

How Research Trends On Ethnoscience In Science Learning? A Systematic and Scoping Review Of Empirical Studies

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Abstract. The science education curriculum in Indonesia is concerned with cultural characteristics local so that it can be used as a potential to develop education in several regions. The increase in scientific research integrated with local culture is called ethnoscience. Thus, it's miles essential to understand the development tendencies of research on ethnoscience in activity science learning. The kind of research used in this research is a systematic literature review of ethnoscience in activity science learning. In this literature review, we analyzed 60 articles published from 2010 to 2020 and indexed on the web of science. The results of the study indicate that there are still several objects or research studies that have not been studied by researchers regarding the ethnoscience approach in activity science learning. Even though the quantity of research has increased, the amount continues to be small, with most tracking results 2020 as many as 18 articles. Most researchers on the ethnoscience approach in science learning are still dominated by researchers from Indonesia who have published in the journal of physics. In terms of the subject matter studied, the physics subject matter was the largest among chemistry and biology subjects, although the difference was not large. Data analysis using the NVivo application to know the ethnoscience research gap in science learning, it is found that there is still a chance to develop a learning model based on local culture and learning media that is integrated with other appropriate approaches.

Key words: Ethnoscience; Local Wisdom; Science Learning; NVivo Application.

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INTRODUCTION

In the curriculum at various levels, character and culture education has become an important issue, especially in developing students' skills to solve problems in everyday life and carry out their roles in the future (Chang & Munoz, 2016). In general, education produces a generation of professionals and quality citizens, where it is not only the generation that knows but also a willingness to always learn and have personal abilities and values (Arthur & Wilson, 2010). Furthermore, in particular, schools have a role in building student character and culture, so that the development of future generations holistic in terms of character, culture, and future competencies or skills are an important part of the educational process.

Character, culture, and future competencies can be obtained by implementing science subjects. The science education curriculum in Indonesia has concerned with the characteristics of the local culture so that it can be used as a potential for developing education in several regions. Science learning can be viewed from a cultural and scientific context based on a multicultural perspective (Sudarmin, 2015). Multiculturalism can be the right tool to reflect on

science education and improve the quality of science learning in the classroom (Ogawa, 1995). Therefore it is interesting to develop the next development regarding science learning in terms of a multicultural perspective (integrated ethnoscience).

Ethnoscience covers some scientific disciplines namely ethnobiology, ethnochemistry, ethnoethnophysics, ethnomathematics, ethnomedicine, various indigenous agricultural practices, food processing technologies, and so on (Silvini et al., 2020). The fundamental principle in the aspect of the customary wisdom system is that the basic concepts and practices are described in the environment and cultural dependencies which are reinforced by knowledge, myths, and the supernatural (Abonyi et al., 2014). So it can be concluded that ethnoscience is local wisdom in the form of a social classification system, a natural phenomenon that leads to cultural, physical, and historical thinking. Local wisdom has a scientific explanation called ethics (Abonyi et al., 2014).

The search for ethnoscience research in science education has existed in recent years (Tsai & Wen, 2014; Lee et al., 2009; Teo et al., 2013; Lin et al., 2014; Lin et al., 2019). Based on the results of the analysis of articles conducted in

the form of tabulated data, there has been no detailed discussion about the development of ethnoscience research trends in science learning. Science learning needs to be researched using an ethnoscience approach (Alexander, 2012; Tenopir et al., 2008). In addition, the development of research in the future is very necessary to review articles in certain fields (Tsai & Wen, 2014; Lee et al., 2009; Chang et al., 2010).

Several sciences learning studies involving local culture, namely the learning outcomes (cognitive) of students in rural areas are better than in urban areas (Fasasi, 2017), the teacher provides learning by involving the habits/culture in the environment where they live will challenge students to be actively involved in the classroom (Ibe & Nwosu, 2018), ethnoscience content in learning has a positive effect on students' local cultural awareness (Sudarmin et al., 2018), increasing student interest in science learning (Okwara, 2017), increasing conceptual understanding (Amila et al., 2018), increasing reading interest and scientific literacy (Melyasari et al., 2018), improving the character of caring for the environment/conservation (Sudarmin & Sumarni, 2018), improving students' critical thinking skills (Sudarmin et al., 2018), effective in increasing students' creativity (Khoiri et al., 2018), effectively increasing the scientific literacy of prospective science teachers (Parmin & Fibriana, 2019), increasing students' love for the country (Ardianti et al., 2019), increasing students' understanding of concepts (Helvina et al., 2021), increasing students' scientific skills and scientific literacy (Hastuti et al., 2019), instill entrepreneurial character (Sudarmin et al., 2019), improving student experience (Sudarmin et al., 2019), improve the creative and innovative character of students (Sudarmin et al., 2020).

There is a literature review reviewing the development of ethnoscience research trends in science learning, but processing and analyzing qualitative data is not assisted by applications or software. Therefore, the results of the tabulation of data on the development of ethnoscience research trends in science learning from 2010 to 2020 need to be analyzed using applications or processing software and qualitative data analysis, one of the applications or software that can be used is the NVivo application. This application or software is also used to find research gaps.

In the description that has been presented above, this research focuses on tracing research articles about the ethnoscience approach in

science learning. Tracking is achieved on articles posted between 2010 to 2020. In particular, the focus of this study was carried out to investigate the research that has been of concern to researchers regarding the ethnoscience approach to science learning. Also, analysis is carried out in fields of science such as physics, chemistry, and biology. related to the topic being analyzed or material in the field of science used as a tool in the research stage. This study aims to find out the description of ethnoscience research in science learning which is still little done by other researchers whose analysis is assisted by the NVivo application. The formulation of the research problem is: The number of research publications developing in the ethnoscience approach to teaching science from 2010 to 2020; Countries that have contributed to researching ethnoscience approaches to science teaching from 2010 to 2020; Subjects taught in an ethnoscience approach to science teaching from 2010 to 2020; Research opportunities on ethnoscience approach in science learning as future researchers plan.

METHODS

This research is included in the research is a systematic literature review of ethnoscience in science learning. The use of a systematic literature review because this type of research includes strict criteria in selecting the articles reviewed so as to avoid the subjectivity of the researcher. The procedure for synthesizing this document follows several steps to ensure the validity of the results. Some new issues are explained in detail to facilitate an understanding of the results that can be presented (Fray & Gore, 2020; Sumarni *et al.*, 2020). Research through literature review can provide an overview of the themes studied related to ongoing research (Oakley, 2012). The systematic literature review in this study uses the PRISMA principle (Moher, 2009). The steps include: Identification, Screening, Eligibility, and Including (Moher, 2009). The process of selecting articles can be seen in Figure 1. This research become performed by looking for articles indexed at the web of science with the subsequent criteria: (1) Journals included in science education journals such as International Journal of Science Education (IJSE), Science Education (SE), Journal of Research in Science Teaching (JRST), Indonesian Journal of Science Education (JPPI), and Journal of Physics; (2) Journal entries in the educational research category; (3) Journal writing in English; (4) Journals have a high effect factor.

Tracking using the search engine sciwheel application by combining several keywords. The combination of keywords used includes ethnosience, local wisdom, and indigenous science. So that the articles obtained are more specific to the field of study, word combinations are used. Journals and articles that have been found are shown in Table 1. Articles found through the Sciwheel application are converted into pdf file format after submitting articles using the Zotero application. The article chosen is science learning using an ethnosience approach. does not include book chapters and review articles.

Selection of The Paper for Analysis

The process of selecting this article uses the basis of continuing this process until the saturation point is reached and no new articles are

identified (Arksey & O’Malley, 2005). it can be seen in Figure entering a combination of keywords including 1. After ethnosience, local wisdom, and indigenous science using applications of indigenous science by searching the database of the International Journal of Science Education (IJSE), Science Education (SE), Journal of Research in Science Teaching (JRST), Indonesian Journal of Science Education (JPII), and Journal of Physics. Total articles using these three keywords were found 72 articles. Then, from 72 articles, researchers conducted a review on the title and abstract of the article. This activity is carried out as a basis for selecting articles that are selected according to or not following the predetermined research scope, namely the approach to the ethnosience of learning science. Based on the results of the review, 60 suitable articles were selected

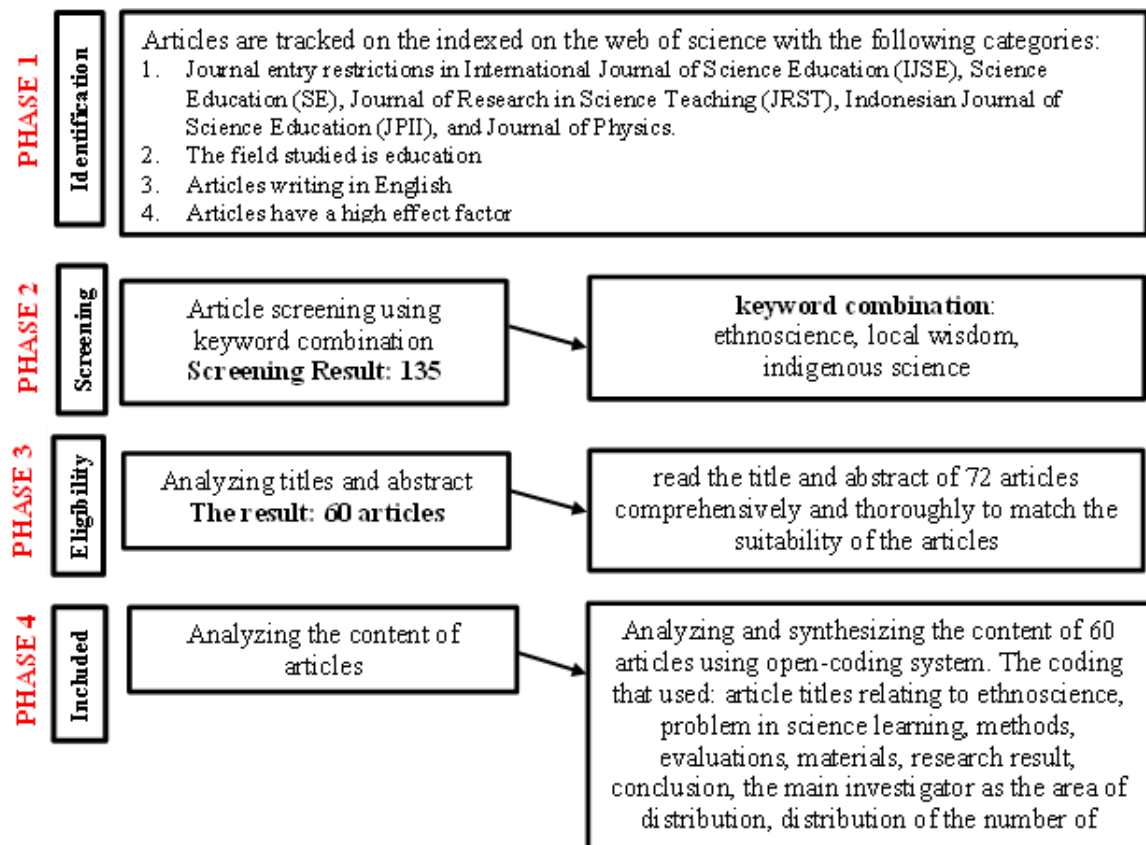


Figure 1. Review Process Chart through Article Selection Flow

Data Extraction

Analyzing and synthesizing the content of 60 articles using an open-coding system. The coding that was used: article titles relating to ethnosience, Methods, evaluations, materials, research results, conclusions, the distribution place of the main researcher, and the obstacle in learning science is the large number of article

distributions. Other criteria used were the distribution area of the main researcher, at the time the article was published (year) how many articles had been distributed, and the name of the journal wherein the article became published. The division of special categories on a number of the topics cited is then displayed in the results.

Table 1. Article search results

Journals	Tracking Results	Matched Tracking Results
International Journal of Science Education (IJSE)	8	6
Science Education (SE)	5	3
Journal of Research in Science Teaching (JRST)	7	4
Indonesian Journal of Science Education (JPII)	14	11
Journal of Physics	38	36
Number	72	60

RESULTS AND DISCUSSION

The focus of this literature review is articles examining the ethnoscience approach to science learning, published in the period 2010–2020 and included in the web of science. Table 1 shows the search results for articles.

The results obtained from the analysis of articles using an ethnoscience approach to science learning, in general, the number of ethnoscience research approaches to science learning is increasing. This can be seen in Figure 2. From 2010 to 2020, there was an increasing trend. Only in 2012 were no articles published on the ethnoscience approach to science learning. Figure 3 shows the publication details of several

journals. Journal of Physics dominates the discovery of articles. every year often, the Journal of Physics publishes most of the papers on the ethnoscience approach to science learning. Furthermore, followed by the Indonesian Journal of Science Education (JPII), International Journal of Science Education (IJSE), Journal of Research in Science Teaching (JRST), and Science Education (SE).

The number of published article data, most researchers from Indonesia are in the Journal of Physics. Researchers conducted the most in 2020 of 18 studies. The ethnoscience approach is very important in science learning, so more research studies are needed (Izzah *et al.*, 2020; Sarwi *et al.*, 2020).

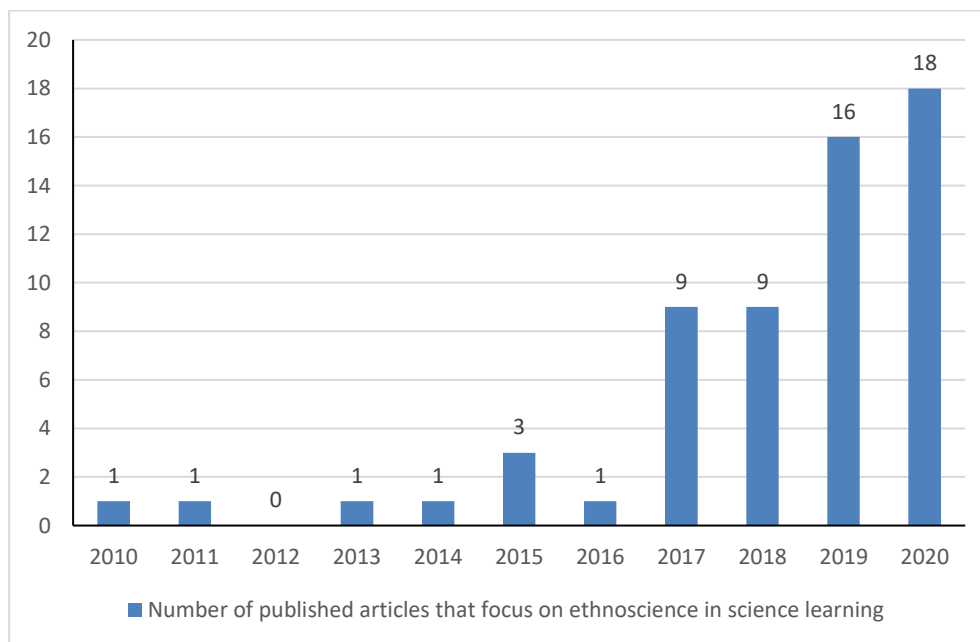


Figure 2. Number of published articles that focus on ethnoscience in science learning

Ethnoscience research on science learning from Indonesia dominates more than in other countries, it can be seen in Figure 4. From 2010 to 2020, 48 research articles from Indonesia dominated the most. The United States and

Nigeria dominate as the second largest countries in research related to ethnoscience in science learning. According to the country of origin, the distribution of research that focuses on ethnoscience research in science learning is very

small. the focus of research on ethnoscience in science learning by researchers from several countries in the world. In this research there are several cases that can be obtained.

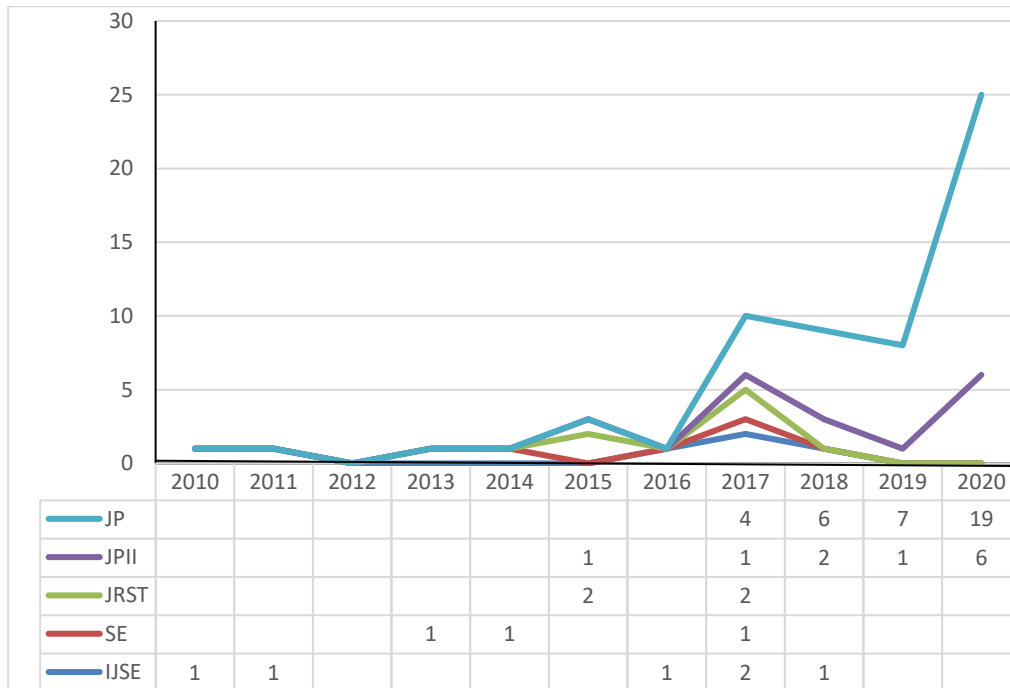


Figure 3. Number of Articles Published in Each Journal and Ethnoscience Focus on Science Learning Research

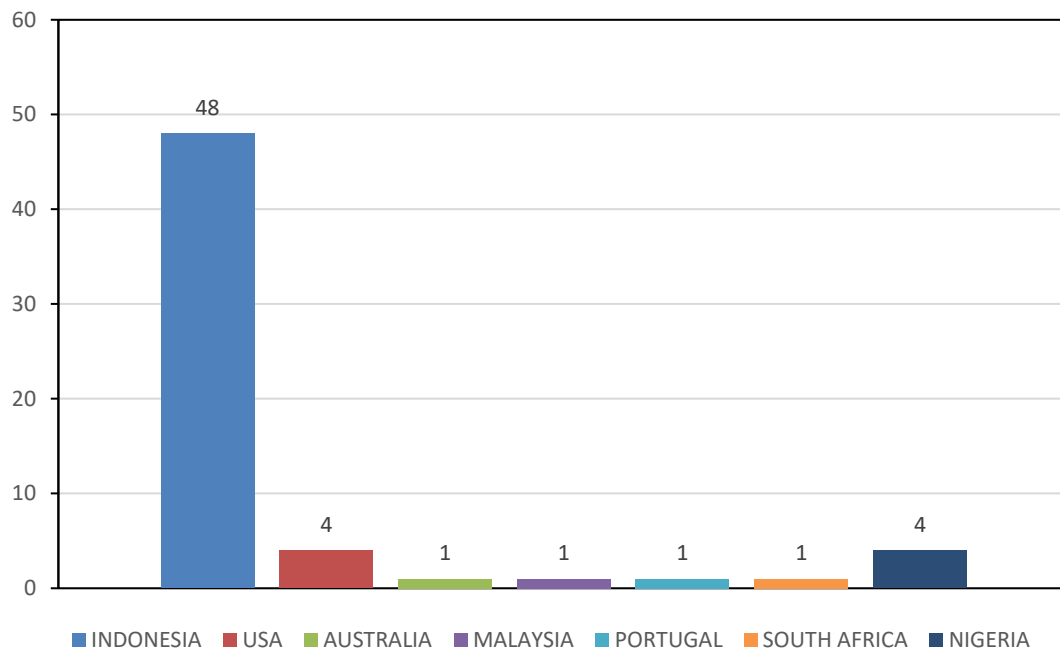


Figure 4. Number of Countries of Origin for Principal Researchers Focusing Ethnoscience on Science Learning Research

Table 2. Topics covered in each subject

Subject	The Topic
Chemistry	Chemical changes, electrolyte solution, secondary metabolites, properties of water molecules, Synthesis of organic compounds, chemical reactions, electrochemistry, photochemistry, chemical kinetics, thermochemistry, chemical environment, an oxidative reaction
Biology	Biodiversity, ecology, microorganisms, genetics, cells, wild animals, respiration, cardiovascular system, biomolecular
Physics	Kinematics, dynamics, heat transfer, electrostatic, density, hydrostatic pressure, heat, light, energy transfers, global warming, energy, wind power, tides

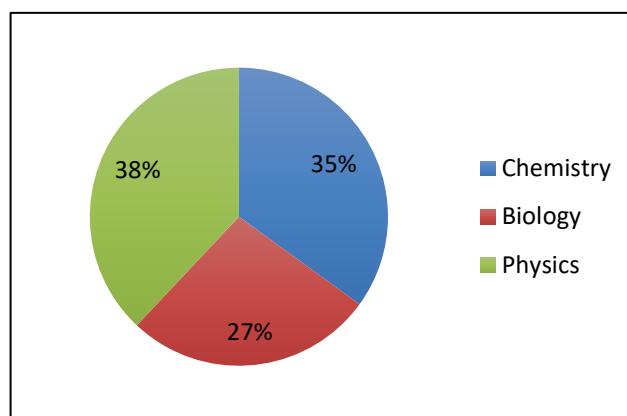


Figure 5. The proportion of study Subjects

In Table 2, it can be seen that the subject of chemistry dominates the number of topics discussed. Mostly, research about ethnosience in science learning is done in Physics study subjects as much as 38% (Figure 5). Also, research was conducted on the subject of Chemistry lessons, as much as 35%. In biology subjects only 27%. Based on this material, related to ethnosience research in science learning, there are still some materials that are not discussed further.

The metadata obtained were 60 articles, then the analysis was carried out using the NVivo

application to find gaps in ethnosience research in science learning. Search results using the NVivo application with a minimum length, and cluster analysis are obtained as shown in Figure 6. The purpose of the cluster analysis is the integrated variable followed by the activities, development, environment, and traditional variables. The technology variable is followed by the achievement and instructional variables. Meanwhile, the development variable is followed by cultural and experiences variables.

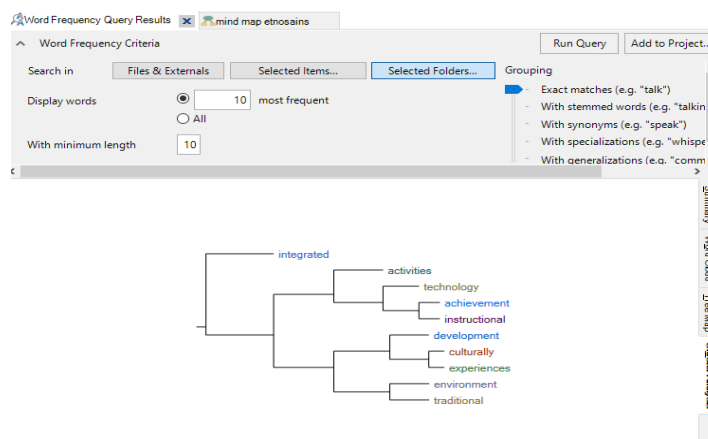


Figure 6. Cluster analysis with NVivo application

When viewed from the tree map and word cloud (Figures 7 and 8) using the NVivo application. Ethnoscience articles here often use the word integration of one approach with another approach, one example of which is the ethnoscience approach with the STEM or Ethno STEM approach and most types of research are development research. for example, Development of instruments with an Ethno STEM approach that students are expected to be responsive to

technology and local wisdom (Reffiane, 2020), through the ethno STEM integrated project-based learning model, students can produce creative products and grow entrepreneurial characters (Sudarmin *et al.*, 2019), learning models on the topic of STEM integrated essential oils can improve learning outcomes and increase student experience (Sudarmin *et al.*, 2019).

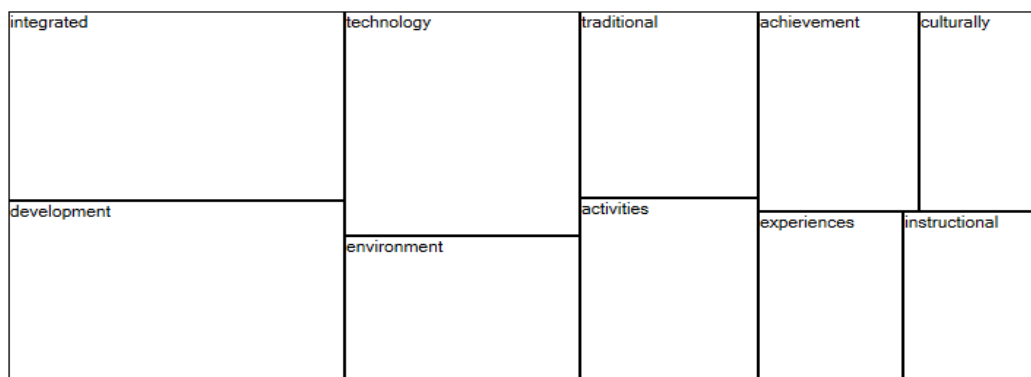


Figure 7. Treemap with NVivo application



Figure 8. Word Cloud with NVivo application

Treemap and Word Cloud with NVivo application in Figures 7 and 8. The words that often appear are integrated and development, this means that ethnoscience research in science learning has used this variable a lot. However, it is still feasible to integrate it with slightly emerging words, namely instructional and culturally. Because the instructional variable here is part of the technology variable, it means that the learning media used when applying the ethnoscience approach to science learning, while the culturally variable here is part of the development variable, it means that learning activities involving culture-based learning models are still low in applying the approach. ethnoscience in science learning. so it would be

very good if the development of learning models based on local culture and learning media are integrated with other appropriate approaches. Research opportunities on ethnoscience approach in science learning as future researchers plan.

CONCLUSION

This research provides information that most researchers with an ethnoscience approach in science learning are still dominated by researchers from Indonesia who have published in physics journals. In terms of the subject matter studied, the subject matter of Physics is mostly between chemistry and biology subjects, although the difference is not too big. Metadata using the NVivo application can be used to find out

opportunities for ethnoscience research in science learning, it is known that there are still opportunities to develop learning models based on local culture and learning media that are integrated with other appropriate approaches. This research is limited to articles that use an ethnoscience approach to science learning in the 2010 to 2020 range and only to five reputable indexed journals that frequently publish articles in the field of science learning. So the next research should be able to do on a longer range of research and in other reputable indexed journals that are representative. In addition, it is suggested that researchers can also use applications other than the NVivo application to get the best metadata. This study is expected to provide an overview of metadata using the NVivo application on the ethnoscience approach in science learning and research opportunities that can be carried out in future research.

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