ETHNOSCIENCE IN HIGHER EDUCATION: A META DATA AND BIBLIOMETRIC ANALYSIS

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ABSTRAK

Indigenous science merupakan pengetahuan yang menjadi landasan dalam pembelajaran etnosains. Etnosains adalah pendekatan yang menitikberatkan kepada kearifan lokal dalam pembelajaran. Penelitian ini bertujuan untuk menganalisis berdasarkan konten dari penelitian pembelajaran etnosains di tahun 2019-2023 ditinjau dari aspek pembelajaran dan dampak. Data diambil dari database Scopus dengan kata kunci "ethnoscience" dari tahun 2019-2023 diperoleh 119 data. Selanjutnya diexclude berdasarkan tipe dokumen, publikasi yang menggunakan berbahasa Inggris, dan open access sehingga didapatkan 79 dokumen. Analisis selanjutnya dilakukan pemetaan data yang sesuai dengan tema riset didapatkan 56 dokumen. Hasil penelitian menunjukkan pembelajaran etnosains di Perguruan Tinggi masih menjadi pendekatan pembelajaran yang diminati oleh pendidik sains. Adanya improvisasi yang dilakukan seperti mengintegrasikan antara etnosains dengan model pembelajaran menjadi satu upaya pendidik dalam menginovasi pembelajaran etnosains. Literasi sains dan kemampuan berpikir kritis merupakan kemampuan yang paling banyak diteliti oleh para peneliti di dunia ketika menggunakan pendekatan etnosains.

Kata kunci: Meta Analisis, Bibliometric, Ethnoscience, Higher Education

ABSTRACT

Ethnoscience is an approach that emphasizes local wisdom in learning. This research aims to analyze based on the content of ethnoscience learning research from 2019-2023 in terms of learning aspects and impacts. Data were collected from the Scopus database using the keyword "ethnoscience" from 2019-2023, resulting in 119 data points. Subsequently, data were excluded based on document type, publications in English, and open access, resulting in 79 documents. Further analysis was conducted by mapping data according to research themes, resulting in 56 documents. The research findings indicate that ethnoscience learning in higher education remains a popular teaching approach among science educators. Improvisations are made, such as integrating ethnoscience with teaching models, as an effort by educators to innovate ethnoscience learning. Scientific literacy and critical thinking skills are the effects most widely studied by researchers in the world when using an ethnoscience approach.

Keywords: Meta-Analysis, Bibliometric, Ethnoscience, Higher Education

INTRODUCTION

Over the last ten years, indigenous science has gained popularity in science classrooms. Local wisdom is a priceless and crucial asset since it is a legacy that has been accumulated and developed by ancestors up until the present (Chaijalearn et al., 2023). Rebuilding native science is the source of local knowledge. Rearranging or translating indigenous science into Western or scientific concepts is part of this reconstruction (Ogawa, 1986). According to Snively & Corsiglia, indigenous science is associated with scientific knowledge acquired through the community's oral tradition (Snively & Corsiglia, 2000). Sudarmin states that through local wisdom, basic theories related to scientific reconstruction can be found, thereby enhancing conservation skills related to the maintenance, preservation, and wise use of natural resources (Sudarmin & Pujiastuti, 2015).. This indigenous science is acquired through the observation of cultures within society. Through the reconstruction of indigenous science, applications of scientific concepts can be developed, thus deepening the understanding of scientific concepts (Khusniati, 2014). Figure 1 illustrates a framework for science teachers to integrate indigenous knowledge into science education (Zidny et al., 2020).

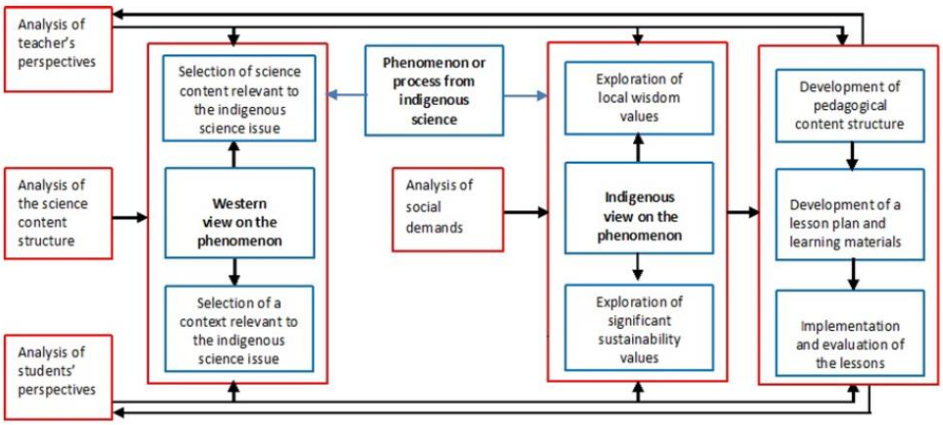


Figure 1. Framework for integrating indigenous knowledge into science education

Figure 1 shows that the selection of phenomena is the focus of the science education framework that integrates indigenous knowledge. This can be done by selecting indigenous/local wisdom contexts available in the region (Zidny et al., 2020). The phenomena developed should be challenging and even mysterious to spark students' curiosity (Grillenberger et al., 2016). Interesting topics also encourage students to explore the local wisdom behind scientific phenomena (Zidny et al., 2020).

Many studies have examined ethnoscience in the literature review, especially in education. Wati et al. found that research on ethnoscience in science education has been extensively studied (Wati et al., 2021). Meanwhile, Sari et al. highlighted the trend of ethnoscience research in education that can be linked to local culture and wisdom (Sari et al., 2023). Further, a study conducted by Jannah et al. focused on the publication of ethnoscience in Indonesia (Jannah et al., 2022). These studies have explained how the trend of ethnoscience research is conducted, but few have examined the trend of ethnoscience research in higher education. Therefore, it is important to conduct research on how ethnoscience education is implemented at the higher education level through literature studies. Introducing local wisdom needs to be done for prospective teachers so that they can understand more deeply the local wisdom that exists as content development for science education, which will eventually be taught to students in schools.

Based on the above explanation, the study of ethnoscience will be examined more deeply in this research, starting from analyzing research trends in science education, visualizing research trends in this topic, and analyzing the impact of ethnoscience in science education at the higher education level. The following are the research questions in this study:

a. What is the profile of ethnoscience publication outputs in science education from 2019-2023?
b. What is the distribution of ethnoscience publications in science education across countries and affiliations worldwide?
c. How can the results of ethnoscience publication trends in science education from 2019-2023 be visualized?
d. What is the impact of ethnoscience in science education at the higher education level?

Research Tools

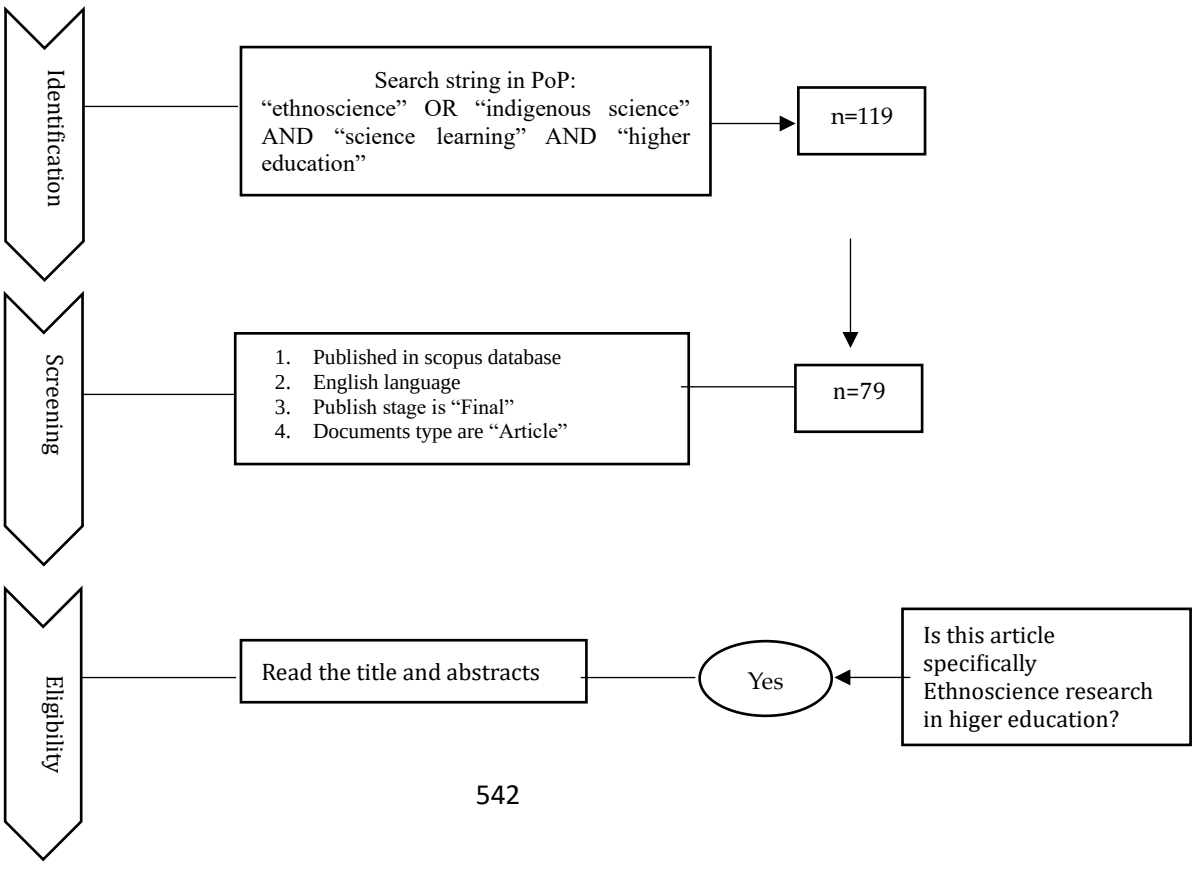
The study used the help of Publish or Perish (PoP) software, Bibliometrix with R programming, and VOSviewer. Qualitative methods and techniques were adopted to review the literature published in 2019-2023.

Data Collection

The Scopus database was used to gather the literature data. Since Scopus is a reliable source of data, it is taken into account when choosing documents (Wei et al., 2023). Data selection was carried out using the PRISMA method. This systematic review uses bibliometric (see Figure 1) adapted from Kulakli & Osmanaj; Yang, et al.; Bonilla-Chaves & Palos-Sánchez; Wei, et al. (Bonilla-Chaves & Palos-Sánchez, 2023; Kulakli & Osmanaj, 2020; Wei et al., 2023; Yang et al., 2017).

Data Analysis

Literature searches were conducted in Maret-April 2023 using the Publish or Perish (PoP) application. Using the keywords "ethnoscience" OR "indigenous science" AND "science learning" AND "higher education," this study searched the Scopus Database and found 119 publications between 2019 and 2023. This research was restricted to English-language articles from the Scopus database; a total of 79 articles met this criteria. Following an analysis to determine its applicability to the research question, 56 documents were found. The programs Biblioshiny and VOSViewer were used to analyze the documents. The data is in the format of a CSV file. Additionally, the VOSViewer and Biblioshiny programs were used to process and analyze this data in order to examine the trends in ethnoscience research in higher education.



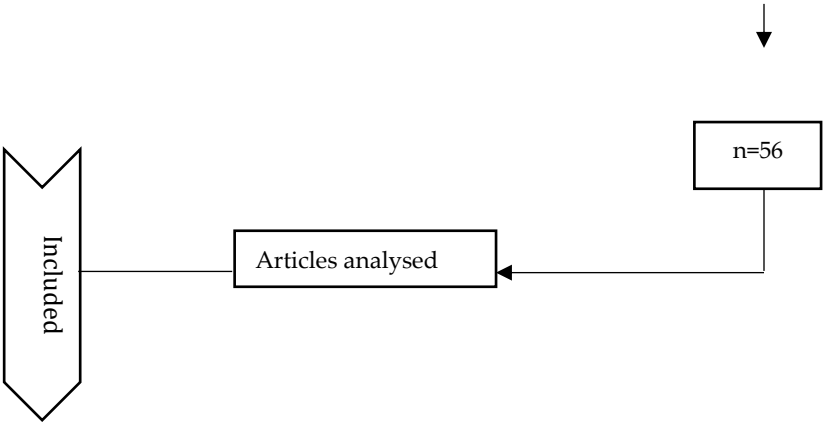


Figure 2. Document Search Steps for Systematic Literature Review Analysis

DISCUSSION

1. Profile of ethnoscience publication outputs in science education from 2019-2023

   The profile of ethnoscience publications in science education at higher education institutions from 2019-2023 can be seen in Figure 2.

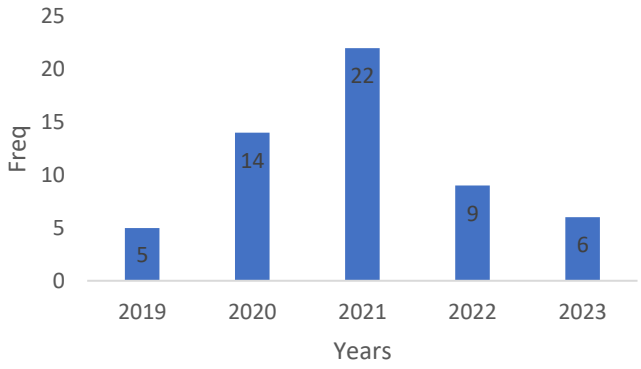


Figure 3. Number of Ethnoscience Research Publications in Science Education at Higher Education Institutions from 2019-2023

Figure 3 shows that the number of publications on ethnoscience in higher education from 2019-2023 was highest in 2021, marking the most productive year for researchers publishing on this topic. Starting in 2022, there has been a decline. This decline can likely be attributed to the significant impact of the COVID-19 pandemic on education. As a result, researchers have shifted their focus more toward technology as a research topic. Technology and artificial intelligence appear to be trending research areas recently. As explained

in Fatimah et al.'s study, research published in the Scopus database on STEM topics related to artificial intelligence has seen a sharp increase, especially in the past ten years (Fatimah et al., 2024). The trend in ethnoscience research through Scopus database searches, as conducted by Iskandar et al., also indicates that the trend in ethnoscience over the ten years prior to 2021 indeed showed an increase (Iskandar et al., 2022). It is also evident in this study that the trend in this topic saw an increase from 2019-2021.

2. Distribution of ethnoscience publications in science education across countries and affiliations worldwide.

The productivity of countries and affiliations worldwide in publishing ethnoscience research at higher education institutions can be seen in Figure 2 and Figure 3.

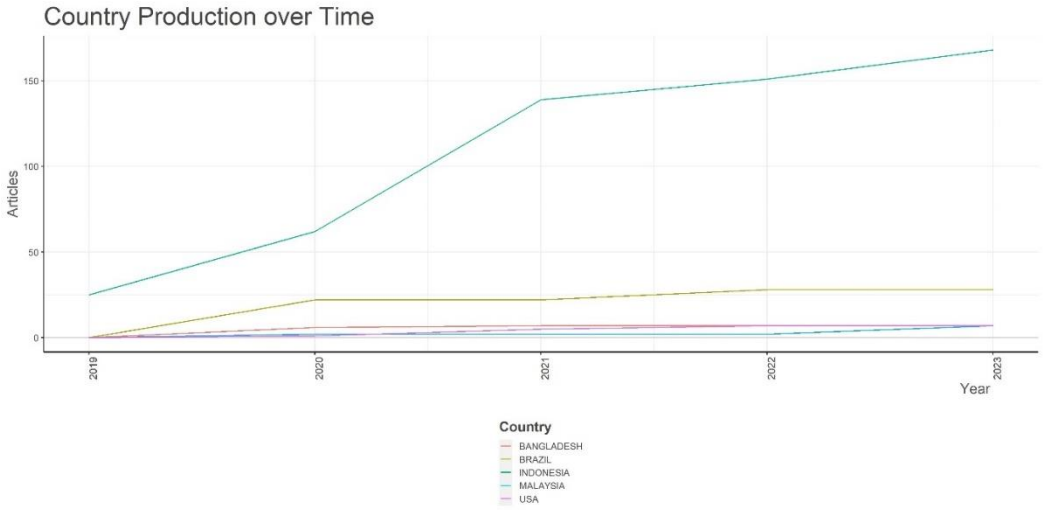


Figure 4. Number of ethnoscience publications by country in the world

Figure 4 shows that Indonesia ranks first as the most productive country in publishing ethnoscience research at the higher education level. Indonesia is a country with a vast amount of local wisdom. Each region has its own local wisdom that can be incorporated into science education. According to the 2023 Cultural Statistics data from the Ministry of Education, Culture, Research, and Technology, in 2022, Indonesia had 11,622 cultural heritages, with 1,728 having been officially recognized. In 2023, the number of officially recognized cultural heritages increased to 1,941 (Kemdikbudristek, 2023). This data

demonstrates that the abundance of cultural heritage in Indonesia attracts significant attention from researchers, encouraging them to explore it further as a subject of study in education. This result also impacts the most productive affiliations, the majority of which are from Indonesia (see Figure 5).

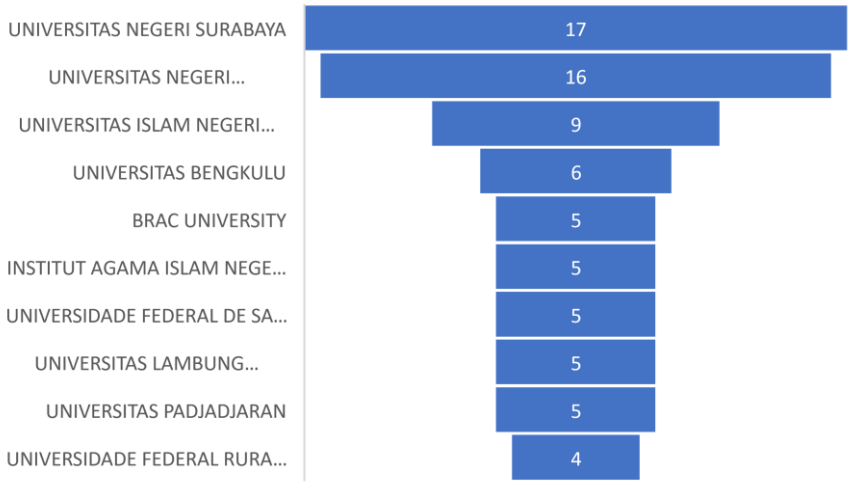


Figure 5. Number of Ethnoscience Publications in terms of Affiliation

Figure 5 shows that Universitas Negeri Surabaya is the most productive affiliation in ethnoscience research at the higher education level, with 17 documents. Universitas Negeri Semarang ranks second with 16 publications. An interesting finding in this research trend is that there are two affiliations from Brazil that are quite productive in conducting ethnoscience research: Universidade Federal De São Paulo (UNIFESP) and Universidade Federal Rural De Pernambuco. In Brazil, there has been significant research on the importance of natural resource conservation, which has led to efforts in preservation, thereby increasing attention to the potential and local wisdom present in the country (Da Silva Ladislau et al., 2021; Diegues, 2014).

3. Visualization of the results of ethnoscience publication trends in science learning in 2019-2023.

The following are the results of thematic networking using VosViewer. It is known that the topic is divided into five clusters which are indicated by different colors.

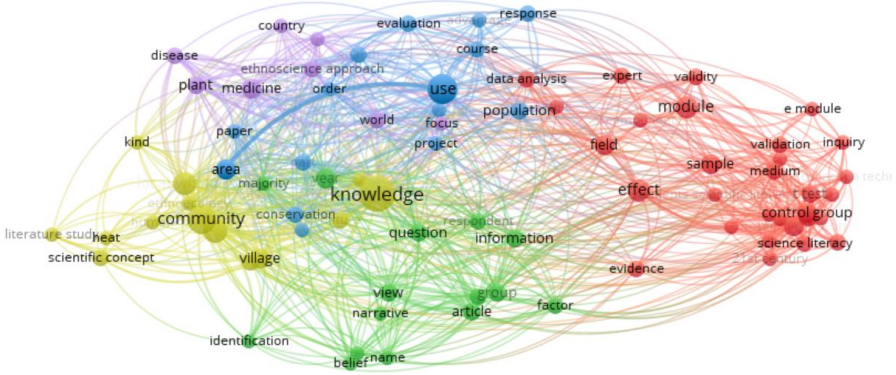


Figure 6. Thematic network of ethnoscience research in higher education institutions

Figure 6 illustrates the thematic network of ethnoscience research at the higher education level with various themes. In the yellow cluster, there is a connection between ethnoscience and local wisdom in the region, communities. The red cluster relates to the impact of ethnoscience on learning, such as science literacy achieved through various research types. The blue cluster relates to learning that can be done using projects. The purple cluster relates to the content of local potential studied, such as plants, medicines, and so on.

4. The Impact of Ethnoscience on Science Learning in Higher Education

Ethnoscience has been shown to have a positive influence on students' abilities and skills. The analysis results indicate that the most significant impact of ethnoscience learning in education is on science literacy. There are 7 publications showing that ethnoscience is used as an approach to enhancing students' science literacy (Atmojo, 2021; Fathonah & Subali, 2020; Hastuti, 2019; Rusilowatil, 2021; Sholahuddin, 2021; Subali, 2023; Yuliana, 2021). Furthermore, critical thinking skills are also extensively researched by scholars applying ethnoscience (Gunawan & Nurosyid, 2019; Sarwi et al., 2021; Utaminingsih, 2021)

CONCLUSION

The research findings indicate that ethnoscience learning in higher education remains a popular teaching approach among science educators. Improvisations are made, such as integrating ethnoscience with teaching models, as an effort by educators to innovate ethnoscience learning. Some impacts of

ethnoscience learning for students include increased conceptual understanding, scientific literacy, motivation, entrepreneurial character, conservation character, critical thinking ability, creative thinking ability, problem-solving skills, and communication skills. Reviewing the many impacts that exist from the use of ethnoscience, the recommendation in this research is that the ethnoscience approach can be applied in science learning in higher education.

REFERENCES

Atmojo, S. E. (2021). Improving Science Literation and Citizen Literation through Thematic Learning Based on Ethnoscience. *Journal of Physics: Conference Series*, *1823*(1). https://doi.org/10.1088/1742-6596/1823/1/012001

Bonilla-Chaves, E. F., & Palos-Sánchez, P. R. (2023). Exploring the Evolution of Human Resource Analytics: A Bibliometric Study. *Behavioral Sciences*, *13*(3), 244. https://doi.org/10.3390/bs13030244

Chaijalearn, Y., Ratchawet, A., Sappan, P., Thanaparn, N., Kaensongsai, J., & Intharawiset, T. (2023). Development of Local Wisdom-Based Science Learning Innovation to Promote Creative Problem-solving Skill: Case Study Chessboard Game of Mueang Kung Pottery, Chiang Mai. *Journal of Curriculum and Teaching*, *12*(3), 58. https://doi.org/10.5430/jct.v12n3p58

Da Silva Ladislau, D., Leao De Souza, P., Rocha Aride, P. H., Teixeira De Oliveira, A., & Andre Gubiani, E. (2021). Current situation and future perspectives of ethnoichthyology in Brazil. *Ethnobiology and Conservation*. https://doi.org/10.15451/ec2020-11-10.09-1-35

Diegues, A. C. (2014). The role of ethnoscience in the build-up of ethnoconservation as a new approach to nature conservation in the tropics: The case of Brazil. *Revue d'ethnoécologie*, *6*. https://doi.org/10.4000/ethnoecologie.1956

Fathonah, S., & Subali, B. (2020). The analysis of ethnoscience-based science literacy and character development using guided inquiry model. *J. Phys. Conf. Ser.*, *1567*(2). Scopus. https://doi.org/10.1088/1742-6596/1567/2/022045

Fatimah, S., Sarwi, S., & Haryani, S. (2024). Artificial Intelligence in STEM Education: A Bibliometric Analysis. *International Journal of Multicultural and Multireligious Understanding*, *11*(1), 186–200.

Grillenberger, A., Przybylla, M., & Romeike, R. (2016). Bringing CS innovations to the classroom using the model of educational reconstruction. *Proceedings of ISSEP*, 31–39.

Gunawan, Y. Y., & Nurosyid, F. (2019). The analysis of students' critical thinking skill through ethnoscience instruction integrated on the topic of magnetic field. In Indriyanti N.Y., Ramli M., & Nurhasanah F. (Eds.), *AIP Conf. Proc.* (Vol. 2194). American Institute of Physics Inc.; Scopus. https://doi.org/10.1063/1.5139765

Hastuti, P. (2019). Integrating Inquiry Based Learning and Ethnoscience to Enhance Students' Scientific Skills and Science Literacy. *Journal of Physics: Conference Series*, *1387*(1). https://doi.org/10.1088/1742-6596/1387/1/012059

Iskandar, H., Sudarmin, S., Susilo, S., & Aji, M. P. (2022). How Research Trends On Ethnoscience In Science Learning? A Systematic and Scoping Review Of Empirical Studies. *ISET: International Conference on Science, Education and Technology*, 474–483.

Jannah, R., Festiyed, F., Yerimadesi, Y., Lufri, L., & Putra, S. (2022). Ethnoscience in Learning Science: A Systematic Literature Review. *Scientiae Educatia*, *11*(2). https://doi.org/10.24235/sc.educatia.v11i2.11488

Kemdikbudristek. (2023). *Statistik Kebudayaan 2023*. Kemdikbudristek.

Khusniati, M. (2014). MODEL PEMBELAJARAN SAINS BERBASIS KEARIFAN LOKAL DALAM MENUMBUHKAN KARAKTER KONSERVASI. *Indonesian Journal of Conservation*, *3*(1), 67–74.

Kulakli, A., & Osmanaj, V. (2020). Global Research on Big Data in Relation with Artificial Intelligence (A Bibliometric Study: 2008-2019). *International Journal of Online and Biomedical Engineering (iJOE)*, *16*(02), 31. https://doi.org/10.3991/ijoe.v16i02.12617

Ogawa, M. (1986). Toward a new rationale of science education in a non-western society. *European Journal of Science Education*, *8*(2), 113–119. https://doi.org/10.1080/0140528860800201

Rusilowatil, A. (2021). Development of integrated teaching materials vibration, wave and sound with ethnoscience of bundengan for optimization of students' scientific literation. *Journal of Physics: Conference Series*, *1918*(5). https://doi.org/10.1088/1742-6596/1918/5/052057

Sari, F. P., Maryati, M., & Wilujeng, I. (2023). Ethnoscience Studies Analysis and Their Integration in Science Learning: Literature Review. *Jurnal Penelitian Pendidikan IPA*, *9*(3), 1135–1142. https://doi.org/10.29303/jppipa.v9i3.2044

Sarwi, S., Nisa, G., & Subali, B. (2021). An analysis of critical thinking skill and interpersonal intelligence in the development of ethnoscience-based teaching material salt production. *J. Phys. Conf. Ser.*, *1918*(5). Scopus. https://doi.org/10.1088/1742-6596/1918/5/052060

Sholahuddin, A. (2021). Project-based learning on ethnoscience setting to improve students' scientific literacy. *AIP Conference Proceedings*, *2330*(Query date: 2023-10-08 09:37:13). https://doi.org/10.1063/5.0043571

Snively, G., & Corsiglia, J. (2000). *Discovering indegenous Science: Implication for Science Education*. John Wiley & Sonsc, Inc.

Subali, B. (2023). Indonesian national assessment support: Can RE-STEM Android app improve students' scientific literacy skills? *International Journal of Evaluation and Research in Education*, *12*(3), 1399–1407. https://doi.org/10.11591/ijere.v12i3.24794

Sudarmin, S., & Pujiastuti, S. E. (2015). Scientific Knowledge Based Culture and Local Wisdom in Karimunjawa for Growing Soft Skills Conservation. *International Journal of Science and Research*, *4*(9), 598–604.

Utaminingsih, S. (2021). Improving Critical Thinking Ability through Discovery Learning Model Based on Patiayam Site Ethnoscience. In Sari M.W. (Ed.), *J. Phys. Conf. Ser.* (Vol. 1823, Issue 1). IOP Publishing Ltd; Scopus. https://doi.org/10.1088/1742-6596/1823/1/012104

Wati, E., Yuberti, Saregar, A., Fasa, M. I., & Aziz, A. (2021). Literature Research: Ethnoscience in Science Learning. *Journal of Physics: Conference Series*, *1796*(1), 012087. https://doi.org/10.1088/1742-6596/1796/1/012087

Wei, Y., Zhang, Q., Guo, J., & Chen, M. (2023). Learning to teach through noticing: A bibliometric review of teacher noticing research in mathematics education during 2006–2021. *Humanities and Social Sciences Communications*, *10*(1), 218. https://doi.org/10.1057/s41599-023-01718-7

Yang, L., Sun, T., & Liu, Y. (2017). A Bibliometric Investigation of Flipped Classroom Research during 2000-2015. *International Journal of Emerging Technologies in Learning (iJET)*, *12*(06), 178. https://doi.org/10.3991/ijet.v12i06.7095

Yuliana, I. (2021). The effect of ethnoscience-themed picture books embedded within contextbased learning on students' scientific literacy. *Eurasian Journal of Educational Research*, *2021*(92), 317–334. https://doi.org/10.14689/ejer.2021.92.16

Zidny, R., Sjöström, J., & Eilks, I. (2020). A Multi-Perspective Reflection on How Indigenous Knowledge and Related Ideas Can Improve Science Education for Sustainability. *Science & Education*, *29*(1), 145–185. https://doi.org/10.1007/s11191-019-00100-x