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RESEARCH TRENDS IN SCIENCE PROCESS SKILLS IN EDUCATION: BIBLIOMETRIC ANALYSIS OF SCOPUS PUBLICATIONS 2019-2024

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Abstract :
Research related to Science process skills has been carried out for a long time. To find out trends related to the development of science process skills research, research was carried out related to this topic. This research is a literature review research with bibliometric analysis carried out on science process skills articles published in Scopus indexed journals from 2019- 2024. The literature review was obtained through the help of Publish or Perish with a total of 297 articles obtained and selection was carried out using the PRISMA method so that 134 articles were analyzed. The analysis was carried out with the help of Excel and VOSViewer. The results of the analysis show how publisher, author, country, affiliation and keywords are most related to the topic of science process skills. Research shows that there is a positive trend in the number of publications related to the topic of science process skills and the results show that countries in Asia and Africa have done the most research on this topic. Indonesia is the country that publishes the most on this topic and its articles are the most cited with 502 citations. The results also show that science process skills are currently very closely related to the inquiry model, STEAM, critical thinking and creative thinking.

Keywords: Bibliometric, Science Process Skill, Trend.

INTRODUCTION

Science process skills are used to observe, draw conclusions, make predictions, test hypotheses, and develop an understanding of the world around us. These skills are very important in various contexts, especially in today's world driven by technology and science (Suryanti et al., 2020; Wola et al., 2023). Overall, science process skills are the foundation for progress in various fields, from science and technology to public policy and everyday life (Tahya et al., 2022; Zorluoğlu et al., 2022). Promoting these skills is important for creating a society that is scientifically skilled and able to face the complex challenges of the modern world (Tanti et al., 2020; Ngozi, 2021). They involve the ability to observe, plan experiments, collect and analyze data, and draw conclusions based on the evidence found (Darmaji et al., 2019; Solé-Llussà et al., 2021). Thus, it can be concluded that science process skills are not only important for scientific progress, but also for holistic and sustainable development throughout the world.

Science process skills have a broad and significant impact on various aspects of human life. In the context of innovation and technology, these skills become the foundation for new discoveries that change the way we live, work and interact (Yustina et al., 202; Kol & Yaman, 2022). Through these

skills, individuals are able to solve problems with a systematic and structured approach (Kadmayana et al., 2021; Li et al., 2024). They learn to identify problems, collect relevant data, analyze information, and develop effective solutions (Halim et al., 2021; Tekin & Muştu, 2021). In addition, science process skills encourage innovation in various fields, such as technology, health and the environment. They trigger new discoveries, product development, and process improvements that can increase the efficiency and quality of products and services (Rahayu & Sari, 2023; Özkul & Özden, 2020). Thus, the existence of scientific process skills has a broad and positive impact on various aspects of human life and overall world development, where to support all stages of scientific process skills research requires strong tools such as bibliometrics.

The previous research is related to the research that I will do. The previous research has a study in the form of the relationship between science process skills in Education with bibliometric analysis. And some previous studies are relevant to the research of Pessin et al., (2022) science mapping and bibliometric processes, through Smart Bibliometrics, have the potential to automate manual and routine processes, connect people and ideas, provide more agile analysis in selecting relevant scientific production in an innovative, simple, and accessible way. Furthermore, research conducted by Wang et al. (2022) Bibliometric mapping functions as a method for systematic ventilation and visually shows the development of research fields. The results of this study are that through the bibliometric method it can improve understanding of scientific education. Further research conducted by Hidayatullaah et al., (2021) analyzed the results of bibliometric mapping visualization of ethnoscience-based learning research trends and their contributions to physics learning. The results obtained by Etnoscience can be integrated with learning innovations in schools and can also train/improve students' thinking skills.

Bibliometrics can be a useful tool for measuring and analyzing the impact and network of research in a scientific field. As for research that uses bibliometric analysis, Triansyah et al. (2023) identified publications on the competencies of madrasah education teachers and described the characteristics of the research conducted. The research results show that publications on teacher competency in madrasas/schools increased every year from 2017 to 2020. This is also different from research conducted by Tiberius & Weyland (2023) identifying the most productive and influential journals and authors using bibliometric analysis. Where the results obtained show a large growth in publications and citations over the last decade and almost equal involvement of business and educational research. Several studies conducted using bibliometrics show that bibliometric analysis can be a useful tool for measuring and analyzing the impact and research networks in a field of science.

The questions of this researchis to see how research trends are related to science process skills from 2019 to 2024. In addition, researchers also see how the benefits of each article published from 2019 to 2024 are seen in terms of citations, collaborations, and what topics are related to science process skills.

RESEARCH METHOD

This research is a bibliometric research on trends in science process skills in education. Bibliometrics is widely used by researchers for several reasons, such as being used to find out trends in articles, research constituents and what forms of collaboration take place in the field of research. Using bibliometrics will help in knowing the development and dynamics of research on a global scale (Donthu et al., 2023; Zahra et al., 2021). Data collection in bibliometric research has many trusted sources in the academic field such as Scopus, Web of Science, and Google Scholar, all three of which are the main databases in the publication of scientific literature (Pham et al., 2024). In this study, the dataset used comes from a dataset owned by Scopus, this is because Scopus has more journals than Web of Science and allows for more citations.

2.1 Research Design

This study employs a qualitative approach, which is well-suited for exploring the meanings researchers attribute to bibliometric phenomena. Through inductive analysis, it seeks to uncover complex patterns and emerging trends in the scientific literature (Creswell & Creswell, 2018). The qualitative in this research design to know about what trend in research about science process skills from 2019 untuk 2024. All qualitative data that used in this study is collect from scopus database.

2.2 Research Target/Subject

The data from this research was obtained from the Scopus dataset, where the first stage was to enter the keyword "Science Process Skills in Education" and by determining that the articles were publications from 2019 - 2024, we obtained 297 publications in the form of articles, books and conference paper. The data screening in this research using prisma diagram to collect the data.

2.3 Research Procedure

Research procedure in this research is starting from collecting data from scopus database using keyword science process skills. After data collected then researcher filtering data using PRISMA diagram (Page et al., 2021). After that the final data colleted through PRISMA diagram is analysis using bibliometric analysis and VosViewer. After finish the analysis then researcher make a disscusion from the analysis result.

2.4 Instruments, and Data Collection Techniques

The next step was to screen the type of publication, where the form of publication used in this research had to be an article and be in English, so the screening was carried out so that a total of 134 publications in the form of articles were included in the screening. Next, an assessment is carried out on articles that have passed the second screening stage, where at this stage a feasibility test is carried out by seeing whether the articles published really discuss science process skills in education. The results of the feasibility test carried out showed that all articles that passed the second stage were feasible and truly discussed science process skills. So in the fourth stage, it was stated that the articles used in the research to find out research trends related to science process skills were 134 articles from the Scopus data set.

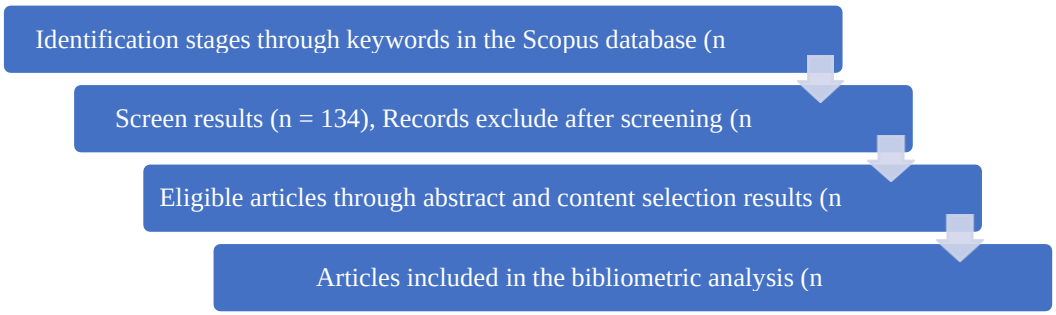

Figure 1. PRISMA diagram of the process of selecting a list of scientific studies for bibliometric analysis

2.5 Data analysis technique

In this study, researchers used bibliometric analysis to carry out data analysis (Page et al., 2021). In this study, researchers focused on publication trends related to science process skills. What is seen is the trend of research publications related to the topic of science process skills from 2019- 2024. Apart from that, an analysis will also be carried out regarding which country publishes the most on the topic of scientific process skills and the country of publisher of the articles that have been published. Apart from that, it is also important to see how keywords are often used in research related to Science Process Skills and what topics of science process skills are frequently cited by researchers. Analysis of these results will be carried out through descriptive statistical analysis together with the help of the VOSviewer application which will be very helpful in finding out the relationship between the subjects studied (van Eck & Waltman, 2010).

RESULTS AND DISCUSSION

The results of the analysis are then interpreted. The results of the first analysis are shown in Figure 2. Figure 2 shows the results related to the development of research related to science process skills in education.

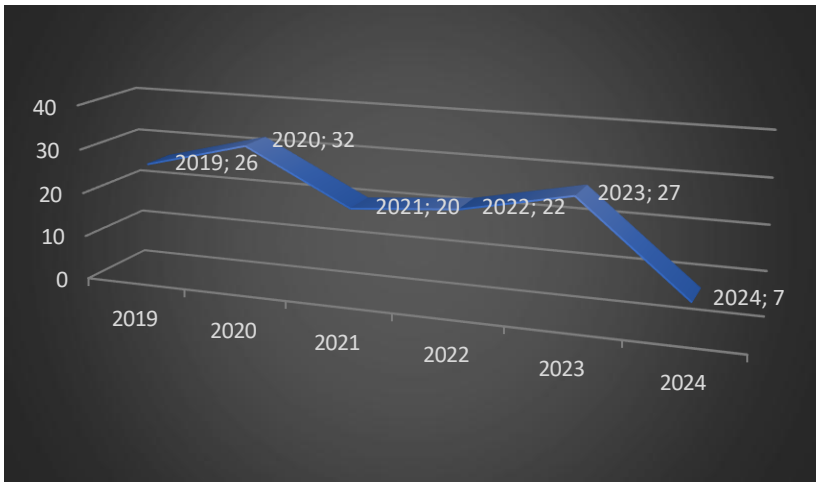

Figure 2. Development of Publications related to Science Process Skills in education

Figure 2 shows the publication trend of Scopus indexed articles about science process skills from 2019 to 2024. The number of article publications has increased from year to year, starting with 26 articles in 2019, increasing to 32 articles in 2020. This increasing trend continues with 20 articles in 2021 and 22 articles in 2022. Projections for the following years also show positive growth. The results show that there are 27 Scopus indexed articles about science process skills in 2023, and in the first 6 months of 2024 7 articles related to science process skills have been published. Although publications in 2024 appear lower than previous years, the overall trend of article publications on this topic shows interest and development continues to increase from year to year. Furthermore, table 1 shows the order of countries that are the most publishers regarding science process skills from 2019-2024.

Table 1. The order of countries with the most publishers regarding Science Process Skills from 2019-2024

No	Publisher Country	Total	No	Publisher Country	Total
1	Turkey	33	12	Canada	3
2	United States of America	23	13	Pakistan	2
3	Indonesia	22	14	Iran	2
4	United Kingdom	9	15	Mauritius	2
5	India	6	16	Switzerland	2
6	Lithuania	6	17	Colombia	1
7	Netherlands	5	18	Australia	1
8	Cyprus	4	19	Serbia	1
9	Ireland	4	20	South Africa	1

10	Spain	3	21	Croatian	1
11	Malaysia	3			

Table 1 shows publishers who publish research results related to science process skills in education. The results of the analysis show that there are 21 countries that are publishers of articles related to science processes. The results show that publishers from Turkey occupy the top position with 33 publications, followed by the United States with 23 publications, and Indonesia with 22 publications. These three countries clearly dominate in contributing to research publications in this field.

Furthermore, there are other countries such as England with 9 publishers and India and Lithuania which each have 6 publishers that publish related to science process skills. Other European countries such as the Netherlands, Cyprus and Ireland also contributed significantly, with 5 and 4 punlishers respectively. Spain and Malaysia recorded 3 publishers, while Canada also entered this category with the same number. On the other hand, some countries such as Pakistan, Iran, and Mauritius, which each have only 2 publishers, show lower involvement but are still important in the global context. Countries with 1 publisher, such as Colombia, Australia, Serbia, South Africa and Croatia, show that even though their contribution is small, research related to science process skills is still ongoing in various parts of the world. This shows that research and studies on science process skills have a broad international scope, although there are variations in the number of publishers who publish related to science process skills between countries. Next, Figure 3 shows a map of the distribution of publishers who publish related to science process skills.

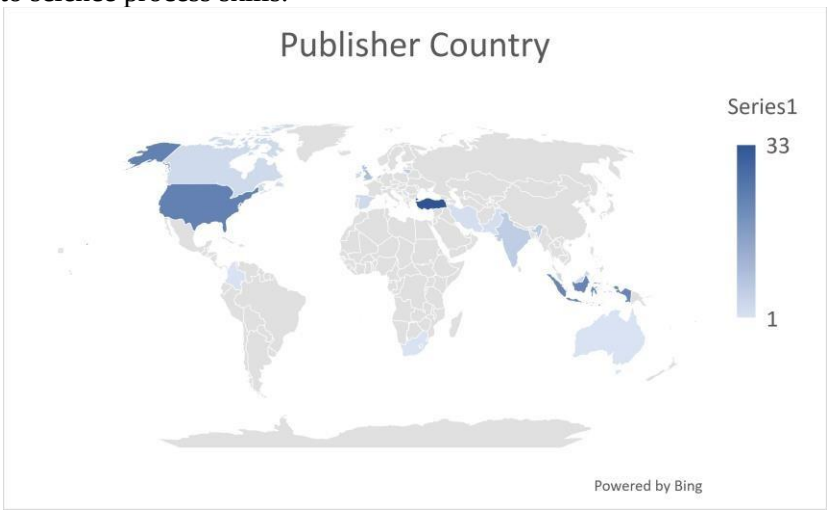

Figure 3. Map distribution of countries with the most publishers regarding Science Process Skills from 2019-2024

Figure 3 depicts the geographical distribution of countries that are the largest publishers regarding Science Process Skills from 2019 to 2024. The colors on the map indicate the number of publications, with darker shades of blue indicating a higher number of publications. The country with the darkest blue color, namely Turkey, has the highest number of publications with 33 publishers publishing topics related to science process skills. The United States, which is also shown in quite dark blue, has 23 publications, while Indonesia with 22 publications is also shown in significant blue. Other countries such as the UK, India and Lithuania, although with fewer publications, are still visible on the map in a lighter shade of blue.

This distribution shows that research related to Science Process Skills widely accepted for publication is not only concentrated in one region, but is spread across various parts of the world. North America, Europe, and Asia have significant involvement in this area, while contributions from countries on other continents, although smaller, remain. Table 2 show about the order of countries with the highest publications related to the topic Science Process Skills from 2019-2024

Table 2. Order of countries with the highest publications related to the topic Science Process Skills from 2019-2024

No	Author Country	Research Publication	Citation	No	Author Country	Research Publication	Citation
1	Indonesia	65	502	12	South Africa	2	3
2	Turkey	31	117	13	Canada	1	2
3	Malaysia	4	35	14	Ghana	1	0
4	Philippines	4	12	15	Greece	1	7
5	Spain	4	17	16	Mexico	1	0
6	Thailand	4	29	17	Pakistan	1	0
7	Rwanda	3	6	18	Taiwan	1	0
8	Ethiopia	2	1	19	Tanzania	1	6
9	Iran	2	0	20	United Kingdom	1	12
10	Nigeria	2	3	21	United States of America	1	6
11	Saudi Arabia	2	50				

Table 2 shows the order of countries with the highest number of publications related to the topic Science Process Skills from 2019 to 2024, along with the number of citations received by these publications. There are 21 countries researching science process skills. Indonesia is in first place with the highest number of publications, namely 65 publications, and received 502 citations. This shows that Indonesia is very interested in research related to the topic of science process skills and has become a reference for researchers in other countries with evidence cited 502 times. Turkey is in second place with 31 publications and 117 citations, followed by Malaysia with 4 publications and 35 citations. The Philippines and Spain, each with 4 publications, recorded 12 and 17 citations.

Other countries such as Thailand, Rwanda, Ethiopia, Iran, and Nigeria have fewer publications but still contribute significantly. Thailand has 4 publications with 29 citations, while Rwanda and Ethiopia have 3 and 2 publications with 6 and 2 citations, respectively. Iran, with 2 publications, received no citations, while Nigeria with the same number of publications received 2 citations. Apart from that, countries such as Ghana, Mexico, Pakistan, Taiwan, Tanzania, England and the United States have 2 or 1 publications with varying numbers ofcitations. Even though the number of research published by countries other than Indonesia and Turkey is smaller, their contribution is still important in enriching global research in the field of Science Process Skills. The UK and USA, for example, have 1 publication with 12 and 6 citations respectively, showing the significant impact of their research. Next, table 3 explains the 20 authors with the highest citations related to the topic Science Process Skills from 2019-2024.

Tabel 3. 20 author with the most citation about science process skills in 2019 untuil 2024

Rank	Authors	Workplace	Negara	Scopus H index	Citation
1	Darmaji	Jambi University	Indonesia	11	78
2	F. Harahap	Medan State University	Indonesia	6	51
3	A.I.M. Elfeky	Najran University	Saudi Arabia	9	50

4	Gunawan	Mataram University	Indonesia	13	36
5	Maison	Jambi University	Indonesia	8	31
6	H.J. Duda	STKIP Persada Kathulistiwa Sintang	Indonesia	1	26
7	E. Hiğde	Aydın Adnan Menderes University	Turkey	4	23
8	J. Juhji	Universitas Islam Negeri Sultan Maulana Hasanuddin Banten	Indonesia	4	23
9	A. Khamhaengpol	Sakon Nakhon Rajabhat University	Thailand	6	21
10	A. Winarti	Universitas Lambung Mangkurat	Indonesia	3	21
11	I.L.L. Ping	Universiti Kebangsaan Malaysia	Malaysia	2	18
12	Zainuddin	Universitas Lambung Mangkurat	Indonesia	2	18
13	A. Solé-Llussà	Universitat de Lleida	Spain	6	17
14	H. Artun	Yüzüncü Yil Üniversitesi	Turkey	6	17
15	Irwanto	Universitas Negeri Jakarta	Indonesia	13	17
16	J. Alfin	UIN Sunan Ampel Surabaya	Indonesia	5	17
17	M. Ekici	Usak University	Turkey	5	17
18	T. Mulyeni	Universitas Negeri Jakarta	Indonesia	1	17

Table 3 displays a list of the 20 authors with the highest number of citations related to the topic Science Process Skills from 2019 to 2024. This table includes the names of the authors, the institutions where they work, country of origin, Scopus H index, and the number of citations received.

The author with the highest number of citations is Darmaji from Jambi University, Indonesia, with 78 citations and a Scopus H index of 11. In second place, F. Harahap from Medan State University, Indonesia, has 51 citations with a Scopus H index of 6. A.I.M. Elfeky from Najran University, Saudi Arabia, is in third place with 50 citations and a Scopus H index of 9. Other authors such as Gunawan from Mataram University, Indonesia, and Maison from Jambi University, Indonesia, respectively have 36 and 31 citations with a Scopus H index of 13 and 8. H.J. Duda from STKIP Persada Khatulistiwa Sintang, Indonesia, recorded 26 citations with a Scopus H index of 1. E. Hiğde from Aydın Adnan Menderes University, Turkey, and J. Juhi from Sultan Maulana Hasanuddin State Islamic University Banten, Indonesia, each had 23 citations with a Scopus H index of 4.

Other authors on the list include academics from countries as diverse as Thailand, Malaysia, Spain and Turkey, indicating that research related to Science Process Skills has a global reach. For example, A. Khamhaengpol from Sakon Nakhon Rajabhat University, Thailand, has 21 citations with a Scopus H index of 6, while A. Solé-Llussà from Universitat de Lleida, Spain, has 17 citations with a Scopus H index of 6. After that, all the authors have many The citations from rank 14 to 20 were filled by authors from Indonesia and Turkey. So, of the 20 authors with the most cited articles related to science process skills, 13 authors from Indonesia occupied the top 20 authors with the most citations. Next, table 4 displays the 20 articles with the highest citations related to the topic science process skills from 2019-2024.

Tabel 4. 20 articles with the highest citations related to the topic Science Process Skills from 2019-2024

Rank	Authors	Title	Citation
1	F. Harahap	The effect of blended learning on student's learning achievement and science process skills in plant tissue culture course	51
2	A.I.M. Elfeky	Advance organizers in flipped classroom via e-learning management system and the promotion of integrated science process skills	46
3	D. Darmaji	Physics education students' science process skills	44
4	Gunawan	Guided inquiry model through virtual laboratory to enhance students' science process skills on heat concept	36
5	Maison	Science process skills and motivation	28
6	H.J. Duda	Enhancing different ethnicity science process skills: Problem-based learning through practicum and authentic assessment	26
7	J. Juhji	Interaction between scientific attitudes and science process skills toward technological pedagogical content knowledge	23
8	E. Hiğde	The effects of STEM activities on students' STEM career interests, motivation, science process skills, science achievement and views	23
9	A. Winarti	The effectiveness of multiple intelligences based teaching strategy in enhancing the multiple intelligences and Science Process Skills of junior high school students	21
10	Zainuddin	The correlation of scientific knowledge-science process skills and scientific creativity in creative responsibility based learning	18
11	I.L.L. Ping	Explicit teaching of scientific argumentation as an approach in developing argumentation skills, science process skills and biology understanding	18
12	T. Mulyeni	Improving Basic Science Process Skills Through Inquiry-Based Approach in Learning Science for Early Elementary Students	17
13	Darmaji	E-Module based problem solving in basic physics practicum for science process skills	17
14	Irwanto	Analyzing the relationships between pre-service chemistry teachers' science process skills and critical thinking skills	17
15	J. Alfin	Development of group science learning (GSL) model to improve the skills of collaborative problem solving, science process, and self-confidence of primary schools teacher candidates	17
16	H. Artun	Effects of virtual reality enriched science laboratory activities on pre-service science teachers' science process skills	17

17	M. Ekici	Developing Science Process Skills through Mobile Scientific Inquiry	17
18	A. Khamhaengpol	Development of STEAM activity on nanotechnology to determine basic science process skills and engineering design process for high school students	17
19	A. Saputro	The impact of problem solving instruction on academic achievement and science process skills among prospective elementary teachers	16
20	Tanti	Science process skills and critical thinking in science: Urban and rural disparity	16

Table 4 displays the 20 articles with the highest citations related to the topic Science Process Skills from 2019 to 2024. The table contains information about the author, article title and number of citations received. The article with the highest number of citations is F. Harahap's work entitled "The effect of blended learning on student's learning achievement and science process skills in plant tissue culture course" which received 51 citations. The second article is by A.I.M. Elfeky with the title "Advance organizers in flipped classroom via e- learning management system and the promotion of integrated science process skills" with 46 citations. D. Darmaji took third place with his article "Physics education students' science process skills" which received 44 citations.

Other articles cover a variety of topics in teaching and applying Science Process Skills. For example, Gunawan wrote about "Guided inquiry model through virtual laboratory to enhance students' science process skills on heat concept" with 36 citations, and Maison wrote "Science process skills and motivation" which received 28 citations. H.J. Duda discussed "Enhancing different ethnicities science process skills: Problem-based learning through practice and authentic assessment" with 26 citations. Other highly cited articles include research on the influence of scientific attitudes, STEM activities, and technology-based approaches in teaching Science Process Skills. For example, J. Juhi with his article "Interaction between scientific attitudes and science process skills toward technological pedagogical content knowledge" and E. Hiğde with The effects of STEM activities on STEM students' career interests, motivation, science process skills, science achievement and views, both received 23 citations. Next, Figure 4 displays the map of keywords by co-occurrence analysis from 2019-2024 with the help of Vos Viewer.

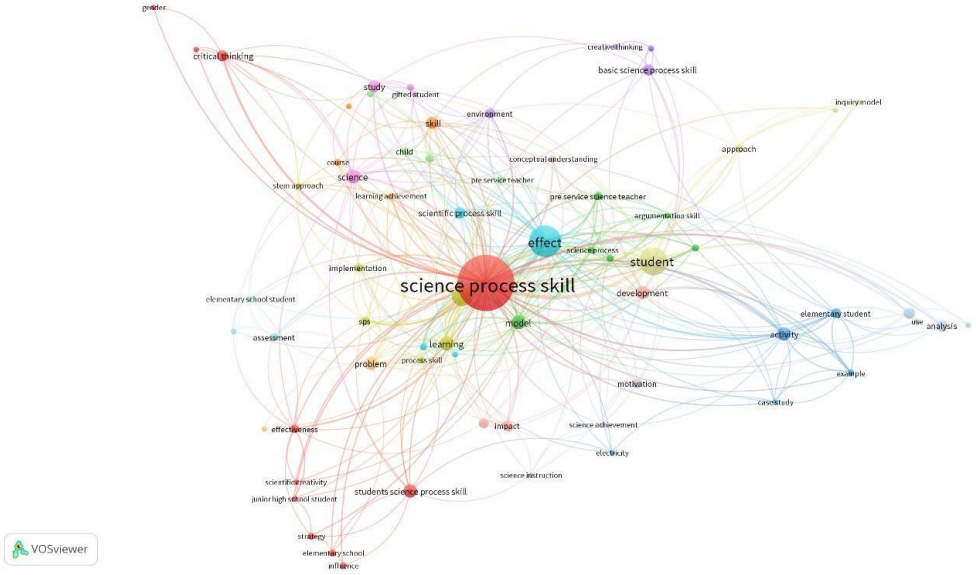

Figure 4 shows the results of the analysis using VOSViewer which shows that from the science process skills topic, 9 clusters were obtained from the analysis results. Science process skills are the main keywords of this bibliometric research. Other circles connected through other networks around it represent more specific science process skills, such as basic science process skills, conceptual

understanding, inquiry models and many more. Next, Figure 5 shows an image related to an overlay visualization of the science process skills topic.

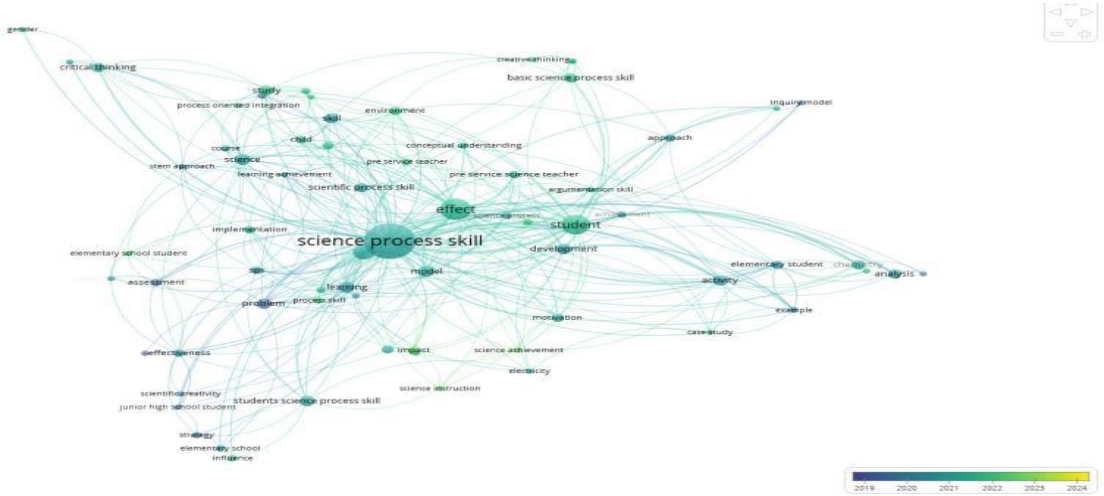

Figure 5. Overlay Visualization

Figure 5 is a result that explains the visualization overlay. Based on Figure 5, it can be seen that the most articles published occurred in 2019-2020. Where in that year there was a lot of research related to science process skills, steam approach, critical thinking, and activity. After that, research in the following years discussed a lot about science achievement, science instruction, and case studies. Meanwhile, before the year where the most publications were related to science process skills, many discussed assessment, science, elementary school students, and basic physics. Next, Figure 6 discusses the topics most related to students.

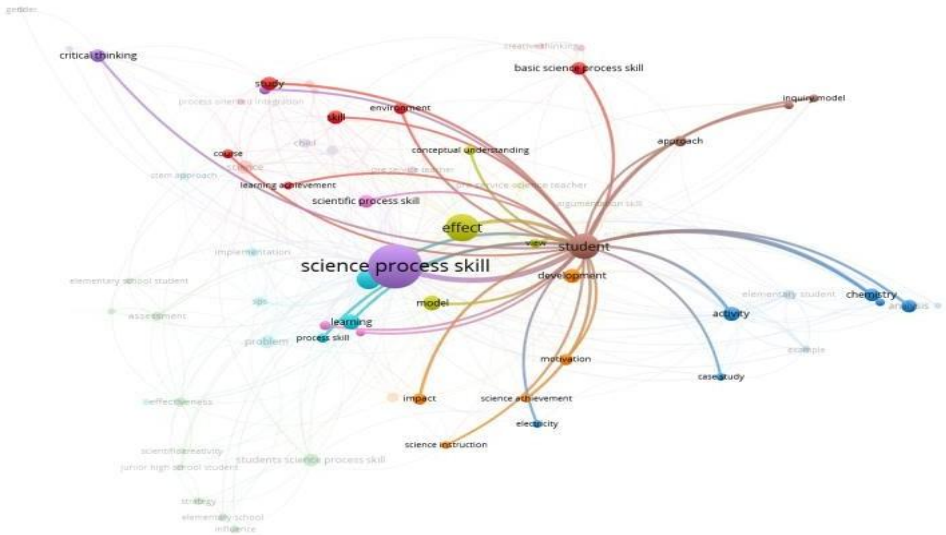

Figure 6. Topics Related to Students

The results from Figure 6 are results that show that the science process skills topic was chosen by students. The results from students show that there is a strong relationship between students and topics related to inquiry models and approaches. Apart from that, in the blue group there is a relationship between activity, chemistry, electricity, case study, process skills, and learning. Meanwhile, the purple color is related to critical thinking and the red node is related to basic science process skills, environment, study, course, learning achievement. The yellow spots are related to conceptual understanding, models, while the people nodes are related to science achievement, impact, development, and motivation. Next, Figure 7 shows topics related to process skills.

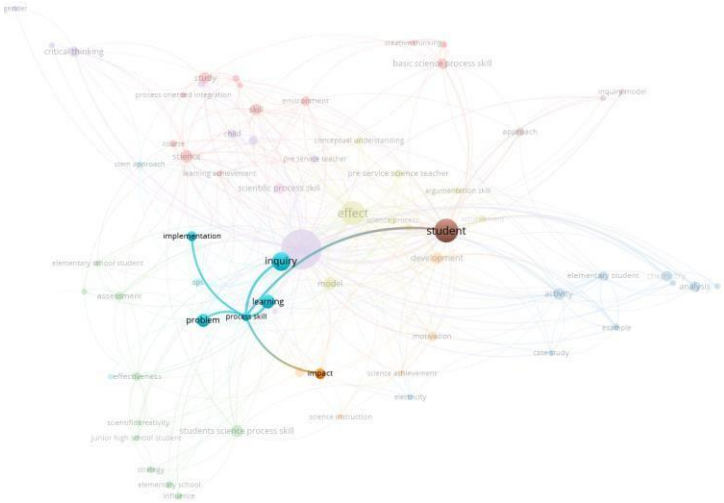

Figure 7. Topics related to process skills

Figure 7 shows that if the keyword process skills is chosen, it will show a strong relationship with several topics, including topics related to inquiry, learning, problems, and implementation. Meanwhile, other topics related to the colors brown and orange are students and impact, respectively. Next, Figure 8 shows topics related to junior high school.

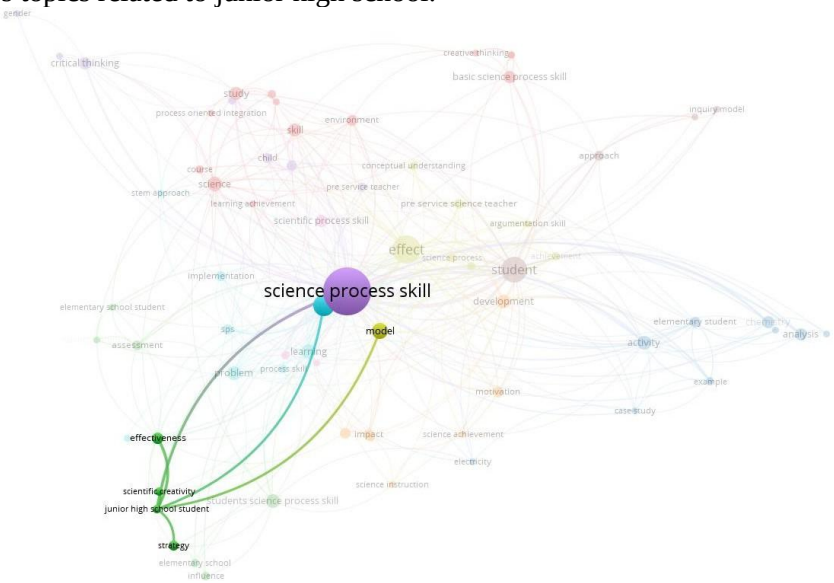

Figure 8. Topics related to Junior High School

Figure 8 shows the results if the junior high school topic is selected. The results show that this topic is closely related to scientific creativity, strategy and effectiveness. Apart from that, of course it is also related to science process skills in purple and also models in yellow.

Science Process skills have been researched for a long time. Many studies related to science process skills in the 2000s discussed the types of science process skills. This is in accordance with research by Chiapetta & Koballa (2006) which discusses science process skills which are divided into basic skills and integrated science process skills. Along with the development of science process skills research, it can be seen that since 2019 research related to this topic has experienced a positive trend. The results of the trend show that research related to science process skills has reached the stage of the relationship between science process skills and the ability to think critically, creative thinking and also conceptual understanding. This is in accordance with the demands of today's era where students are asked to be able to think in higher order thinking skills (Muhibbuddin et al., 2023). So this research trend shows suitability to current educational needs.

This research also succeeded in analyzing the distribution of research conducted on science process skills. The results show that out of 20 countries, 4 of the 6 countries with the most publications related to this topic are countries in the Southeast Asia area. Developing countries rank very high in

publications related to this topic, especially countries on the Asian and African continents. Meanwhile, for developed countries such as the United Kingdom and United States of America, only a little research has been carried out related to science process skills. This is because according to Mushani's (2021) research results, the unequal distribution of science process skills in the science curriculum and implementation in developing countries has resulted in a high level of research related to science process skills so that developing countries can find out how to implement science process skills appropriately, which is different from developed countries which have get the right formula

This research also analyzes the authors and their affiliations and sorts them based on the number of citations. A total of 10 universities in Indonesia are included in the 20 most cited articles based on affiliation. The results also show that the most cited articles are articles written by Darmaji with 78 citations and the affiliation is Jambi University. Next, analysis was carried out on the most cited articles, where the article written by Harahap et al., (2019) was the most cited with a total of 58 citations. The article written by Harahap et al., (2019) is entitled "The Effect of Blended Learning on Student's Learning Achievement and Science Process Skills in Plant Tissue Culture Course" which discusses the impact of blended learning on science process skills and learning outcomes.

The final analysis is an analysis using the help of the VOSViewer application. The results of the analysis using VOSViewer show relationships related to the topic of science process skills seen from keywords. In general, the results of the analysis show that science process skills are related to science achievement, argumentation skills, learning achievement, and assessment. The results of the analysis also show that science process skills are currently very closely related to the application of the inquiry model, critical thinking, creativity skills, conceptual understanding, and also the Steam approach. These results are also supported by research by Sari et al., (2020) which shows that Stem greatly influences students' science process skills as well as research conducted by Biswal & Behera, (2022) that the inquiry model can improve students' science process skills.

Previous research conducted by Herman et al. (2024) where research related to bibliometric analysis of science process skills using vosviewer, their research focused on the relationship of each article used for analysis where the articles were articles taken from 2018 to 2023 based on the schoolar database. In addition, research conducted by Sudriman et al. (2023) showed that the results showed that the assessment of science process skills performance can be assessed through peer assessment and self-assessment. In addition, research by Elliyani et al. (2024) related to bibliometric analysis of science process skills research in 2020 to 2023, where he mapped several keywords related to science process skills.

The novelty of this research is that this research focuses on how the trend of research related to science process skills and how each keyword of science process skills is related. Other novelties can also be seen from the differences in the databases used where this study uses the Scopus database and analyzes using the help of R studio and VosViewer. This study has implications for the direction of further research in the field of physics education, especially related to science process skills. The results of this study support to show that in which countries research related to science process skills has been conducted and collaborated with what variables. The limitation of this study is that the researcher only conducted an analysis until 2024, not until 2025. In addition, the researcher also still experiences limitations in conducting further tests of the bibliometric analysis carried out. The researcher recommends that further research can conduct a systematic review analysis related to what forms of assessment can be used in science process skills and what topics have been widely mastered by students.

CONCLUSION

The results of bibliometric analysis on the trending topic of science process skills are based on several things, including publisher country, author, affiliation, keywords, number of citations, most cited articles, and countries that publish the most on science process skills topics. The number of research related to science process skills has decreased slightly compared to 2020, but remains on a positive trend and covers a wider range of relationships. The university in Indonesia that publishes the most articles related to science process skills with the author of the most publications related to science process skills from 2019-2024 is Darmaji from Jambi University. The publisher that publishes the most articles related to Science Process Skills is Türkiye, followed by the United States of America and Indonesia. The results show that this research topic is being widely researched in developing countries, especially countries on the continents of Asia and Africa. The mapping results show that science process skills will be closely

related to STEAM, inquiry models and also HOTS abilities in the form of critical thinking and creative thinking. It is hoped that the results of this research can become a reference for seeing research trends related to science process skills and can group and describe future research.

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