714978	34999.55
10	2021	31	152	5635	1570616	50665.03
11	2022	12	505	13876	1527914	127326.2
Total		993	934	250772	19042981	19177,22

3.2. Visualization science education topic area using VOSviewer

In the VOSviewer data mapping visualization, the relationship between each term has a minimum number of two relationships. VOSviewer has a function to evaluate data [44]. VOSviewer evaluates the data obtained and the resulting data in this study are grouped into 5 groups: Clusters 1 to 5 are represented by 5 colours including red, green, blue, yellow, and purple. Each cluster has a function to describe the relationship of each term. Each cluster describes the relationship between two or more terms [44]. Figure 2 shows the number of items for each cluster. Cluster 1 totalled 18 items. Cluster 2 totalled 14 items. Clusters 3 and 4 total 13 items. Cluster 5 totalled 6 items.

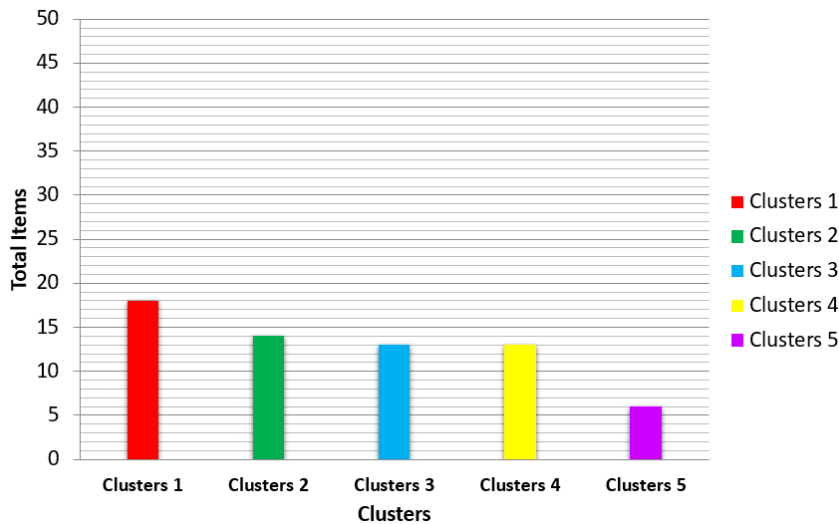


Fig. 2. Total items in every cluster.

The research data described by VOSviewer usually has three different representations on the bibliometric mapping. The three representations include (1) network visualization, (2) overlay visualization, and (3) density visualization. Keywords are labelled by coloured circles, and the size of the coloured circles is closely related to the number of keywords in the abstract and title. The more frequent the frequency of occurrence, the larger the size of the coloured circles.

Figure 3 shows a visualization of the network for each cluster that is searched according to the theme or term of the keywords being searched. Network visualization is represented by lines or nets that connect related terms [44]. This study consisted of 5 clusters that were visualized on the network visualization image (Fig. 3). The explanation includes:

- (1) Cluster 1 consists of 18 items. These items include age, analysis, covid, data, educational research, English language teaching, foundation guide, impact, information, interest, life, linguistics, reader, researcher, social science, text, and world. This cluster is marked in red.
- (2) Cluster 2 consists of 14 items. These items include articles, classes, effects, English language art, English language learners, evidence, math, meta-analysis, science teaching, special education, student learning, systematic review, tools, and word. This cluster is marked in green.
- (3) Cluster 3 consists of 13 items. These items include addition, change, chapter, child, culture, curriculum, disability, history, idea, nature, person, psychology, and understanding. This cluster is marked in blue.
- (4) Cluster 4 consists of 14 items. These items include challenge, discipline, engineering, higher education, implications, literature, mathematics, quality, science learning, self, technology, unique need, and university. This cluster is marked in yellow.

- (5) Cluster 5 consists of 6 items. These items include ability, foreign language, high school, high school student, intervention, and perspective. This cluster is marked in purple.

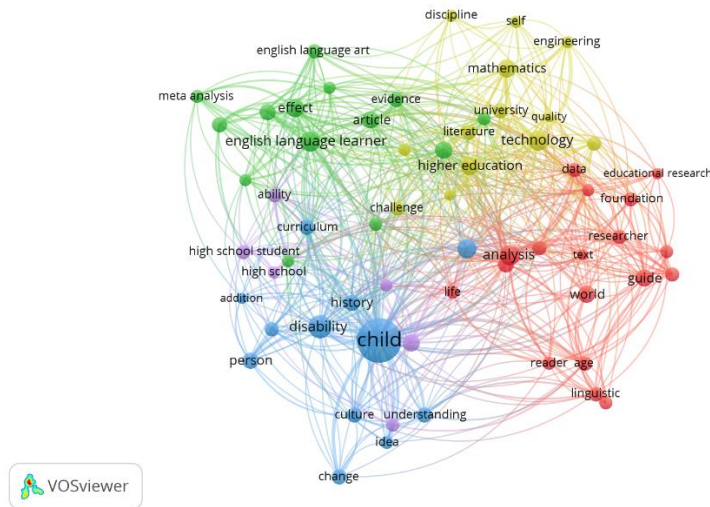


Fig. 3. Network visualization of the materials keyword.

Figure 4 shows a research overlay visualization on the theme searched according to keywords. The light colour shows that the newer the research is, the brighter the colour is. In the data visualization of the results of this study, research less than 2014 was visualized with a dark navy blue colour. While the research above in 2015 is visualized in bright yellow colour. The results of research developments show that research developments related to the themes of the English language, science education, and students with special needs are decreasing. This is evident from the small number of colours that look bright.

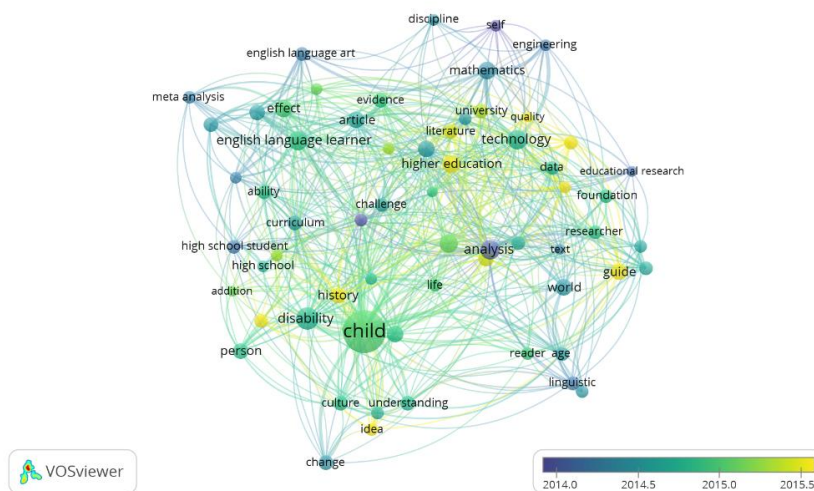


Fig. 4. Overlay visualization of the materials keyword.

4. Conclusion

This study discussed mapping analysis combined with VOSviewer software. Data were obtained from the Publish or Perish application program with VOSviewer. The data we analyse is based on three keywords, namely English language, science education, and students with special needs. The results of the analysis found 993 research articles for 11 years from 2012 to 2022. Research on this theme fluctuates every year and tends to decrease. From the results of the analysis, it appears that the English language research theme is directly related to the science and special education themes.

References

1. Rao, P.S. (2019). The role of English as a global language. *Research Journal of English*, 4(1), 65-79.
2. Belli, S. A. (2018). A study on ELT students' cultural awareness and attitudes towards incorporation of target culture into language instruction. *Journal of Language and Linguistic Studies*, 14(1), 102-124.
3. Him, C.Y. (2018). Contexts, problems and solutions in international communication: Insights for teaching English as a lingua franca. *Journal of Asia TEFL*, 15(2), 257.
4. Hartshorne, J. K.; Tenenbaum, J. B.; and Pinker, S. (2018). A critical period for second language acquisition: Evidence from 2/3 million English speakers. *Cognition*, 177, 263-277.
5. Oktaviani, A.; and Fauzan, A. (2017). Teachers perceptions about the importance of English for young learners. *Linguistic, English Education and Art (LEEA) Journal*, 1(1), 1-15.
6. Shaturaev, J. (2021). 2045: Path to nation's golden age (Indonesia policies and management of education). *Science and Education*, 2(12), 866-875.
7. Riza, L.S.; Pertiwi, A.D.; Rahman, EF.; Munir, M.; and Abdullah, C.U. (2019). Question generator system of sentence completion in TOEFL using NLP and k-nearest neighbor. *Indonesian Journal of Science and Technology*, 4(2), 294-311.
8. Haristiani, N.; and Rifa'i, M.M. (2020). Combining chatbot and social media: Enhancing personal learning environment (PLE) in language learning. *Indonesian Journal of Science and Technology*, 5(3), 487-506.
9. Haristiani, N.; and Rifai, M.M. (2021). Chatbot-based application development and implementation as an autonomous language learning medium. *Indonesian Journal of Science and Technology*, 6(3), 561-576.
10. Dallyono, R.; Sukyadi, D.; and Hakim, L. (2020). A mathematical model of the cognitive semantics of the English preposition ON. *Indonesian Journal of Science and Technology*, 5(1), 133-153.
11. Medani, D.I.; and Sakti, A.W. (2022). Introduction of Indonesian poem (pantun) as a creative effort of elementary school students in improving language skills in the Covid-19 pandemic era. *Indonesian Journal of Multidisciplinary Research*, 2(1), 229-236.
12. Maryanti, R.; Hufad, A.; Sunardi, S.; and Nandiyanto, A.B.D. (2022). Teaching on Pascal's Law: The use of experimental videos of hydraulic concepts from everyday products in the learning process for students with special needs and vocational school students. *Journal of Engineering Education Transformations*, 35(Special Issue 2), 96-101.

13. Maryanti, R.; Hufad, A.; Sunardi, S.; and Nandiyanto, A.B.D. (2022). The curriculum of heat transfer in vocational schools for students with special needs. *Journal of Engineering Education Transformations*, 35(Special Issue 2), 198-203.
14. Nandiyanto, A.B.D. (2022). Engineering and economic analysis of the production of sieve shaker for teaching particle size to students with visual impairment. *Journal of Engineering Research*, 10(1A), 281-294.
15. Maryanti, R.; Hufad, A.; Sunardi, S.; and Nandiyanto, A.B.D. (2021). Analysis of curriculum for science education for students with special needs in vocational high schools. *Journal of Technical Education and Training*, 13(3), 54-66.
16. Maryanti, R.; Hufad, A.; Nandiyanto, A.B.D.; and Tukimin, S. (2021). Teaching the corrosion of iron particles in saline water to students with special needs. *Journal of Engineering Science and Technology*, 16(1), 601-611.
17. Maryanti, R.; Hufad, A.; Nandiyanto, A.B.D.; and Tukimin, S. (2021). Teaching heat transfer on solid-to-liquid phase transition phenomena to students with intellectual disabilities. *Journal of Engineering Science and Technology*, 16(3), 2245-2259.
18. Maryanti, R.; Nandiyanto, A.B.D.; Manullang, T.I.B.; Hufad, A.; and Sunardi, S. (2020). Adsorption of dye on carbon microparticles: physicochemical properties during adsorption, adsorption isotherm and education for students with special needs. *Sains Malaysiana*, 49(12), 2949-2960.
19. Maryanti, R.; Hufad, A.; Tukimin, S.; Nandiyanto, A.B.D.; and Manullang, T.I.B.; (2020). The importance of teaching viscosity using experimental demonstration from daily products on learning process especially for students with special needs. *Journal of Engineering Science and Technology*, 15, 19-29.
20. Hidayat, D.S.; Rahmat, C.; Fattah, N.; Rochyadi, E.; Nandiyanto, A.B.D.; and Maryanti, R. (2020). Understanding Archimedes law: What the best teaching strategies for vocational high school students with hearing impairment. *Journal of Technical Education and Training*, 12(1), 229-237.
21. Maryanti, R.; Hufad, A.; Sunardi, S.; and Nandiyanto, A.B.D. (2022). Teaching high school students with/without special needs and their misconception on corrosion. *Journal of Engineering Science and Technology*, 17(1), 0225-0238.
22. Hidayat, D.S.; Rahmat, C.; Suryadi, A.; Rochyadi, E.; Nandiyanto, A.B.D. N.; and Maryanti, R. (2022). Wheat flour as a thermal insulator for learning media for students with hearing impairment. *Journal of Engineering Science and Technology*, 17(1), 0085-0094.
23. Rusyani, E.; Maryanti, R.; Muktiarni, M.; and Nandiyanto, A.B.D. (2021). Teaching on the concept of energy to students with hearing impairment: changes of electrical energy to light and heat. *Journal of Engineering Science and Technology*, 16(3), 2502-2517.
24. Suherman, Y.; Maryanti, R.; and Juhanaini, J. (2021). Teaching science courses for gifted students in inclusive school. *Journal of Engineering Science and Technology*, 16(3), 2426-2438.
25. Rusyani, E.; Maryanti, R.; Utami, Y. T.; and Pratama, T. Y. (2021). Teaching science in plant structure for student with hearing impairments. *Journal of Engineering Science and Technology*, 16(2), 1577-1587.

26. Susetyo, B.; Maryanti, R.; and Siswaningsih, W. (2021). Students with hearing impairments' comprehension level towards the exam questions of natural science lessons. *Journal of Engineering Science and Technology*, 16(2), 1825-1836.
27. Maryanti, R.; Nandiyanto, A.B.D.; Hufad, A.; Sunardi, S.; and Hidayat, D.S. (2021). Rice flour as a heat insulator for learning media for students with special needs. *Journal of Engineering Research*, 9, 1-12.
28. Al Husaeni, D.F.; and Nandiyanto, A.B.D. (2022). Bibliometric using Vosviewer with Publish or Perish (using google scholar data): From step-by-step processing for users to the practical examples in the analysis of digital learning articles in pre and post covid-19 pandemic. *ASEAN Journal of Science and Engineering*, 2(1), 19-46.
29. Nandiyanto, A.B.D.; Al Husaeni, D.N.; and Al Husaeni, D.F. (2021). A bibliometric analysis of chemical engineering research using vosviewer and its correlation with covid-19 pandemic condition. *Journal of Engineering Science and Technology*, 16(6), 4414-4422.
30. Van Eck, N.J.; and Waltman, L. (2017). Citation-based clustering of publications using CitNetExplorer and VOSviewer. *Scientometrics*, 111(2), 1053-1070.
31. Orduña-Malea, E.; and Costas, R. (2021). Link-based approach to study scientific software usage: The case of VOSviewer. *Scientometrics*, 126(9), 8153-8186.
32. Xie, L.; Chen, Z.; Wang, H.; Zheng, C.; and Jiang, J. (2020). Bibliometric and visualized analysis of scientific publications on atlantoaxial spine surgery based on Web of Science and VOSviewer. *World Neurosurgery*, 137(2020), 435-442.
33. Wang, K.; Xing, D.; Dong, S.; and Lin, J. (2019). The global state of research in nonsurgical treatment of knee osteoarthritis: a bibliometric and visualized study. *BMC Musculoskeletal Disorders*, 20(1), 1-10.
34. Xing, D.; Zhao, Y.; Dong, S.; and Lin, J. (2018). Global research trends in stem cells for osteoarthritis: a bibliometric and visualized study. *International journal of Rheumatic Diseases*, 21(7), 1372-1384.
35. Mustafa, K.A.Y.A.; and Erbay, E. (2020). Global trends of the researches on covid-19: A bibliometric analysis via VOSviewer. *Ankara Sağlık Bilimleri Dergisi*, 9(2), 201-216.
36. Garcia, I. (2020). e-Leadership: A bibliometric analysis. *International Journal of Advanced Corporate Learning*, 13(1), 19-34.
37. Syahid, A.; and Qodir, A. (2021). Journal of language and linguistic studies: A fifteen-year bibliometric quest for a bigger impact. *Journal of Language and Linguistic Studies*, 17(1), 290-314.
38. Vahendra, A.N.; and Nandiayanto, A.B.D. (2022). Bibliometric computational mapping analysis of graphene-based surfaced-enhanced raman scattering (SERS) during 2012–2022. *Advance Sustainable Science Engineering and Technology*, 4(2), 0220205.
39. Bilad, M.R. (2022). Bibliometric analysis for understanding the correlation between chemistry and special needs education using Vosviewer indexed by google. *ASEAN Journal of Community and Special Needs Education*, 1(2), 61-68.

40. Li, W.H.; Hadizadeh, M.; Yusof, A.; and Naharudin, M.N. (2022). Analysis of research trends on elbow pain in overhead sports: A bibliometric study based on web of science database and VOSviewer. *Healthcare*, 10(11), 2242.
41. Nandiyanto, A.B.D.; and Al Husaeni, D.F. (2022). Bibliometric analysis of engineering research using vosviewer indexed by google scholar. *Journal of Engineering Science and Technology*, 17(2), 883-894.
42. Dubyna, M.; Popelo, O.; Kholiavko, N.; Zhavoronok, A.; Fedyshyn, M.; and Yakushko, I. (2022). Mapping the literature on financial behavior: A bibliometric analysis using the VOSviewer program. *WSEAS Transactions on Business and Economics*, 19, 231-246.
43. Sahidin, I.; Nohong, N.; Manggau, M.A.; Arfan, A.; Wahyuni, W.; Meylani, I.; Malaka, M.H.; Rahmatika, N.S.; Yodha, A.W.M.; Masrika, N.U.E.; Kamaluddin, A.; Sundowo, A.; Fajriah, S.; Asasutjarit, R.; Fristiohady, A.; Maryanti, R.; Rahayu, N.I.; and Muktiarni, M. (2023). Phytochemical profile and biological activities of ethylacetate extract of peanut (*Arachis hypogaea* L.) stems: In-vitro and in-silico studies with bibliometric analysis. *Indonesian Journal of Science and Technology*, 8(2), 217-242.
44. Al Husaeni, D.F.; Nandiyanto, A.B.D.; and Maryanti, R. (2023). Bibliometric analysis of educational research in 2017 to 2021 using VOSviewer: Google scholar indexed research. *Indonesian Journal of Teaching in Science*, 3(1), 1-8.
45. Al Husaeni, D.F.; and Nandiyanto, A.B.D. (2022). Bibliometric using Vosviewer with publish or perish (using google scholar data): From step-by-step processing for users to the practical examples in the analysis of digital learning articles in pre and post covid-19 pandemic. *ASEAN Journal of Science and Engineering*, 2(1), 19-46.
46. Al Husaeni, D.F.; and Nandiyanto, A.B.D. (2022). Bibliometric computational mapping analysis of publications on mechanical engineering education using vosviewer. *Journal of Engineering, Science and Technology*, 17(2), 1135-1149
47. Al Husaeni, D.F.; Nandiyanto, A.B.D.; and Maryanti, R. (2023). Bibliometric analysis of educational research in 2017 to 2021 using VOSviewer: Google scholar indexed research. *Indonesian Journal of Teaching in Science*, 3(1), 1-8.
48. Al Husaeni, D.N.; and Nandiyanto, A.B.D. (2023). A bibliometric analysis of vocational school keywords using VOSviewer. *ASEAN Journal of Science and Engineering Education*, 3(1), 1-10.
49. Al Husaeni, D.N.; and Nandiyanto, A.B.D. (2023). Bibliometric analysis of high school keyword using VOSviewer indexed by Google scholar. *Indonesian Journal of Educational Research and Technology*, 3(1), 1-12.
50. Al Husaeni, D.N.; Nandiyanto, A.B.D.; and Maryanti, R. (2023). Bibliometric analysis of special needs education keyword using VOSviewer indexed by google scholar. *Indonesian Journal of Community and Special Needs Education*, 3(1), 1-10.
51. Bilad, M.R. (2022). Bibliometric analysis for understanding the correlation between chemistry and special needs education using Vosviewer indexed by Google. *ASEAN Journal of Community and Special Needs Education*, 1(2), 61-68.
52. Fauziah, A.; and Nandiyanto, A.B.D. (2022). A bibliometric analysis of nanocrystalline cellulose production research as drug delivery system using VOSviewer. *Indonesian Journal of Multidisciplinary Research*, 2(2), 333-338.
53. Hamidah, I.; Sriyono, S.; and Hudha, M. N. (2020). A bibliometric analysis of covid-19 research using VOSviewer. *Indonesian Journal of Science and Technology*, 5(2), 209-216.

54. Hirawan, D.; Oktafiani, D.; Fauzan, T.A.; Luckyardi, S.; and Jamil, N. (2022). Research trends in farming system soil chemical: A bibliometric analysis using VOSviewer. *Moroccan Journal of Chemistry*, 10(3), 576-590
55. Kurniati, P.S.; Saputra, H.; and Fauzan, T.A. (2022). A bibliometric analysis of chemistry industry research using Vosviewer application with Publish or Perish. *Moroccan Journal of Chemistry*, 10(3), 428-441
56. Luckyardi, S.; Soegoto, E.S.; Jumansyah, R.; Dewi, N.P.; and Mega, R.U. (2022). A bibliometric analysis of climate smart agriculture research using VOSviewer. *Moroccan Journal of Chemistry*, 10(3), 488-499
57. Mudzakir, A.; Rizky, K.M.; Munawaroh, H.S.H.; and Puspitasari, D. (2022). Oil palm empty fruit bunch waste pretreatment with benzotriazolium-based ionic liquids for cellulose conversion to glucose: Experiments with computational bibliometric analysis. *Indonesian Journal of Science and Technology*, 7(2), 291-310.
58. Mulyawati, I.B.; and Ramadhan, D.F. (2021). Bibliometric and visualized analysis of scientific publications on geotechnics fields. *ASEAN Journal of Science and Engineering Education*, 1(1), 37-46.
59. Nandiyanto, A.B.D.; Al Husaeni, D.F.; and Ragadhita, R. (2023). Bibliometric data analysis of research on resin-based brake-pads from 2012 to 2021 using VOSviewer mapping analysis computations. *ASEAN Journal for Science and Engineering in Materials*, 2(1), 35-44.
60. Nandiyanto, A.B.D.; and Al Husaeni, D.F. (2021). A bibliometric analysis of materials research in Indonesian Journal using VOSviewer. *Journal of Engineering Research (Kuwait)*, 9(Special issue), 1-16.
61. Nandiyanto, A.B.D.; and Al Husaeni, D.F. (2022). Bibliometric analysis of engineering research using vosviewer indexed by google scholar, *Journal of Engineering Science and Technology*, 17(2), 883-894
62. Nandiyanto, A.B.D.; Al Husaeni, D.N.; and Al Husaeni, D.F. (2021) A bibliometric analysis of chemical engineering research using vosviewer and its correlation with Covid-19 pandemic condition. *Journal of Engineering Science and Technology*, 16(6), 4414-4422
63. Nandiyanto, A.B.D.; Biddinika, M. K.; and Triawan, F. (2020). How bibliographic dataset portrays decreasing number of scientific publication from Indonesia. *Indonesian Journal of Science and Technology*, 5(1), 154-175.
64. Nandiyanto, A.B.D.; Ragadhita, R.; Fiandini, M.; Al Husaeni, D.F.; Al Husaeni, D.N.; and Fadhillah, F. (2022). Domestic waste (eggshells and banana peels particles) as sustainable and renewable resources for improving resin-based brakepad performance: Bibliometric literature review, techno-economic analysis, dual-sized reinforcing experiments, to comparison. *Communications in Science and Technology*, 7(1), 50-61.
65. Nandiyanto, A.B.D.; Ragadhita, R.; Al Husaeni, D.N.; and Nugraha, W.C. (2023). Research trend on the use of mercury in gold mining: Literature review and bibliometric analysis. *Moroccan Journal of Chemistry*, 11(1), 1-19.
66. Nordin, N.A.H.M. (2022). A bibliometric analysis of computational mapping on publishing teaching science engineering using VOSviewer application and correlation. *Indonesian Journal of Teaching in Science*, 2(2), 127-138.
67. Nordin, N.A.H.M. (2022). Correlation between process engineering and special needs from bibliometric analysis perspectives. *ASEAN Journal of Community and Special Needs Education*, 1(1), 9-16.

68. Nugraha, S. A.; and Nandiyanto, A.B.D. (2022). Bibliometric analysis of magnetite nanoparticle production research during 2017-2021 using VOSviewer. *Indonesian Journal of Multidisciplinary Research*, 2(2), 327-332.
69. Ragahita, R.; and Nandiyanto, A.B.D. (2022). Computational bibliometric analysis on publication of techno-economic education. *Indonesian Journal of Multidisciplinary Research*, 2(1), 213-220.
70. Riandi, R.; Permanasari, A.; and Novia, N. (2022). Implementation of biotechnology in education towards green chemistry teaching: A bibliometrics study and research trends. *Moroccan Journal of Chemistry*, 10(3), 417-427.
71. Saputra, H.; Albar, C.N.; and Soegoto, D.S. (2022). Bibliometric analysis of computational chemistry research and its correlation with covid-19 pandemic. *Moroccan Journal of Chemistry*, 10(1), 37-49
72. Setiyo, M.; Yuvenda, D.; and Samue, O.D. (2021). The Concise latest report on the advantages and disadvantages of pure biodiesel (B100) on engine performance: Literature review and bibliometric analysis. *Indonesian Journal of Science and Technology*, 6(3), 469-490.
73. Shidiq, A.P.A. (2023). Bibliometric analysis of nano metal-organic frameworks synthesis research in medical science using VOSviewer. *ASEAN Journal of Science and Engineering*, 3(1), 31-38.
74. Shidiq, A.S.; Permanasari, A.; and Hernani, S.H. (2021). The use of simple spectrophotometer in STEM education: A bibliometric analysis. *Moroccan Journal of Chemistry*, 9(2), 290-300
75. Soegoto, H.; Soegoto, E.S.; Luckyardi, S.; and Rafdhi, A.A. (2022). A bibliometric analysis of management bioenergy research using vosviewer application. *Indonesian Journal of Science and Technology*, 7(1), 89-104.
76. Sudarjat, H. (2023). Computing bibliometric analysis with mapping visualization using VOSviewer on “pharmacy” and “special needs” research data in 2017-2021. *ASEAN Journal of Community and Special Needs Education*, 2(1), 1-8.
77. Wiendartun, W.; Wulandari, C.; Fauzan, J.N.; Hasanah, L.; Nugroho, H.S.; Pawinanto, R.E.; and Mulyanti, B. (2022). Trends in research related to photonic crystal (PHC) from 2009 to 2019: A bibliometric and knowledge mapping analysis. *Journal of Engineering Science and Technology*, 17(1), 0343-0360.
78. Wirzal, M.D.H. ; and Putra, Z.A. (2022). What is the correlation between chemical engineering and special needs education from the perspective of bibliometric analysis using vosviewer indexed by google scholar?. *Indonesian Journal of Community and Special Needs Education*, 2(2), 103-110.
79. Utama, D.M.; Santoso, I.; Hendrawan, Y.; and Dania, W.A.P. (2023). Sustainable production-inventory model with multi-material, quality degradation, and probabilistic demand: From bibliometric analysis to a robust model. *Indonesian Journal of Science and Technology*, 8(2), 171-196.
80. Maryanti, R.; Rahayu, N.I.; Muktiarni, M.; Al Husaeni, D.F.; Hufad, A.; Sunardi, S.; and Nandiyanto, A.B.D. (2022). Sustainable development goals (SDGs) in science education: Definition, literature review, and bibliometric analysis. *Journal of Engineering Science and Technology*, 17 (Special issue on ICMSCE 2022), 161-181.
81. Gunawan, B.; Ratmono, B.M.; Abdullah, A.G.; Sadida, N.; and Kaprisma, H. (2022). Research mapping in the use of technology for fake news detection: Bibliometric analysis from 2011 to 2021. *Indonesian Journal of Science and Technology*, 7(3), 471-496.