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Research on Ethnoscience in Science Education: An Analysis of the Literature

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Abstract.
We examined 231 papers from the Scopus database that were written about ethnoscience in science education and were published between 1967 and 2023. This article aims to provide a comprehensive bibliometric evaluation of the ethnoscience literature in science education research. The characteristics of this study were organized, categorized, and visualized using VOSviewer software based on the study's title, author, country of origin, and institutional affiliation of the author. Overall, this assessment provides a solid foundation for future studies on ethnoscience in science education research.

Keywords: Ethnoscience, science education, an analysis of the literature

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1. INTRODUCTION

The Greek words ethnos, which means nation, and Scientia, which means knowledge, are the roots of the word ethnoscience [1–3] Thus, ethnoscience is the information that a cultural group possesses. It focuses on a cultural community's innate and unique knowledge [3]. In other words, ethnoscience is a subfield of cultural studies that focuses on how indigenous people see their own nature. Indigenous people typically have a philosophy of life and an ideology that affect their capacity for survival. Accordingly, it can be said that ethnoscience is a modernised version of ethnography. Cultural researchers can develop their own theories from the ground up using ethnoscience rather than adopting dated Western cultural notions. The foundation of ethnoscience studies of cultural phenomena is usually ethnography and folklore. Cultural research will definitely benefit from the inclusion of ethnoscience [4]. Even if they are already familiar with verstehen (understanding), this does offer cultural studies a fresh look. Ethnoscience investigations

have, in fact, been systematically used by many cultural researchers. Indeed, there is no consensus among scholars regarding what exactly constitutes ethnoscience. It is also known as descriptive semantics, ethnographic semantics, and cognitive anthropology [4, 5]. The reason for the variety of names is that each expert places a different emphasis, but the goal is the same: to elevate cultural studies to a scientific level.

Every culture expands and changes as a result of occasionally shifting demands. In this evolution, numerous problem-solving techniques are used to create a better and wealthier way of life. Science and technological advancements have both beneficial and harmful effects, which cannot be separated. On the one hand, the use of science and technology has spawned a number of advances to raise the quality of life for people. On the other hand, the use of science and technology has also exploited natural resources to pursue production without taking long-term survival into account. An example of this is what happened when the natural environment was destroyed, leading to a variety of natural disasters like extended droughts, floods, forest fires, and air pollution, all of which only cause suffering for the general populace [6].

The physical and sociocultural environment can have a distinct impact on how well pupils learn. These experiences might manifest as mental and emotional (cognitive), emotional (affective), and behavioural (psychomotor) patterns. Due to social influences, notably intuitive understanding of the environment, scientific concepts learned in school did not develop smoothly (lifeworld) [6]. This knowledge is acquired during childhood and is assimilated by others (such as parents and peers) through socialisation and enculturation. Social or cultural science, often known as indigenous science, is one of the intuitive sciences, according to Ogawa [3, 7]. Additionally, according to other researchers, original science is linked to scientific knowledge that is learned orally in a long-inhabited location [8].

The idea behind the construction of science education curriculum is particularly pertinent to ethnoscience learning. A philosophy, according to which education is anchored in national culture to improve the lives of present and future nations, was used to construct the science education curriculum. 2) The cultural heirs of the country are the students. 3) Through education in scientific areas, education aims to enhance intellectual and academic genius. 4) Education to develop varied intellectual abilities, communication skills, social attitudes, care, and participation to develop a better life for the community and nation. The pupils' or the community's cultural background has a significant impact on how well the educational process goes in school [6, 9, 10].

Therefore, this study uses bibliometric analysis because it is very helpful for researchers to identify research trends and impactful studies. This analysis is a research project that

examines the scientific output on the topic in order to determine a research path and strategy for the future. There have been a few bibliometric studies on ethnoscience [6, 11, 12], but there has been little research on ethnoscience in science education. Until present, there has been no bibliometric analysis of ethnoscience in science education with Scopus data.

For the reasons listed above, this paper's goal is to fill a research gap by conducting a thorough bibliometric study of the literature on the use of ethnoscience in science education. Journals are regarded as important platforms for disseminating academic and scientific knowledge to a global audience. In any field of knowledge, these avenues of communication are open to both established and new trends Bibliometric analysis uses certain markers to analyse research published in the literature and summarise it. This study is a suitable technique for assessing journals' contribution to knowledge growth. By using bibliometric analysis, one may create a network structure that addresses issues like what the primary scientific themes are, how they are related to one another, and how they change over time. [13, 14]. The bibliometric approach can be used to determine many numbers, including the increase in publications from year to year, the list of contributors (authors, institutions, nations), collaboration between writers and institutions, and the percentage of references per piece.

2. RESEARCH METHOD

This study provides a thorough review of the quantitative literature. By article title, journal title, author, country, and institutional affiliation of the author, this bibliometric analysis evaluated journal publications on ethnoscience in science education research [15]. An appropriate database should be employed for the investigation in order to access as many published articles on ethnoscience in science education research as is practical. This procedure is divided into several phases, including:

2.1. Source Identification and Search Criteria

The Scopus database served as the writers' primary source of information for this review. Scopus was picked because it uses standardised criteria to decide which papers to include in its index. This component offers a broader document coverage than the Web of Science for research evaluations in education and the social sciences. Additionally, Scopus has more sophisticated exporting options for bibliographic information than Google Scholar.

You can search Scopus for journal articles, books, book chapters, and conference proceedings. Scopus includes publications from 1967 through 2023. The topic of the review is “ethnoscience.” We conducted our search using a wide term (such as “ethnoscience”). The Scopus search was conducted using the following keywords:

2.2. TITLE-ABS-KEY ("ethnoscience")

2.3. The initial search results

Scopus found 231 documents that corresponded to the keywords. We revise the keywords and eliminate inappropriate documents. The data is then converted to CSV format, allowing for the download of every piece of recorded information. Following this screening, we determined the relevance of each document’s title and abstract before expanding it to 31 articles.

2.4. Data Analysis

The data was collected on June 28, 2023. Ethnoscience document metadata is exported by Scopus to a master Excel file. The ethnoscience was documented using Excel’s descriptive statistical analysis. The information from the primary spreadsheet file is then loaded into the VOS viewer, a bibliometric programme used for science mapping. The VOS viewer’s bibliometric analysis includes author and document citation analysis as well as co-author citation analysis. On the basis of shared citation networks, the VOS viewer may also create publication maps, author maps, journal maps, and keyword maps. The generated data are then examined using the software VOSviewer to visualise and investigate bibliometric knowledge maps [16–18].

3. RESULTS AND DISCUSSION

The journal articles published on ethnoscience between 1967 and 2022 are included in this section of the articles. The following are the findings of the bibliometric analysis:

Between 1967 and 2023, 132 journal articles, 58 conference papers, 28 book chapters, 8 reviews, 2 books, 2 editorial reviews, and 1 conference review were included in Scopus-indexed materials. Among the subjects covered were the social sciences (30.7%), physics and astronomy (14.6%), arts and humanities (12.3%), environmental science (9.5%), agricultural and biological sciences (8.6%), medicine (5.4%), earth and

planetary science (4.0%), nursing (2.9%), psychology (2.3%), biochemistry, genetics, and molluscan biology (1.4%), and other (8.3%).

As seen in Figure 1 below, the trend in scientific publishing persisted until 2023. Starting in 1967, ethnoscience materials in Scopus-indexed journals were published as a single article.

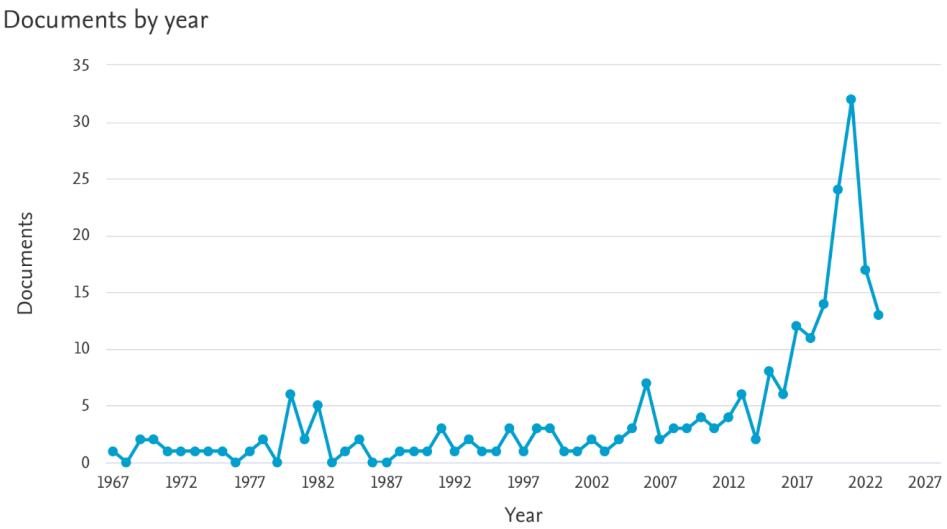

Figure 1: Growth trajectory of the literature on ethnoscience, 1967-2023.

After that, we examined the ethnoscience literature's regional distribution (Figure 2), which showed that it has developed into a global literature. The main contributors to the ESD knowledge base in secondary schools are Sweden (25), Germany (18), the United Kingdom (13), Norway (5), Portugal (5), Austria (4), Finland (4), Hong Kong (3), Japan (3), and the Russian Federation (3).

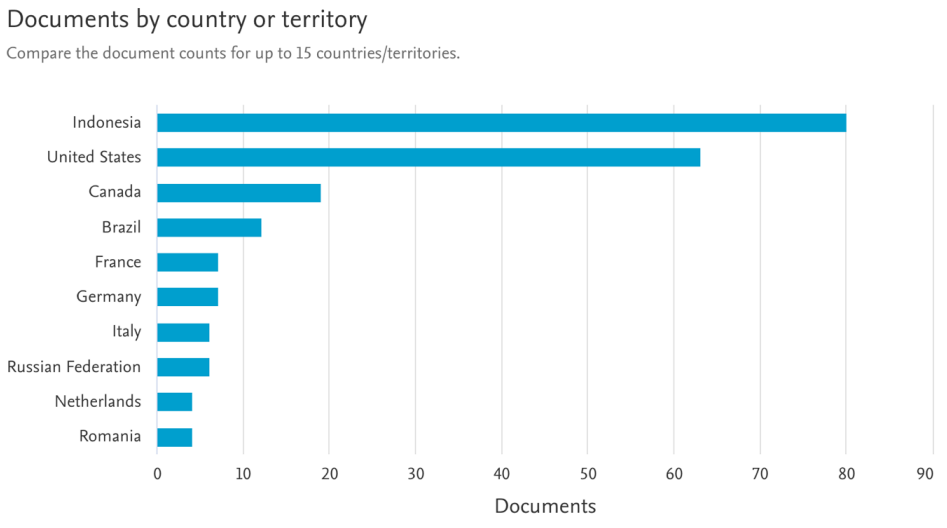

Figure 2: Global distribution of literature on ethnoscience in education, 1967-2023 (n = 31).

The findings of the researcher's attempt to provide the five publications in the field of ethnoscience in science education with the highest citation value (the first five cited articles) are shown in Table 1.

Table 1: Top 5 Cited Articles.

No	Year	Author	Title	Journal	citation	Publisher
1	2020	Zidny R., Sjöström J., Eilks I.[10]	A Multi-Perspective Reflection on How Indigenous Knowledge and Related Ideas Can Improve Science Education for Sustainability	Sci. Educ.	55	Springer Science and Business Media B.V.
2	2017	Sudarmin, Febu R., Nuswowati M., Sumarni W.	Development of Ethnoscience Approach in the Module Theme Substance Additives to Improve the Cognitive Learning Outcome and Student's entrepreneurship	J. Phys. Conf. Ser.	14	Institute of Physics Publishing
3	2021	Suprapto N., Prahani B.K., Cheng T.H.	Indonesian curriculum reform in policy and local wisdom: Perspectives from science education	J. Pendidikan IPA Indones.	11	Universitas Negeri Semarang
4	2021	Dewi C.A., Erna M., Martini, Haris I., Kundera I.N.	Effect of Contextual Collaborative Learning Based Ethnoscience to Increase Student's Scientific Literacy Ability	J. Turk. Sci. Educ.	9	Ekip Buro Makineleri A.
5	2019	Sudarmin S., Sumarni W., Rr Sri Endang P., Sri Susilogati S.	Implementing the model of project-based learning : integrated with ETHNO-STEM to develop students' entrepreneurial characters	Institute of Physics Publishing	8	J. Phys. Conf. Ser.

The articles on ethnoscience in science education garnered the most citations from other researchers between 2017 and 2021, as shown in the table above. Following analysis with the VOS viewer, Figure 3 displays the data mesh visualisation of ethnoscience-related Scopus data in the search refined ethnoscience term, while Figures 4 and 5 display the overlay visualisation and density visualisation, respectively.

The results reveal clusters of diverse study themes with ethnoscience in science education based on keywords in the title and abstract. The relationships between the themes are depicted in Figure 3. There were a total of 56 words, but see Figure 6 for the themes with the highest ethnoscience in science education:

Figure 6 demonstrates the continued interest in working with the issue of ethnoscience research in science education. There is still time to look at the ways that

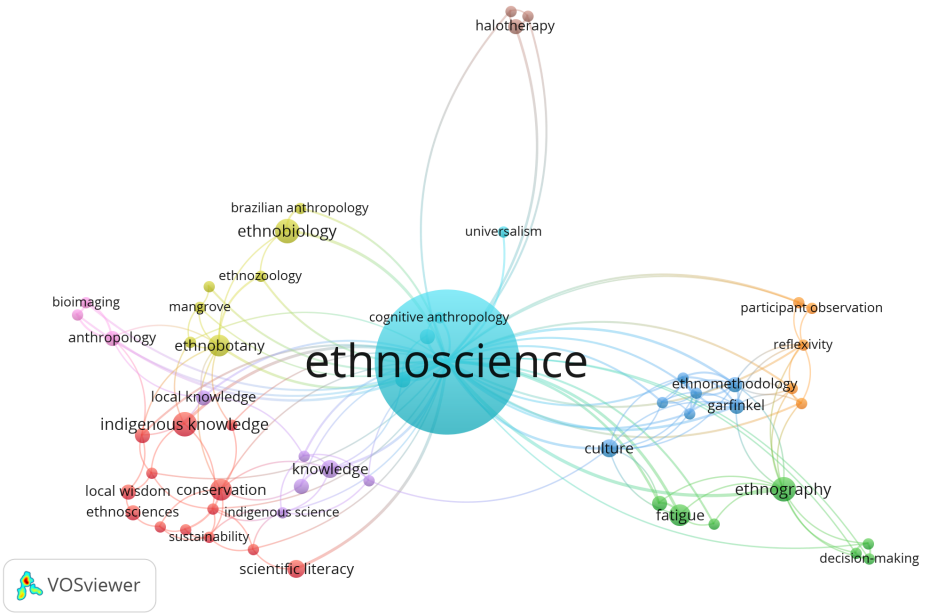

Figure 3: Visualization topic area using VOS Viewer using network visualization.

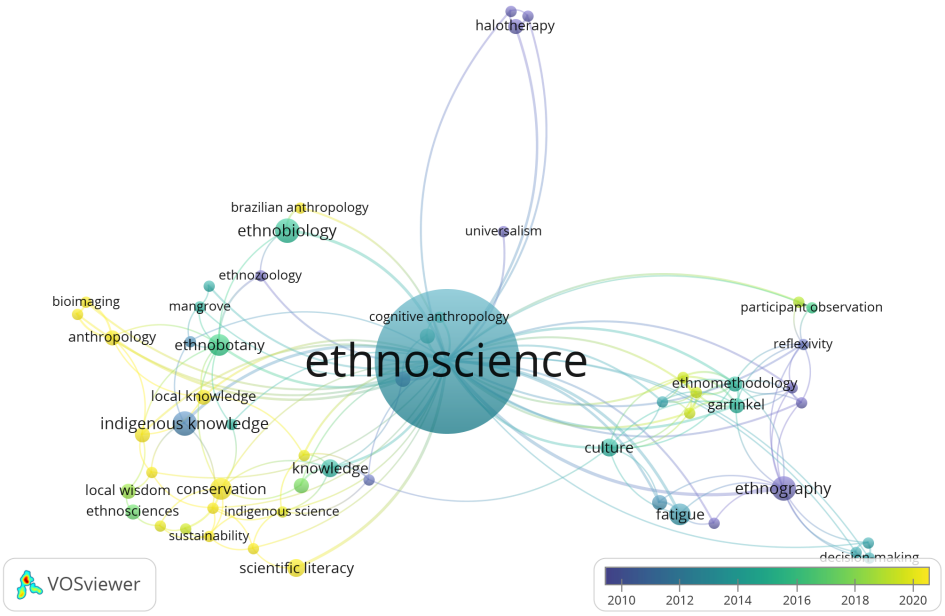

Figure 4: Visualization topic area using VOS Viewer using overlay visualization.

curriculum, teaching materials, teacher views, and ethnoscience are used in science education. This might be a chance to build on the research by emphasising innovation based on the applicability of themes visualised by the Vos viewer.

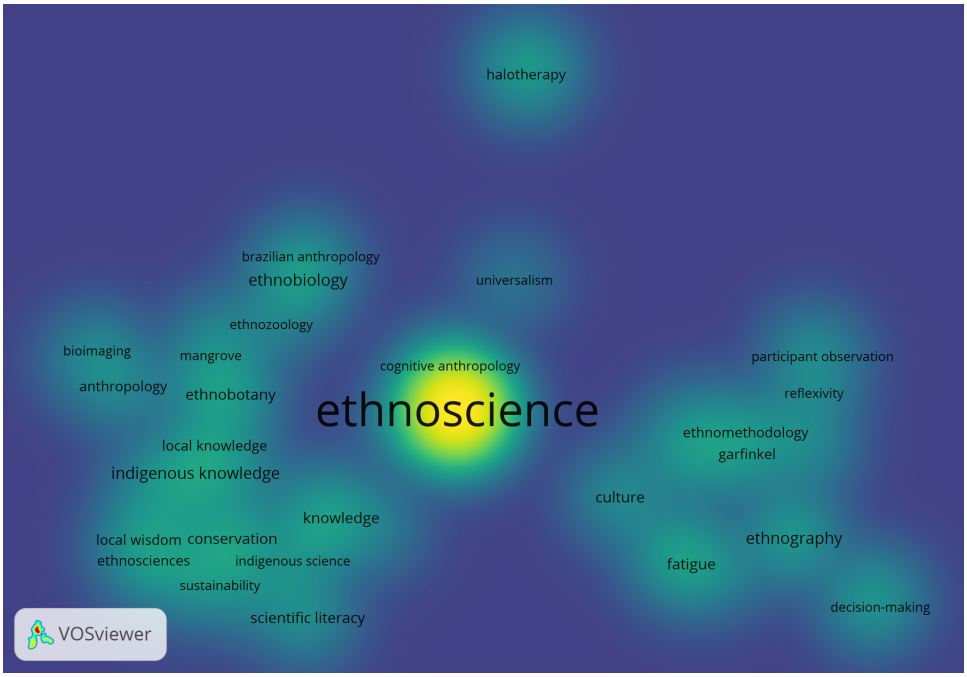

Figure 5: visualization topic area using VOS Viewer using density visualization.

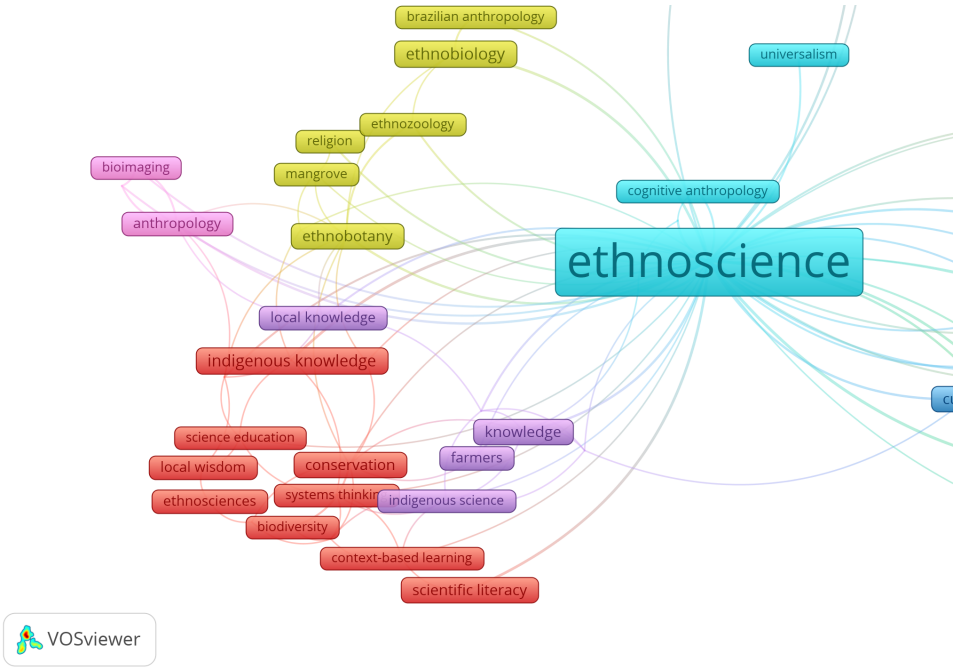

Figure 6: Visualization topic area using VOS Viewer in ethnoscience – science education.

4. CONCLUSION

Based on the aforementioned findings and discussion, it can be stated that the development of ethnoscience in science education research has fluctuated from 1967 to 2023. Several essential points related to ethnoscience research trends have been

analysed using bibliometrics. The number of publications in 2003–2021 increased dramatically. With 32 papers, 2021 has the most publications on this topic; nonetheless, there is still room for more research on this topic. In terms of document formats, 31 articles on the topic of ethnoscience in science education research were published between 1967 and 2023. This article uses bibliometric analysis to visualise diverse literature in order to discover essential themes in each study or setting. The VOS viewer identified nine clusters describing thirteen research issues connected to the application of ethnoscience in science education based on the findings of this study. The results of this study can help related researchers recognise research trends in ethnoscience in science education and provide direction for further research.

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