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Science Learning Model in Indonesian Elementary Schools during Pandemic

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This study aims to determine trends and recommendations for research on science learning models in elementary schools using a descriptive quantitative literature study method with a bibliometric approach. The data collection technique used is content analysis documentation. The data analysis technique in this study used Google Scholar database, Microsoft Excel and VOSviewer. The objective is to find out the trend of learning models as search topics during the 2020-2021 pandemic, namely Problem-Based Learning, Discovery Learning, Project-Based Learning, Contextual Teaching Learning and RADEC learning focusing on learning outcomes objectives, HOTS (critical and creative thinking), the effectiveness of learning media, learning motivation and understanding of science concepts. Recommendations for learning model topics for further research are Contextual Problem-Based Learning, Creative Responsibility Based Learning (CRBL), Guessing Word, Scramble, Murder, Somatic, Auditory, Visual and Intellectual (SAVI), Talking Stick, Discovery-Inquiry learning and Gallery Walk, Children Learning in Science (CLIS) with a focus on Religion, Culture and Social Attitudes. Meanwhile, based on VOSviewer, the recommendations for the learning model topic for the subsequent research are STEM education linked to religion.

Keywords

Bibliometric Analysis

Learning Models

Science

Elementary School

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Introduction

Coronavirus is the leading cause of Indonesian education changing learning strategies; previously, face-to-face, now distance learning is implemented. Elementary school is one of the education levels exposed to the Coronavirus's impact. The entire school community to change learning strategies to achieve a learning goal and vice versa. It becomes the basis for determining strategies [1]. Based on that, all teachers prepare lessons with various learning models to support the delivery of the learning material. During this pandemic, there are obstacles regarding learning. For an instant, they feel bored, so teachers have to think about strategies, techniques, methods, materials, media, and learning assessment tools [2]. Based on this, a teacher must be able to adjust and choose a suitable learning model to be applied to all learning content, one of which is science subjects in elementary schools because, in this subject, there are many experiments and certainly requires guidance from a teacher. Science learning is expected to be a separate vehicle for students when learning about the natural environment so that students get direct experience to develop competencies to explore and understand the natural surroundings. In the end, they find themselves with the concept of the subject matter they are studying [3].

These problems gave rise to research ideas to solve these problems and create the expected learning so that research on science learning models in elementary schools proliferates. The researcher is interested in discovering the development trend regarding the science learning model in Indonesian elementary schools and providing recommendations for future research topics. The learning model has a broader meaning than approaches, strategies, methods and techniques. Joyce & Weil said that the learning model is a pattern or plan which later the data to shape the curriculum, organize learning materials and provide instructions for educators [4]. According to Arends, a learning model is a comprehensive approach to planning learning [5]. The learning model is very effective in improving the quality of teaching and learning activities because, in learning activities, students are required to play an active role in learning and are expected to use higher-order thinking skills, hone cohesiveness and work together in a team or group [6].

Based on this, the learning model applied to science learning must be structured as attractive as possible because learning science is mastering a collection of knowledge and a process of discovery that will stimulate students to be active and involved in it. There are several things that educators can use in bridging science learning so that it is not monotonous, including using teaching materials, methods, media and learning models.

Natural Science is the science that deals with natural phenomena as outlined in the form of facts, concepts, principles and laws that are proven true through a series of activities in the scientific method [7]. Natural Science has a rational and objective nature about the

universe obtained from research and experimentation. Science can reveal the magnitude of the mysteries of the universe scientifically [8]. The goal of science is to develop the knowledge, skills, attitudes and values of science students for lifelong learning, develop an appreciation for the role of science in leading safety with a healthy lifestyle, develop an awareness of science values in solving problems that exist every day, have a practical function in ever-increasing technology and the global environment and appreciate the need to contribute to sustainable development [9]. So that a series of creative and fun learning activities are needed to achieve a science learning goal, this research is helpful for teachers in finding recommendations for appropriate learning models and has been successfully tested in science subjects at the elementary school level. In addition, this study also recommends research topics for future researchers.

Method

This type of research is a descriptive quantitative literature study method which aims to analyze research trends in science learning models in Indonesian elementary schools in 2020-2021 using a bibliometric approach. The bibliometric process is a science or study of recorded and scientific information using statistical and mathematical methods [10]. The literature study in this research is content analysis on 107 research articles that have been filtered to obtain more accurate data. This research will be explained descriptively with calculations using Microsoft Exel and Vosviewer tools.

This research began in September 2020 and until June 2022 and was applied by taking the population in the form of research articles on the science learning model in elementary schools on Google Scholar in the 2020-2021 timeframe. Five research stages: determining search keywords, initial search results, narrowing search results, compiling initial data statistics, and data analysis [11].

Based on these five stages, in the first stage, the researcher determined the search keywords, namely "science learning model in Indonesian elementary schools" for national journals and the keyword "science learning model in Indonesian elementary school" for international journal searches.



Fig. 1. Results for Science Learning Models in Indonesian Elementary Schools 2020-2021



Fig. 2. Results for research keywords Science Learning Model in Indonesian Elementary School 2020-2021

The required research article documents will be found using the Google Scholar database in the second stage. Based on Figure 1, 32,900 national journals have not been filtered by the SINTA index, while Figure 2 has found 29,000 international journals that have yet to be filtered by the Scopus or DOAJ indexes.

In the third stage, through narrowing the search results, the research articles will be filtered again through selection based on the index of international journals and SINTA journals so that a total of 107 research article documents are obtained. In the fourth stage, compiling initial statistical data, research articles that have gone through index screening are checked for metadata using Mendeley for more accurate data. At this stage, the content analysis stage collects data based on title, author, research focus, journal institution, and what researchers need. The fifth stage is data analysis, where the raw data will be processed using Microsoft Excel and Vosviewer software to form tables, graphs and visualizations.

VOSViewer is software used to build and describe bibliometric networks. Networks are referred to as individual journals, researchers or publications and grouped by citations, bibliographical amalgamations, co-citations or co-authorship links [12]. VOSViewer can also provide a clear picture of the relationship between networks in each data by providing three types of visualization: network visualization, overlay visualization and density visualization. The visualization shown by VOSViewer allows us to see the mapping in more detail.

Result and Discussion

Based on Google Scholar data with the keyword "science learning models in Indonesian elementary schools", 107 research article documents were obtained in 2020-2021. A total of 107 research article documents, each distinguished according to its indexation. Figure 3 shows a graph of the publication of the science learning model in Indonesian elementary schools according to the indexation.

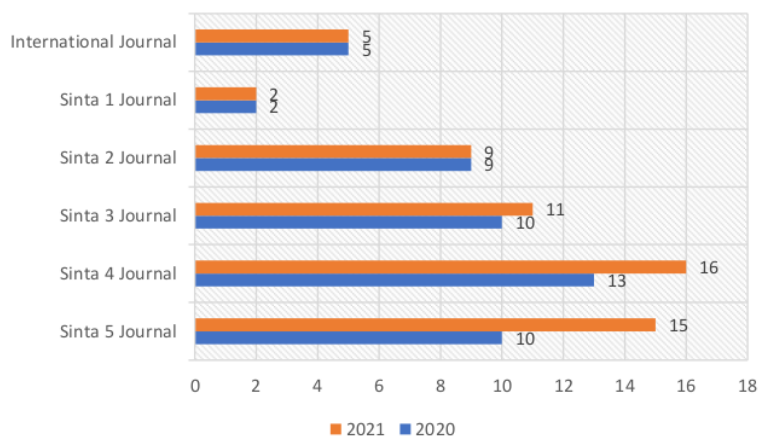


Fig. 3. Journal of Scientific Articles based on indexation

Figure 3 shows the publication of scientific articles whose indexation is known. Namely, there are international journals and SINTA 1 to SINTA 5 journals, along with the number of documents obtained in the 2020-2021 time bracket. Scopus and DOAJ index ten research articles. Furthermore, there are four research articles with a SINTA index of 1. In this index, it is rare to find research that raises the topic of science learning models in Indonesian elementary schools, so only a few research articles are obtained. Furthermore, there are nine research articles with the SINTA 2 and SINTA 3, which is 2021 with 11 research articles, while in 2020, there are ten research articles. It is the same with the SINTA 4 and SINTA 5 indices, where in 2021, it is superior with 16 and 15 research articles, while in 2020, there are 13 and 10 research articles, so publications in 2021 are superior to 2020.

Based on 107 research articles, Ganesha University of Education is the institution that ranks highest for the publication of research articles on science learning models in Indonesian elementary schools. Figure 4 shows the eight institutions with the top publications researching science learning models in Indonesian elementary schools. The Ganesha University of Education publishes as much as 37% of the 107 research articles published in Elementary School Scientific Journal, International Journal of Elementary Education, Journal of Education Technology, Journal of Pedagogy and Learning, Scientific Journal of Teacher Professional Education, Journal of EDUTECH, Journal of Educational Research and Development, Indonesian Education Journal (JPI), Journal of Education Action Research, Journal of Education and Learning Science, Journal for Lesson and Learning Studies and Indonesian Journal of Educational Research and Review. Ganesha State University has a policy to expand the scope of the articles it receives.

Table 1. Number of Documents by Affiliation of Research Article Authors

NO	Author Name	Publisher Institution	Number of Documents
1	Wahyu Sopandi	University of Education of Indonesia	5
2	Yanti Fitria	Padang State University	4
3	I Made Citra Wibawa	Ganesha University of Education	4
4	Ika Maryani	Ahmad Dahlan University	3
5	Nani Mediatati	Satya Wacana Christian University	3
6	Jajang Bayu Kelana	IKIP Siliwangi	3
7	Gede Wira Bayu	Ganesha University of Education	3

Eight authors with the highest publications, including Wahyu Sopandi from the Indonesian University of Education institution, contributed as many as five documents. Yanti Fitria from Padang State University Institution contributed four papers. I Made Citra Wibawa from the Ganesha University of Education Institute contribute four documents. Ika Maryani from the Ahmad Dahlan University Institute contributed as many as three papers. Neni Wediatati is from the Satya Wacana Christian University Institution and contributed three documents. Finally, Jajang Bayu Kelana from the Siliwangi IKIP Institute contributed as many as three papers. Finally, I, Gusti Ayu Tri Agustiana, from the Ganesha University of Education, contributed three documents.

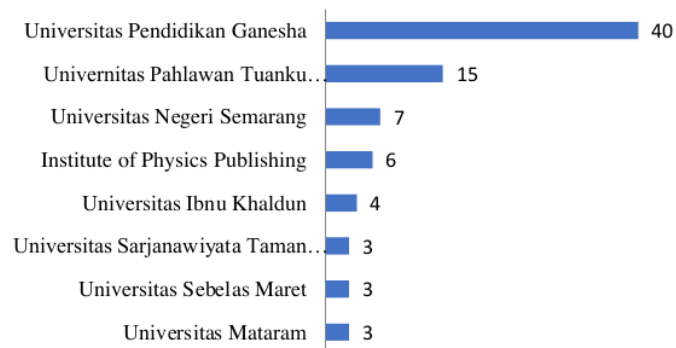


Fig. 4. Journal of Scientific Articles based on the Institute for Publishers of Research Articles on the Science Learning Model

However, the scientific journal that published the highest number of research articles on science learning models in Indonesian elementary schools was the Basicedu Journal from the Publishing Institute of Pahlawan Tuanku Tambusai University with 12 documents, followed by the Scientific Journal of Teacher Professional Education with eight papers, the

International Journal of Elementary Education with six documents, the Journal of Educational Research and Development with six papers, the Journal for Lesson and Learning Studies with six documents from the Ganesha University of Education institution. Next is the Journal of Physics: Conference Series of 5 papers from the Institute of Physics Publishing. The last highest is the Science Education Journal, with three Semarang State University Institutions documents. Figure 5 shows the scientific journal graph.

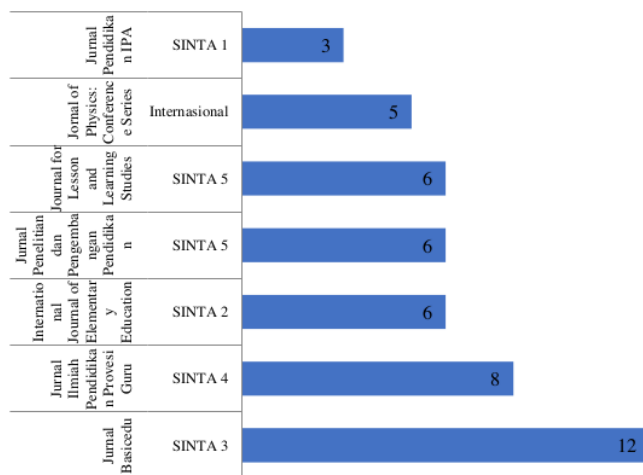


Fig. 5. Journal of Scientific Articles based on Publishing Journals

The Basicedu Journal publishes the most research articles about science learning models in elementary schools because the Primary School Teacher Education Program manages the Basicedu Journal at Pahlawan Tuanku Tambusai University. The Basicedu journal has published the results of a literature review and research covering elementary schools, so the 12 research articles that have been published are under the established domain.

A total of 28 learning models have been used and studied in research with validated results that have a good effect on the focus of research objectives, so they recommended educators in learning activities. Based on table 1, the most used learning models are Problem-based learning, Discovery learning, Project-based learning, Contextual Teaching and Learning (CTL), Read, Answer, Discuss, Explain and Create (RADEC), so five learning models have become a trending topic of research on science learning models in Indonesian elementary schools in 2020-2021.

Table 2. Types of Learning Models as Research Topics

No.	Types of Document	Frequency	Percentage Learning Models
1.	Problem-based learning	23	21%
2.	Discovery learning	14	13%
3.	Project-based learning	12	11%
4.	Contextual Teaching and Learning (CTL)	10	9%
5.	Read, Answer, Discuss, Explain and Create (RADEC)	6	5%
6.	Science, Environment, Technology and Society (SETS)	5	5%
7.	Science, Technology, Engineering and Math (STEM)	5	5%
8.	Guide Inquiry Learning	4	4%
9.	Inquiry	3	3%
10.	Cooperative type Two Stay Two Stray (TSTS)	3	3%
11.	Cooperative type Jigsaw	2	2%
12.	Student Team Achievement Divisions (STAD)	2	2%
13.	Cooperative type Group Investigation (GI)	2	2%
14.	Cooperative type Team Assisted Individualization (TAI)	2	2%
15.	Cooperative type Make a Match	2	2%
16.	Blended Learning	2	2%
17.	Quantum Teaching	2	2%
18.	Contextual Problem-based Learning	1	1%
19.	Creative Responsibility Based Learning (CRBL)	1	1%
20.	Cooperative type of Guessing Word	1	1%
21.	Cooperative type Scramble	1	1%
22.	Direct Instruction	1	1%
23.	Cooperative type Murder	1	1%
24.	Somatic, Auditory, Visual and Intellectual (SAVI)	1	1%
25.	Cooperative type Talking Stick	1	1%
26.	Discovery-Inquiry learning	1	1%
27.	Cooperative type Gallery Walk	1	1%
28.	Children Learning in Science (CLIS)	1	1%

The learning model with the number of research article documents in Table 1 can be used as a recommendation for researchers to study more deeply and broadly. There are 11 learning models with the publication of 1% of 107 research articles, including Creative Responsibility Based Learning (CRBL), Guessing Word Cooperative type, Scramble Cooperative type, Direct Instruction, Murder Cooperative type, Somatic, Auditory, Visual and Intellectual (SAVI), Talking Stick type cooperative, Discovery-Inquiry learning, Gallery Walk type cooperative, and Children Learning in Science (CLIS).

The Contextual Problem-Based Learning model still needs to be found to be applied to elementary school education based on Google Scholar searches. Students use contextual integration and problem-solving very well, but in 2020-2021. Only a few implemented them. Contextual Problem-Based Learning can improve problem-solving skills and student learning outcomes with the help of LKS Science learning tools [13], so the Contextual Problem-Based Learning learning model is highly recommended for broader research in the future.

Based on searches on Google Scholar, the Creative Responsibility Based Learning (CRBL) learning model still needs to be studied. Creative responsibility-based learning (CRBL)

has advantages in increasing students' creative thinking skills and self-confidence [14]. Besides that, Creative responsibility-based learning (CRBL) can also improve students' scientific knowledge, science process skills, and creativity [15], so the Creative Responsibility Based Learning (CRBL) learning model is highly recommended for broader research in the future.

There are five cooperative learning models with the weakest type or learning method: Guessing Word Cooperative, Scramble Cooperative, Talking Stick Cooperative, Gallery Walk Cooperative and Mood, Understand, Recall, Digest, Expand, Review (MURDER) Cooperative. The cooperative learning model is a model in which students work in groups to achieve a common goal. Cooperative Guessing Word type can increase students' activeness in guessing words, and this activity challenges students to create a pleasant classroom atmosphere. Scramble-type cooperatives can improve students' concentration, action, creativity and thinking speed through exercises searching for scrambled words to make a correct answer. Cooperative Talking Stick types can create a pleasant classroom atmosphere, motivating students to learn and be active and confident in expressing opinions. Gallery Walk-type cooperatives can assist students in conveying ideas and increase activity because, in this learning activity, students are required to be active in groups in sharing information and knowledge, being supportive, and building social skills and communication skills. The Mood, Understand, Recall, Digest, Expand, Review (MURDER) suitable type has the advantage of creating a pleasant learning atmosphere, an effective and efficient learning system and student activity.

The Direct Instruction learning model, based on searches on Google Scholar in 2020-2021, this learning model still has a little study that focuses on elementary schools. The Direct Instruction learning model has advantages in improving student learning outcomes, increasing teacher activity and increasing student motivation in learning [16].

Somatic, Auditory, Visual and Intellectual (SAVI) is a learning model that can improve students' higher-order thinking. The Somatic, Auditory, Visual and Intellectual (SAVI) learning model can be arranged in all learning styles and can fully awaken students' intelligence through physical movement with scientific activities. Students do not easily forget because they build their knowledge. The atmosphere in the learning process is fun because students feel cared for, so they don't get bored quickly learning. Apply for group work so that more innovative students can help less intelligent students, create a more exciting and effective learning atmosphere, create creativity and improve participants' psychomotor abilities, increase self-confidence and be responsible [17].

Discovery-Inquiry learning combines Discovery Learning and Inquiry learning to include "discovery" and "investigation" activities on what has been found. Inquiry is an extension of discovery used more maturely because it contains higher mental processes. For

example, formulating problems independently, designing to conduct experiments, collecting and analyzing data, drawing conclusions, being honest, having curiosity, being open, and there are many more so that this learning model is suitable for high grades.

Children Learning in Science (CLIS) is recommended because only some researchers have studied this learning model. This learning model is suitable for use in science subjects. The Children Learning in Science (CLIS) learning model has the advantages of creating student independence in solving problems, creating student creativity, and establishing cooperation between students so that students are directly involved, and learning is more meaningful [18]. Based on the things that have been mentioned, these ten learning models are highly recommended for broader research in the future.

Each research has a goal focus for a more definite direction. Therefore 107 research articles that have been published have as many as 11 focus objectives that have been grouped, including learning outcomes, HOTS, which includes critical and creative thinking, the effectiveness of learning media, which provides for E-comic media, Powtoons, learning videos, LKPD, and modules. Learning motivation, understanding of science concepts, problem-solving abilities, literacy and numeracy, social attitudes, science process skills, the urgency of religious and cultural knowledge in science and finally, scientific attitude. Figure 6 shows the focus graph.

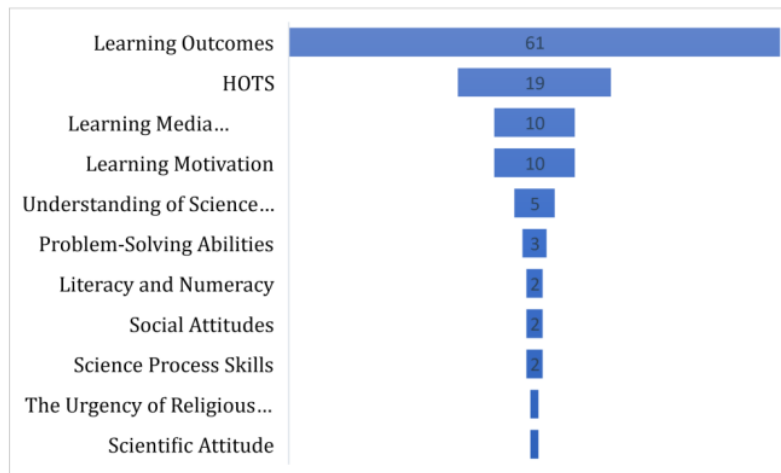


Fig. 6. The research focus finding

Learning outcomes are the focus of the highest goal, which reaches 61 research article documents—followed by HOTS, which includes critical and creative thinking, which gets 19 papers. Furthermore, the effectiveness of learning media and learning motivation reaches ten documents. Understanding the concept of IPA suggests getting five articles. Based on these data,

research on the science learning model in Indonesian elementary schools in 2020-2021 has five research focus trends, including learning outcomes, HOTS, the effectiveness of learning media, learning motivation, and understanding of science concepts. In comparison, the focus of the goal, which only has one publication article document, can be recommended, such as the urgency of religious and cultural studies in science and scientific attitudes.

The science of religion and culture, which concerns science subjects, still needs to be widely practised even though the three sciences complement each other. Science, religion and culture are united materials that cannot be separated [19]. However, it is deplorable that the facts that have occurred in the field during this period are that learning in schools focuses more on understanding concepts, formulas and theories, so subjects and study hours are dominated by general science so that education in Indonesia gives the impression of secularism [20]. Therefore, linking science with religion and culture is essential for forming good social attitudes and religious character. Furthermore, there is a scientific attitude, a positive attitude seen through applying a structured scientific method [21].

Winarni said that in science, learning a scientific attitude is very important because it can give students the best understanding of natural processes, bring them closer to scientific ideology, create a sense of satisfaction in solving problems, and increase motivation in finding things in groups with other people and improve students' ability to think rationally and critically [22]. It can be concluded that the two focus objectives are essential and are included in the profile of Pancasila students, which consist of faith, piety to God Almighty and noble character. One of these profiles can be related to the focus of the objectives of religious studies in science subjects because it creates a spiritual nature for students.

The following profile is global diversity so that it can be linked to local cultural studies in science subjects because Indonesian students should maintain their noble culture, locality, and identity and keep an open mind in interacting or responding to other cultures to create the character of good social attitudes and mutual respect for a different culture. The following profile related to the scientific perspective is independence and cooperation because, in the scientific perspective itself, there are two of the same type, namely the attitude of responsibility which has a relationship with the profile of Pancasila students, namely independence. In this profile, students are required to be responsible for the process and results of their learning. At the same time, the cooperation profile can be associated with a type of scientific attitude, namely cooperation, because in this type, students carry out learning activities together to realize shared goals.

Research journals that have collected 107 documents are downloaded in RIS format using Mendeley. This RIS document will later be used to view the mapping visualization of the keyword "science learning models in Indonesian elementary schools" using the help of the

VOSviewer software. VOSviewer is software that helps the data analysis process in which there are Network Visualization, Overlay Visualization and Density Visualization menus. Keyword networks will be viewed using the Network Visualization menu; in this view, items will be shown with nodes grouped by cluster, and each set has a different colour. The more things with named occurrences, the larger the node size.

Figure 7 shows a visualization of a bibliometric map; the size of the nodes represents the occurrence of items, namely keywords; the colour of the nodes indicates clusters, and the thickness of the connecting line nodes represents the strength of the relationship between these keywords. The keyword network map for the science learning model in SD Indonesia contains 49 items in 6 clusters. The colour of the nodes in the 6 clusters includes red, green, blue, yellow, purple and orange.

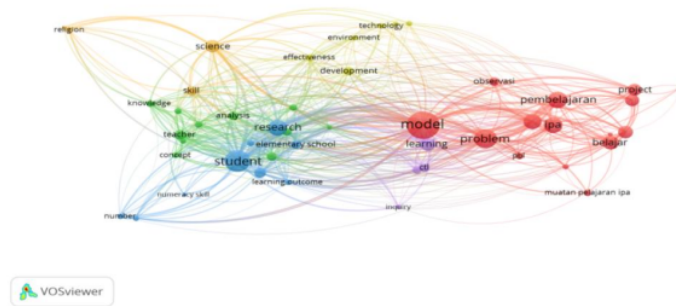


Fig. 7. Network Visualization Keyword Network

Figure 8 shows the items that have been studied concerning the "model" item, namely the items "learning", "problem", "cti", "contextual teaching-learning", "project", "student", "pbl", "discovery", "project", "technology", "sets", "radec" and many more. Many items about the "model" item have been studied, namely the "student" item. It is evident from the large size of the nodes and reaching 114 occurrences and 1897 link strengths. Besides that, there is a "problem" item which also studies a lot about the "model" item. It is evident from the large size of the nodes and reaching 87 occurrences and 1110 link strengths. Based on these data, many studies have been carried out on science learning models related to students and problem-based science learning models, so problem-based science learning models are a research trend during the 2020-2021 pandemic.

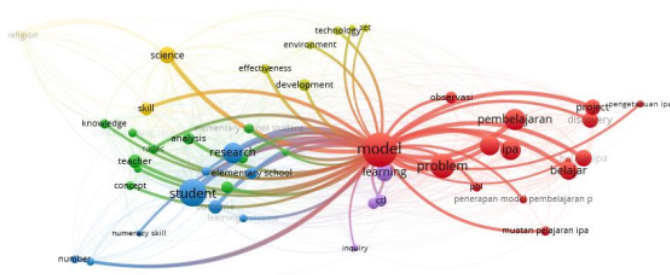


Fig. 8. Network Visualization Item Model

34
12
12
Other learning models in visualization include project-based learning models, contextual teaching-learning, discovery learning models, Read, Answer, Discuss, Explain and Create (RADEC), Science, Environment, Technology and Society (SETS) and Science learning models. , Technology, Engineering and Math (STEM). According to Table 1, learning models have been included in the learning models studied the most and are becoming a research trend in 2020-2021.

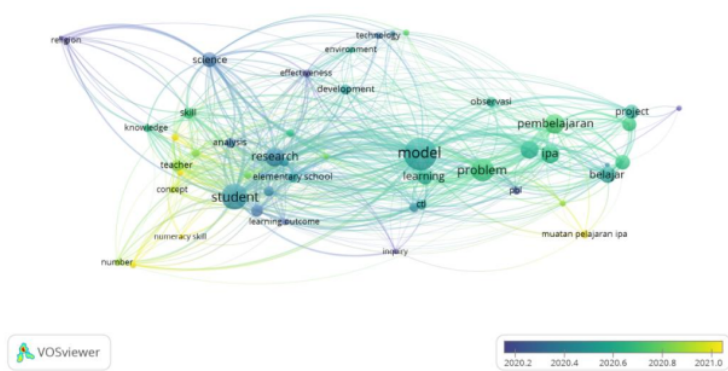


Fig. 9. Overlay Display of Key Words Visualization Learning Model of Science in Indonesian Elementary Schools

The colour of the nodes displayed by the VOSviewer software on the Overlay Visualization menu indicates the year the items appeared. In this view, only 2020 is known if the data was taken from the last two years. For example, 2020-2021 is still considered uniform. The colour displayed indicates when research with these items has been extensively researched, such as items with purple colours found in old studies while yellow nodes are found in recent studies. Items in yellow may not necessarily be recommended just because this

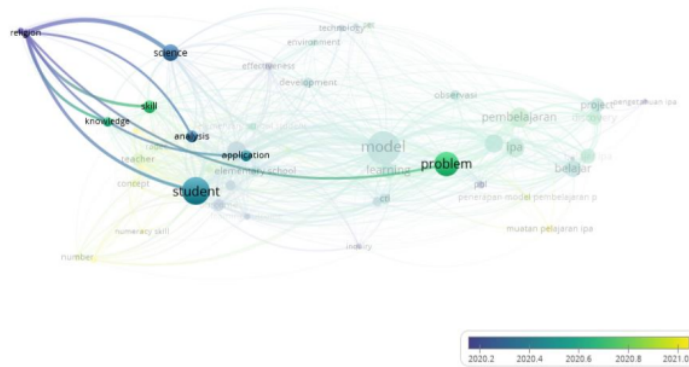


Fig. 11. Display Overlay Visualization Item Religion

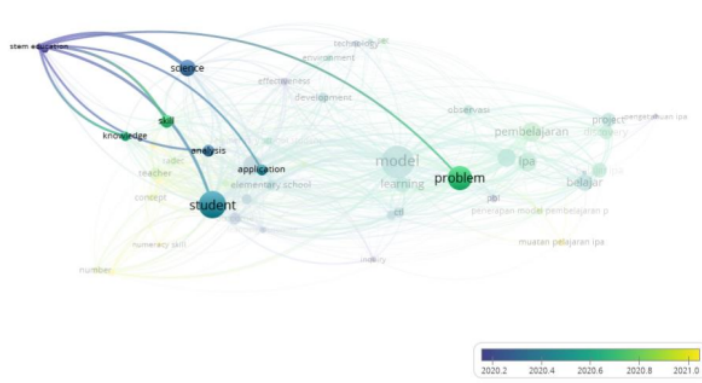


Fig. 12. Overlay Visualization of STEM Education Items

The contents of literacy are culture and citizenship, literacy in literacy, science literacy, numeracy literacy, technology literacy, communication and financial literacy. So that STEM education is suitable for education in Indonesia [23]. It related to the Religion item where STEM education adapts to the first pillar of education, namely learning to believe in God Almighty. In contrast, in science learning, it is required to link religion and culture with science to create good social attitudes and religious character in students. Religious items are the same as the focus of objectives which discuss the urgency of religion and culture in science which is also related to the profile of Pancasila students, so it is essential to study more deeply by being linked to the learning model that researchers have recommended.

Conclusion

As many as 28 learning models have been proven effective in research journals, so these learning models can continue to be applied during learning. The most research topics for

8 science learning models in elementary schools during the 2020-2021 pandemic were obtained from Google Scholar, namely problem-based learning, recovery learning, project-based learning, contextual teaching-learning, and RADEC learning, while there was the most research focuses, namely to determine learning outcomes, HOTS (critical and creative thinking), the effectiveness of learning media, learning motivation and understanding of science concepts. Recommended learning model topics include Contextual Problem-Based Learning, Creative Responsibility Based Learning (CRBL), Guessing Word Cooperative type, Scramble Cooperative type, Murder Cooperative Direct Instruction type, Somatic, Auditory, Visual and Intellectual (SAVI), Talking Stick Cooperative type, Guessing Word type cooperatives, Discovery-Inquiry learning and Gallery Walk type cooperatives, 32 Children Learning in Science (CLIS) which are associated with the urgency of religious and cultural knowledge in science and scientific attitude. Meanwhile, based on the data processed using the VOSviewer, it produces a recommendation topic for the subsequent research. It is obtained from items that are not yet connected to the keyword model and are located far from these keywords, namely the article "STEM education" and the item "religion" the recommendation for further research is to link the model STEM education-based learning that is still connected to religion.

20 Conflict of Interests

The authors declare that there is no conflict of interest.

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