Research Trends on Ethnoscience based Learning through Bibliometric Analysis: Contributed to Physics Learning

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Abstract. The research purposes are 1) Analyse the results of bibliometric mapping visualization on research trends ethnoscience-based learning and its contribution to physics learning, 2) Analyse author collaboration on research trends ethnoscience-based learning, and 3) Recommendations for future ethnoscience research in physics learning. In this research, the descriptive method is applied with a bibliometric approach. Data was obtained through the Scopus and Google Scholar databases published in the period 2011-2020. The results showed that ethnoscience-based learning made a major contribution to science learning at the elementary to junior high school level and physics at the high school to university level. Ethnoscience can be integrated with learning innovations in schools and can also train/improve students' thinking skills. Ethnoscience also dominates the social sciences. The recommended research trends in the Scopus and Google Scholar databases are physics learning about ethno-stem, development of ethnoscience-based physics teaching materials, ethnoscience-based physics learning to train students' scientific literacy and problem-solving skills.

1. Introduction
Indonesia is a country with a wide variety of natural resources and cultural traditions [1]. Globalization in the 21st century has transformed the Indonesian original cultural values, causing local culture to decrease and be forgotten. In the current era of globalization, students are more familiar with foreign cultures and do not understand the culture and local wisdom of the Indonesian, so that the sense of nationalism of students begins to fade. For the existence of culture and local wisdom to remain strong, students as the nation's next-generation need to be instilled with a sense of love for culture and local wisdom by integrating cultural knowledge in the learning process [2–4]. Therefore, an educational breakthrough is needed, especially in learning that combines culture with science or commonly called ethnoscience.

Learning science, particularly physics, is an important aspect of preparing students to respond to societal problems socially, critically, and imaginatively [5–7]. Physics does not only memorize its products in the form of concepts, principles, laws, and theories but also conducts a re-examination to create a scientific attitude in students. Physics is the study of the natural environment [8,9]. In learning physics, a pleasant atmosphere and conditions are needed. According to the facts on the ground, students' ability to integrate physics study into daily life is still lacking [10]. For this reason, teachers must be able to incorporate local cultural values into the science and physics learning process. Teaching science involves a curriculum and approach that goes beyond theory and facts to boost the relevance of education [11,12]. Students will be able to study facts and phenomena that occur in society more easily using ethnoscience-based learning, which may be combined with scientific knowledge [13–15].
Authors all over the world have conducted ethnoscience research at the primary, intermediate, and tertiary levels. For example, research with the title Top 100 Cited Publications in Physics Education in The last Thirty Years: A Bibliometric Analysis [16], about students' innovative and creative thinking skill profile in designing chemical batik after experiencing ethnoscience integrated science technology engineering mathematic integrated ethnoscience (ethno-stem) learnings [17], anything about The validity of e-module based on guided inquiry integrated ethnoscience in high school physics learning to improve students' critical thinking [18], there is also about Local and scientific knowledge in the school context: Characterization and content of published works, etc [19]. Several researchers focus on literature studies on ethnoscience-based learning using bibliometric analysis [19].

Bibliometrics has 2 roots, namely (i) Biblio and (ii) Metrics [20]. The term "metrics" denotes knowledge of meters or measurements, derived from the Latin or Greek word metrics meaning measure [21]. Bibliometrics is a term that uses mathematical and statistical methods to study and identify patterns in the use of literature/publications as analysis material to determine the development of specific literature, especially authorship, publication, and use [22]. The purpose of bibliometrics is to explain the process of written communication and the nature and direction of developing descriptive means of calculating and analyzing the various facets of communication [23–25].

Ethnoscience study is an attempt to integrate culture into the existing science curriculum, based on past research. Studies on bibliometric literature review, on the other hand, have not been considered. So, this study focuses on the trend of ethnoscience based learning research in the last 10 years interval with three research questions:

a. How the results of bibliometric mapping visualization on research trends ethnoscience-based learning and its contribution to physics learning?

b. How does the author collaborate on research trends in ethnoscience-based learning?

c. What are the recommendations for future ethnoscience research in physics learning?

2. Method

A descriptive research method with a bibliometric approach was used in this study. Bibliometrics aims to measure the progress of the publication of scientific articles and scientific contributions [26]. Bibliometric analysis was carried out by looking at the publications distribution to evaluate the contribution of articles to the progress of knowledge of various literature using a statistical approach [27]. Bibliometric reviews are a sort of review that focuses on quantitative research in journals, articles, books, and other forms of written communication [28]. This study was conducted by searching the Scopus and Google Scholar databases. The article metadata search was based on parameters that matched the study emphasis with the keyword ethnoscience in learning in the search results. The stage is to collect/harvest metadata in the 2011-2020 range. Exploring data on the Scopus and Google Scholar databases. Publish or Perish (PoP) is software to make it easier to search metadata in the Google Scholar database. Furthermore, to visualize metadata about ethnoscience-based learning, VOSviewer software is used. Making visualizations in the form of maps is by exporting the search results from the database into RIS format, then inputting them into the VOSviewer. The results of data visualization shown by VOSviewer were used to carry out an analysis of ethnoscience-based learning and its relationship to physics learning.

3. Results and Discussion

3.1 The results of bibliometric mapping visualization on research trends ethnoscience-based learning and its contribution to physics learning

Based on the search results of metadata about ethnoscience-based learning from the Scopus database in the last ten years (2011-2020) obtained as many as 230 documents from 434 throughout the year. From the Google Scholar database with the help of the Publish or Perish (PoP) search software, 386 documents were obtained from a maximum number of results of 500 documents. Figure 1 shows a network visualization of the VOSviewer software on ethnoscience-based learning from the Scopus database.
Figure 1. Network visualization from term ethnoscience-based learning in the last 10 years (2011-2020) on the Scopus database

The display in Figure 1 is a network visualization of the ethnoscience-based learning with a minimum number of occurrences of 5 of the 5,200 terms, 227 meet the threshold resulting in 136 items composed of 4 clusters with 3,910 links. In cluster 1, red is related to the terms of student, learning, ethnoscience, local wisdom, implementation, learning process, etc. Cluster 2 in green is related to the terms of strategy, opportunity, level, issue, person, etc. In Cluster 3, blue is related to the terms of relationship, interpretation, contribution, work, social science, etc. The last cluster is cluster 4 in yellow with related terms system, environment, reality, fact, etc.

If we look at the relationship between the term ethnoscience and learning itself, from the visualization of VOSviewer it is clear that the two have a very close and close relationship. The most dominant visualization display of ethnoscience-based learning is the term/keyword student and the second is learning (Figure 2), where the student itself has 125 links with a total link strength of 588 and occurrences of 70. The term student is connected with learning, such as learning process, implementation, strategy, skill, inquiry, stem, etc.

Figure 2. The dominant term in the visualization of ethnoscience-based learning outcomes in the Scopus database

Figure 2 also describes the various data collections carried out by the author in researching ethnoscience-based learning such as samples in research, experimental groups, control classes, experimental classes, test data collection methods, questionnaires, surveys, and so on. This means that
the authors researched ethnoscience-based learning using quantitative and qualitative research methods. In addition, it is also seen that ethnoscience-based learning over the past 10 years has dominated the learning of science (physics) and social science (Figure 3).

In Figure 3a, it can be seen that physics is related to learning, students, and skills. This means that ethnoscience-based physics learning can train/improve students' skills during the learning process. This is in line with research that the effectiveness of learning physics can improve students' creative skills [29]. The term ethnoscience-based learning does not only focus on learning about science which consists of the physical sciences and life sciences but also dominates the branches of social sciences such as sociology, history, anthropology, language, and culture (Figure 3b).

Furthermore, based on the metadata search results about ethnoscience-based learning from the Google Scholar database with the help of the Publish or Perish (PoP) search software, 386 documents were obtained from a maximum number of results of 500 documents.

The network visualization in Figure 4 about ethnoscience-based learning on the Google Scholar database with a minimum number of occurrences of a term 3 of the 3180 terms, 291 meet the threshold resulted in 156 items composed of 8 clusters. Cluster 1 (red) is related to the terms of language, cognitive, history, etc. Cluster 2 (green) is related to the terms ethnoscience approach, response,
effectiveness, etc. Cluster 3 (dark blue) is related to the terms place, literature, indigenous science, etc. Cluster 4 (yellow) is related to the terms problem, project, ethnomathematics, etc. Cluster 5 (purple) is related to the terms effect, physics learning, etc. Cluster 7 (orange) is related to the terms innovations, scientific, etc. The last cluster is cluster 8 (brown) related to the terms critical thinking skills, scientific science, etc. Where each cluster consists of terms that describe the keyword ethnoscience-based learning.

From the Google Scholar database, it can be seen that during the 2011-2020 period there were more researchers on the ethnoscience approach, which can be seen in Figure 5a that the ethnoscience approach has a total link strength of 33 with 14 occurrences. Based on the visualization of the google scholar database, it can be seen that the application of ethnoscience has been implemented in physics learning (Figure 5b).

![Figure 5. (a) Network visualization in terms of ethnoscience approach and (b) Network visualization in terms of physics learning](image)

In Figure 5b, it can be seen that physics learning related to ethnoscience-based learning is connected with terms in the same cluster, namely elementary school student, effect, communication technology. In addition, physics learning is also related to leadership, achievement, and critical thinking skills. This means that ethnoscience-based learning researchers in physics learning are not only studied at the high school level but also the elementary school (science) level by applying learning innovations to improve students’ thinking skills. In line with research that ethnoscience can be integrated into learning at the high school level [9]. In addition, ethnoscience in learning is also closely related to critical thinking, problems, ethnomathematics, and student chemical literacy (Figure 6). This means that ethnoscience in learning in addition to improving cognitive can also train students' skills.

![Figure 6. Network visualization in terms of critical thinking, literacy, and other thinking skills](image)

Furthermore, the VOSviewer display also displays metadata in the form of overlay visualization and density visualization. Overlay visualization can show traces of history in ethnoscience research in learning and density visualization which shows the density/emphasis on research groups on ethnoscience in learning over the last 10 years (Figure 7).
Figure 7. (a) Overlay visualization of ethnoscience-based learning on the Scopus database and (b) Overlay visualization of ethnoscience-based learning on the google scholar database

Each colour in the variable represents the last 10 years (2011-2020), the yellow colour indicates the most recent research conducted in 2020. While dark blue represents research that was conducted several years ago. It can be seen that each cluster is connected with the title, keywords, abstract, and words in the abstract about ethnoscience-based learning. Researchers can also detect future trends and crucial changes in clusters, identify study gaps and research limits where they can contribute to future research fields [30].

3.2 Visualization of the author’s collaboration on the ethnoscience-based learning research trend

The results of the Co-authorship visualization on ethnoscience-based learning with a minimum number of documents of an author 1 of the 490 authors in the Scopus database and 656 authors in the Google Scholar database obtained visualization results as shown in Figure 8. Based on the Scopus and Google Scholar databases, it can be seen that the top three researchers during the 2011-2020 period were Sumarni et al., Sudarmin et al., and Wiyanto, et al. This shows that the authors who have researched about ethnoscience based learning for the last 10 years are Indonesian authors.

Figure 8. (a) Overlay visualization co-authorship on ethnoscience-based learning (Scopus database) and (b) Density visualization co-authorship on ethnoscience-based learning (Google scholar database)

3.3 Recommendations for future ethnoscience research in physics learning

The trend of research that has not been carried out but has the potential to be carried out is visible in the word variable (concrete or abstract) which has a little circle in the bibliometric analysis shown by VOSviewer. If the term variable does not exist, it will be a novelty for future researchers who want to research ethnoscience in learning and its contribution to physics learning. Based on the bibliometric visualization analysis of ethnoscience-based learning results, the recommended research trends in the Scopus and Google Scholar databases are physics learning about ethno-stem, development of ethnoscience-based physics teaching materials ethnoscience-based physics learning to train students'
scientific literacy and problem-solving skills. The literature review, in this case, is qualitative and relies on personal judgment [31].

4. Conclusion
Based on the results of the analysis and discussion, the research trend of ethnoscience-based learning for the last 10 years (2011-2020) from the Scopus database consists of four clusters with the most dominant terms being students and learning. Meanwhile, the Google Scholar database consists of eight clusters with the most dominant terms being effects and ethnoscience approaches. Ethnoscience-based learning greatly contributes to physics learning, both at the elementary school (physics science) to high school and college. Ethnoscience can be integrated with learning innovations in schools and can also train/improve students' thinking skills. Besides being able to contribute to science learning (physics), ethnoscience also dominates social science. The recommended research trends in the Scopus and Google Scholar databases are physics learning about ethno-stem, development of ethnoscience-based physics teaching materials ethnoscience-based physics learning to train students' scientific literacy and problem-solving skills.

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