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Ethnoscience Studies Analysis and Their Integration in Science Learning: Literature Review

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Abstract: Ethnoscience is a learning approach related the actual knowledge of the community to scientific knowledge. This article aims to analyze the study of ethnosciences and their integration with science learning for the last five years published in journals indexed by SCOPUS and SINTA This is qualitative research using a literature review of 20 articles selected based on the paper classification form (PCF). Ethnoscience Learning can be related with culture and local wisdom to the local environment. The results of the paper classification form for research in the field of science, physics, chemistry, and biology. Analysis results show that ethnoscience learning can be integrated with other learning approaches and models, such as contextual, collaborative learning, context-based learning, direct instruction, problem-based learning, and project-based learning. Based on this study, the application of ethnoscience learning can train, improve, and provide a positive effect on competencies in the 21st century, such as critical thinking, creativity, generic science skill, concepts understanding, character, chemical literacy, and scientific literacy.

Keywords: Ethnoscience; Learning; Science

Introduction

In the 21st century, development of science, technology and information takes place quickly and full of competition. The rapid growth triggered the fast flow of globalization. The current globalization can erode cultural values and local wisdom so that students will lose their Identity in the future (Puspasari et al., 2019). One example of the negative impact of globalization is the declining quality of nationalism affected by foreign cultures and gadgets (Asra & Akmal, 2021). Indonesian government, especially ministry of education is challenged to design and develop various supporting competencies (Sudarmin et al., 2019).

Related to this, character education is a priority in curriculum implementation, especially the 2013 curriculum. Schools have instilled some character's, include mutual cooperation, independence, integrity, religion, and nationalism, which can be done by planting trees, disposing of trash in its place, discipline, and love of Indonesian culture (Astuti et al., 2019). The growing character and love local culture can also be done through ethnoscience learning (Hadi et al., 2019). The particular challenge in implementing ethnoscience learning is many student don't understand their local culture (Putri & Ananda, 2020). In the curriculum development, ethnoscience learning is also in line with the implementation of the latest curriculum, the independent curriculum which targets the Pancasila students profile who have an understanding and love of the local wisdom of archipelago culture (Genisa et al., 2020).

Ethnoscience is a more technical term than indigenous knowledge, native science, although the term of ethnoscience is still being debated (Zidny & Eilks, 2022). However, indigenous knowledge is influential in education, where a number of countries have integrated indigenous knowledge into the school curriculum, including Africa, United States, Aotearoa New Zealand, Australia, and Canada (Aikenhead & Michell in (Desmarchelier, 2020)). Including indigenous knowledge in the science curriculum is not wrong,

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because the Indigenous ways of living in nature, has its own culture and it's a theory-laden (Handayani, Wilujeng, & Prasetyo, 2018).

Related to this, research on optimizing ethnoscience-based learning can be integrated with learning models, strategies and approaches. This article will review the integration of ethnoscience-based learning in Indonesia which was published in Scopus and Sinta indexed journals from 2018-2023.

Method

This research is a systematic literature review research. That Systematic review is a transparent method for finding, determining, selecting, and synthesizing sources information from published empirical evidence so as to be able to answer the research questions to be conducted (Afikah, Astuti, Suyanta, Jumadi, & Rohaeti, 2022). The keywords used in the search for articles in the SCOPUS and SINTA was ethnoscience. The article search was limited from 2018 to 2023, with 20 articles. Article search using the paper classification form (PCF) technique. The results of the analyzed article criteria can be seen in Table 1.

Table 1. Article Criteria

Type of publication	Articles published in journals
Keywords	Ethnoscience in learning
Journal specifications	International journals indexed by Scopus National journals indexed by at least Sinta 2
Year published	2018-2023
Research site	Indonesia
Field	Science, physics, chemistry, biology
Access	*Open access*

Based on the paper classification form technique that has been used, 20 articles were obtained, with details in Table 2.

Table 2. Details of Articles

Index/ rank	Name	Keywords
Scopus/ Q2	Journal of Turkish Science Education	Contextual collaborative learning, ethnoscience, scientific literacy. Test development, PSETI, ethnoscience, context, preservice, teachers
Scopus/ Q3	Eurasian Journal of Educational Research	context-based learning, ethnoscience, picture books, primary school students, scientific literacy
Scopus/ Q2	Education sciences	context-based learning; socio scientific issues; indigenous science; sustainability; education for sustainable development; systems thinking
Scopus/ -	Universal Journal of Educational Research	Ethnoscience, Direct Instruction Model, Critical Thinking Skill, Intensity and Intensity Level
Scopus/ Q3	International journal of learning, teaching and educational research	Critical thinking skills, ethnoscience, inquiry-creative learning, prospective science teachers, traditional teaching
Scopus/ Q2	Jurnal Pendidikan IPA Indonesia	chemistry learning, ethnoscience, scientific literacy problem-based learning, ethnoscience, generic science skills, green chemistry, learning outcomes
Sinta/ S1		
Sinta 2	Journal of innovation in educational and cultural research	Cognitive learning outcomes, colloids, ethnoscience, PjBL, scientific literacy
Sinta 2	Edusains	Chemistry learning; colloid; ethnoscience; local wisdom; scientific literacy
Sinta 2	Jurnal Penelitian Pendidikan IPA	Development; worksheets; Ethnoscience; Student Creativity Ethnoscience; critical thinking; culture. Student worksheet learning tools, ethnoscience, science literacy Development, worksheets, ethnoscience, student creativity
Sinta 2	Jurnal Ilmiah Pendidikan Fisika Al Biruni	creativity thinking, ethnoscience in physics, revolution 4.0 era
Sinta 2	Journal of Education and Learning (Edulearn)	Ethnoscience, Heat material, Learning set of phisics
Sinta 2	Journal of Innovation in Educational and Cultural Research	conceptual understanding, ethnoscience, project based learning
Sinta 2	Jurnal Prima Edukasia	textbook, ethnoscience, basical science concepts
Sinta 2	Journal of Education, Teaching and Learning	Digital Pocket Book; Ethnoscience; Literacy Science

The ethnoscience research in learning was mostly carried out in 2021 and 2022, namely as many as sci journal articles. In 2020 there were four journal articles discussing ethnoscience and three journal articles in 2019. Meanwhile, the minor research in 2018 and 2023 was one study. Based on the paper classification form with various restrictions that have been made, only 21 journal articles with the topic of ethnoscience were obtained. This is because the majority of researchers use the term local wisdom or what is commonly called local wisdom, local potential, and indigenous knowledge.

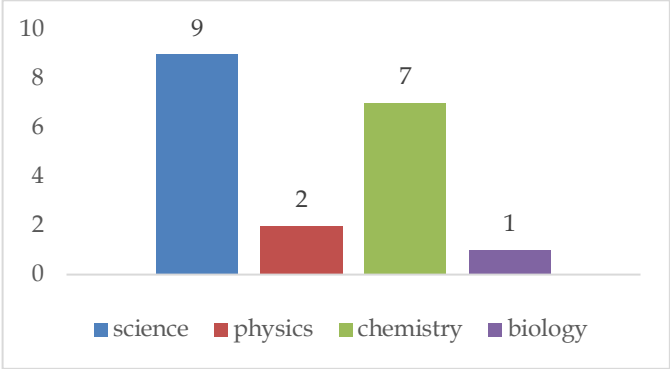

Figure 1. Graph of Ethnoscience Research Field

Result and Discussion

Learning with an ethnoscience approach is a process of teaching and learning activities combining certain materials with the local environment and culture to make learning more meaningful (Fahrozy et al., 2022). In general, the purpose of applying ethnoscience in learning is to introduce and understand the environment and local culture, have a positive impact with the existence of skills and expertise that support local culture, have an attitude that is by noble values, can shape the character of a nation, and preserve and maintain culture (Akmal et al., 2021).

In ethnoscience learning, scientific science knowledge was reconstructed based on local culture and wisdom. In this process, knowledge was transformed in the form of perceptions, concepts, habits, facts, and principles into described knowledge. It means there wa a process of transformation of validation activities and standardization of scientific terms, conceptualization, descriptions, and declarative. With this process, there were several principles in ethnoscience learning, such as the relationship between culture and science that was the object of research, the existence of actual knowledge of the science of society that will be studied so that learning was more meaningful and valuable in everyday life, the presence of actual scientific understanding of culture and common sense that has a place in science learning, the existence of a methodology connected conventional knowledge to knowledge scientific, as well as the presence of original expertise such as the phenomenological understanding of the universe.

In the last lustrum, ethnoscience research has become a trend in learning, especially in natural sciences such as science, physics, chemistry, and biology. This is because natural science is very close to daily life, including culture, local wisdom, and local potential. To be clear, the percentage of fields of study of the natural sciences that have become the trend of ethnoscience research in the last one lustrum can be seen in Figure 1.

Ethnoscience learning in the field of science get nine articles, In chemistry get seven articels, Meanwhile, they get minor rates in physics and biology. The field of science and chemistry receives the most significant percentage because science and chemistry are applicable in everyday life, both in product manufacturing, cultural involvement, and local wisdom.

The types of research used to analyze articles on ethnoscience learning are vary, for example, applying the kinds of R&D (research and development) and quantitative and qualitative research. The most used method is R&D, with a percentage of 37%. This is because teaching materials, teaching media, and ethnoscience-based learning tools are not easy to find in the bookstore, so researchers more often develop their ethnoscience learning with Addie development models (analysis, develop, design, implementation, and evaluation) and 4D (define, design, develop, disseminate). In R&D research, researchers developed various variations of learning support such as student worksheets, modules, KITS, digital pocketbooks, teaching materials, and even picture books where each material developed was inserted ethnoscience in it. Meanwhile, quantitative research reached 44%, with the average researcher using a pre-experimental design with a quasi-experimental type. The distribution of ethnoscience research samples was relatively evenly distributed, from elementary school students to middle schools, both junior high and high school, to students in college.

Ethnoscience Objects in Learning

The ethnoscience used in learning can be related with their environment. Table 3 showed an example of an ethnoscience object used in education according to the results of paper classification.

Table 3. Details of Examples of Ethnoscience Objects Used in Learning

Category	Example
Local food	*Gatot & tiwul, pudak, terasi, serabi, poteng reket,* shrimp paste, smoke fish, milkfish
Local wisdom of the environment	Carica plants, tobacco, banana, agriculture
Culture	*Sasak Sade* village, *bau Nyale, tenun sesek, gendang beleq, mamaq, ulos waven fabric*

Based on the Table above, most researchers integrate learning with ethnoscience in the form of specialties of a particular region. Typical local foods are snacks or cuisine native to the area and are characteristic. Local regional snacks are one type of typical food. Where local, and regional snacks are straightforward to find in the community. Where their manufacture always involves science materials so that students can easily find the meaningfulness of learning materials (Tyas et al., 2020).

There is research about local food like *gatot & tiwul,* a typical Central Javanese food made from cassava. The ethnoscience of *gatot & tiwul* is connected with various chemical concepts such as photosynthesis, chemical reactions, carbohydrates, evaporation, monosaccharides, and disaccharides. The other research using *pudak* cake is a typical East Java Gresik cake made from rice flour and coconut milk wrapped in betel nut leaf fronds (*ope*) which are included in learning materials for changes in form, digestive organs, and natural resources. In the process of making *pudak* cakes, when ingredients are mixed, such as rice flour, sugar, and coconut milk, there is a change in the form of solid to liquid substances (Yuliana, Cahyono, Widodo, & Irwanto, 2021). After the dough ingredients are perfectly flattened, the dough is put into the fronds of the betel nut leaves and steamed. In the steaming process, there is an event of a permanent change in the form of a liquid to a solid substance.

There is research use shrimp paste related to buffer material (Dewi et al., 2019), *serabi* cakes where in their manufacture they use durian leaf extract as a developer and are related to compound materials (Andani et al., 2020), and "*poteng reket*" which is a typical snack of the Sasak Tribe made of glutinous rice and fermented, so that the manufacturing process involves conventional biotechnology materials (Hikmawati et al., 2021).

Ecological wisdom is knowledge gained from the abstraction of the experience of active adaptation to a typical environment to manage the environment wisely and sustainably. This is following the function of local wisdom, namely the conservation and preservation of natural resources. The local wisdom can be obtained in carica plant (Khoiri et al., 2019). The carica plant is a type of plant just grown in Wonosobo. This is due to the differences in the plateau and the characteristics in Dieng. Dieng is a highland area located on the island of Java with an altitude of up to 2400 meters above sea level. Anoter plant widespread in the Wonosobo area is tobacco and bananas. The existence of several examples of local wisdom in the environment can be used to hone students' creative thinking skills.

In addition to the typical food and local wisdom of the environment, ethnoscience learning can also be integrated with the local culture. Culture can be interpreted as a symbol that applies to a particular society. Concern for culture is a character value related to how students deal with a changing environment. One example of using of local culture as ethnoscience learning carried out by Hikmawati et al. (2021), about "Sasak Sade Village, Nyale smell tradition, sesek weaving, beleq drum". These four cultures are characteristic of the Sasak Tribe which was not owned by other tribes. And there is research about the "mamaq" culture, which was a sasak tribal culture to strengthen teeth, in this case related to acid-base matter (Dewi et al., 2019).

Batak ethnoscience that can be used in science learning is woven cloth. Woven cloth is a tradition of the Batak people that is used during traditional ceremonies and other skaral events. At the stage of preparation of materials for making woven fabrics, related to plant classification materials. This is because the manufacturing process requires mahogany bark, jalawe fruit, turmeric, ketapang leaves, shallot skin, teak wood, tingi tree, and indigofera. The second stage is washing yarn and plants related to base molecule material; The third stage is reducing plant size related to solid pressure and extraction material. The next stage is drying which is related to heat transfer material, physical changes, and solar energy. The next step is smoothing turmeric, plant boiling stage, filtering stage, yarn dyeing stage, fixation stage, yarn washing state, and drying stage. All of that is related to the material temperature and its changes, boiling point, filtration, additives, concentration of solutions and molecules, color change, wind energy, ions, elements, compounds, and mixture (Pratama, L, & Sujatmika, 2023).

Based on the description above, we can conclude that ethnoscience learning can be done by combining culture, special foods, and local wisdom of the environment. However, before using the type of ethnoscience used, as researchers and educators, you should study and find links to the learning material to be carried out.

Ethnoscience Integration in Learning

After determining the type of ethnoscience that will be used in learning, researchers and educators can analyze the integration of ethnoscience in their learning. An example of the integration of ethnoscience in learning can be seen in Table 4.

Table 4. Details of Ethnoscience Integration in Learning

Category	Percentage (%)
Ethnosains learning	70
Ethnosains-contextual collaborative learning	5
Ethnosains-context based learning	5
Ethnosains-based direct instruction	5
Ethnosains-problem based learning	5
Ethnosains-project based learning	10
Ethnosains-inquiry creative learning	5

The application of ethnoscience can be applied purely or integrated with others. The pure application of ethnoscience also has a significant impact on improving students' cognitive knowledge, such as the ability to think creatively, scientific literacy, and understanding concepts (Mahyuny, Nursamsu, Hasruddin, & Muslim, 2022; Winarto, Sarwi, Cahyono, & Sumarni, 2022). Ethnoscience is authentic so that students are easier to understand science learning.

The integration of ethnoscience in learning is very diverse. Nevertheles, it is common for researchers to use ethnoscience as learning and integrate it with other learning models with a student-centered approach. For example, in integrating ethnoscience with contextual collaborative learning which is part of learning related material in daily life (contextual) and works together with other students, commonly called as collaboration or context-based learning aimed to make it easier for students to understand and learn about science and direct instruction (Dewi et al., 2021; Yuliana et al., 2021).

Ethnoscience learning can also be integrated with problem-based learning and project-based learning. This is because the phenomena related to the learning material are not escaping a problem, and students must solve these problems using ethnoscience. In problem-based learning, ethnoscience learning can be integrated through various steps such as: 1) determining the relationship between the material to be studied and the background of ethnoscience, 2) determining the real problems to be analyzed using ethnoscience, 3) determining the stages of ethnoscience to be included in the PBL syntax, 4) conservation of ethnoscience from original science knowledge to scientific science, and 5) determining the moral message in ethnoscience to be studied so that learning is more meaningful. PjBL ethnoscience integration can train students to deepen knowledge, apply scientific concepts, connect independent knowledge with scientific knowledge; and increase scientific concepts (Rumansyah, Leny, & Sofia, 2023; Suciyati et al., 2021).

While project-based learning is a learning model used project tasks for students. Example activity of Project-based learning integrated with ethnoscience, among others creating flora and fauna projects as a part of local potential. Implementing Project Based Learning (PjBL) with an ethnoscience approach invited students to learn about the environment through actual activities so students gained hands-on experience, learned science concept concretely based on examples found around them (Ardianti & Raida, 2022).

Variables Influenced By Ethnoscience

The many applications of ethnoscience in learning natural sciences, both in the fields of science, physics, chemistry, and biology, positively impact students' abilities, especially abilities supported 21st-century skills. Figure 2 described variables influenced to ethnoscience learning.

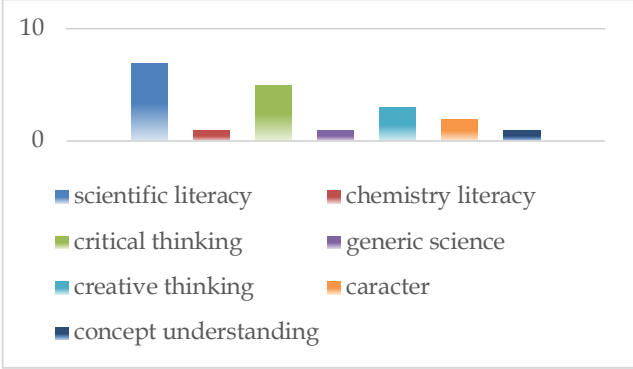

Figure 2. Variables Influenced by Ethnoscience

Based on the graph above, the bound variable widely used and positively impacts to students is science literacy. Because ethnoscience has a close relationship with science literacy. Science literacy is the capability to recognize phenomena, explain, and draw conclusions related to scientific problems, understand science as a science of inquiry, and be actively involved in solving scientific problems (Saraswati el., 2021). Ethnoscience makes it easier for students to understand concepts found in everyday life, connecting experiences in life with learning materials to support students' science literacy in terms of content and context (Sulistri et al., 2020).

Scientific literacy also has a close relationship with ethnoscience, including context, which means that the environment to be studied is very close to daily life, for example, culture, regional food, and local wisdom. Next

is the content dimension included scientific facts existed in an everyday and extraordinary life, a competence which is the ability to use its knowledge, as well as attitudes that mean all behaviour and responses to oneself and the surrounding environment. Science literacy is critical to prepare a future that is science literate and able to overcome scientific problems well, and can make the right decisions.

In addition to science literacy, the variable that occupies the second position in the most significant percentage is critical thinking. With ethnoscience through students learn to effectively use the environment or things around them, thereby stimulating students' curiosity, making observations, asking, concluding, and having scientific experience, so that it can indirectly motivate students to play an active role in learning and influence critical thinking skills when ethnosciene learning was applied (Risdianto et al., 2020). By applying ethnoscience learning, students have more responsibility and improve learning activities optimally. In addition, students can also hone their thinking more optimally so that they can think critically well (Putu Verawati, Harjono, Wahyudi, & Gummah, 2022).

The following variable is creative thinking. One way to foster creativity and hone students' creative thinking skills requires diversity and clear learning strategies, an emphasis on developing student creativity, and student-focused learning activities. Learning utilized local wisdom lead students to make creative ideas. Students can collect information, collect data, solve problems, and come up with new ideas more efficiently. In addition, aspects of creative thinking and creativity are also in line with ethnoscience principles, such as awareness (awareness), although there are still other aspects of the invention, such as smoothness, flexibility, authenticity, and memory.

Ethnoscience can train students' creative thinking skills through ideas to solve environmental problems as a source of information because it is an approach to creating and designing a learning environment integrated with community culture (Khoiri et al., 2019). In addition to the ability to think, ethnoscience can also train the conservation character of students. The values of conservation character are very close to life, such as throwing garbage in its place, saving water, and saving energy (Utari et al., 2021). Ethnoscience can affect the character value of students because the information absorbed through learning can change their mindset and form good habits in students that positively impact the cultural environment.

The least used variables are chemical literacy and concept understanding, about 6% each. The use of local local wisdom as a learning resource makes learning more meaningful (Ardianti & Raida, 2022). Learners can connect real-life examples in the surrounding environment with learning materials to help them understand more in-depth concepts through real-life examples. It can help reduce or dispel students' notion that science learning materials are complex.

Conclusion

Based on the study of the literature review, it is known that the ethnoscience approach can be applied to the sciences learning, such as science for middle school, physics, chemistry, and biology. Ethnoscience can be used as a teaching resource when combined with culture, special foods, and local wisdom of the environment that supports learning materials and the reconstruction of original science knowledge with scientific science. The ethnoscience approach can be integrated with various learning models, such as contextual-based, collaborative, direct instruction, problem-based, and project-based learning. Based on the 16 articles have been studied, ethnoscience can improve and positively affect competencies in the 21st century, such as the ability to think critically and creatively, generic science, understanding concepts, character, chemical literacy, and science literacy. Still, the most significant research result is that scientific literacy. The integration of ethnoscience with learning models and approaches can be carried out for further research by measuring various variables influenced each other.

References

Afikah, A., Astuti, S. R. D., Suyanta, S., Jumadi, J., & Rohaeti, E. (2022). Mobile Learning in Science Education to Improve Higher-Order Thinking Skills (HOTS) and Communication Skills: A Systematic Review. *International Journal of Advanced Computer Science and Applications*, *13*(7), 698–704. https://doi.org/10.14569/IJACSA.2022.0130782

Akmal, A. U., Lia, Lestari, T., Asra, A., Effendy, Festiyed, & Skunda. (2021). Analisis Etnosains Dalam Pembelajaran IPA di SekolahDasar (SD) Kota Padang Dan Bukittinggi. *Jurnal Inovasi Pendidikan Dan Pembelajaran Sekolah Dasar*, *4*(2), 68–77. https://doi.org/10.24036/jippsd.v4i2.111385

Andani, D. T., Gani, A., Pada, A. U. T., & Rahmatan, H. (2020). Ethnoscience-Based Student Worksheet Development to Improve Senior High School Student Creativity. *Jurnal Penelitian Pendidikan IPA*, *7*(1), 26–33. https://doi.org/10.29303/jppipa.v7i1.457

Ardianti, S. D., & Raida, S. A. (2022). The Effect of Project Based Learning with Ethnoscience Approach on Science Conceptual Understanding. *Journal of Innovation in Educational and Cultural Research*, *3*(2), 207–214. https://doi.org/10.46843/jiecr.v3i2.89

Asra, A., & Akmal, A. U. (2021). Analisis Perangkat Pembelajaran Berbasis Etnosains Di Smp Kabupaten Rokan Hulu. *Jurnal Pendidikan Rokania*, *VI*(1), 9–22.

Astuti, T., Ferawati, A., & Pujaningsih, F. B. (2019). Analisis Hubungan Kuesioner Cinta Tanah Air dengan Soal Karakteristik Zat pada Mata Pelajaran IPA Terpadu di SMP N 17 Kota Jambi. *Jurnal Pendidikan Matematika Dan Sains*, *7*(1), 31–35. https://journal.uny.ac.id/index.php/jpms/article/view/25216

Desmarchelier, R. (2020). Indigenous Knowledges and Science Education: Complexities, Considerations and Praxis. In *The SAGE Handbook of Critical Pedagogies*, 1, 642-657. https://doi.org/10.4135/9781526486455.n62

Dewi, C. A., Erna, M., Martini, Haris, I., & Kundera, I. N. (2021). Effect of Contextual Collaborative Learning Based Ethnoscience to Increase Student's Scientific Literacy Ability. *Journal of Turkish Science Education*, *18*(3), 525–541. https://doi.org/10.36681/tused.2021.88

Dewi, C. A., Khery, Y., & Erna, M. (2019). An ethnoscience study in chemistry learning to develop scientific literacy. *Jurnal Pendidikan IPA Indonesia*, *8*(2), 279–287. https://doi.org/10.15294/jpii.v8i2.19261

Fahrozy, F. P. N., Irianto, D. M., & Kurniawan, D. T. (2022). Etnosains sebagai Upaya Belajar secara Kontekstual dan Lingkungan pada Peserta Didik di Sekolah Dasar. *Edukatif : Jurnal Ilmu Pendidikan*, *4*(3), 4337–4345. https://doi.org/10.31004/edukatif.v4i3.2843

Genisa, M. U., Subali, B., Djukri, Agussalim, A., & Habibi, H. (2020). Socio-scientific issues implementation as science learning material. *International Journal of Evaluation and Research in Education*, *9*(2), 311–317. https://doi.org/10.11591/ijere.v9i2.20530

Hadi, W. P., Sari, F. P., Sugiarto, A., Mawaddah, W., & Arifin, S. (2019). Terasi Madura: Kajian Etnosains Dalam Pembelajaran Ipa Untuk Menumbuhkan Nilai Kearifan Lokal Dan Karakter Siswa. *Quantum: Jurnal Inovasi Pendidikan Sains*, *10*(1), 45–55. https://doi.org/10.20527/quantum.v10i1.5877

Handayani, R. D., Wilujeng, I., & Prasetyo, Z. K. (2018). Elaborating indigenous knowledge in the science curriculum for the cultural sustainability. *Journal of Teacher Education for Sustainability*, *20*(2), 74–88. https://doi.org/10.2478/jtes-2018-0016

Hikmawati, H., Suastra, I. W., & Sudiatmika, A. A. I. A. R. (2021). Assessment in Science Learning Based on Ethnoscience. *Jurnal Penelitian Pendidikan IPA*, *7*(3), 443–451. https://doi.org/10.29303/jppipa.v7i3.736

Khoiri, A., Nulngafan, N., Sunarno, W., & Sajidan, S. (2019). How is Students' Creative Thinking Skills? An Ethnoscience Learning Implementation. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, *8*(2), 153–163. https://doi.org/10.24042/jipfalbiruni.v0i0.4559

Mahyuny, S. R., Nursamsu, N., Hasruddin, H., & Muslim, M. (2022). Development of Students Worksheet Learning Tools Made by Ethnoscience Based on Science Literacy. *Jurnal Penelitian Pendidikan IPA*, *8*(4), 2294–2301. https://doi.org/10.29303/jppipa.v8i4.1949

Pratama, D. H., L, L. R., & Sujatmika, S. (2023). Ulos Fabric Dyeing Process as Ethnoscience-Based Science Learning Resource. *International Journal of STEM Education for Sustainability*, *3*(1), 1–21. https://doi.org/10.53889/ijses.v3i1.112

Puspasari, A., Susilowati, I., Kurniawati, L., Utami, R. R., Gunawan, I., & Sayekti, I. C. (2019). Implementasi Etnosains dalam Pembelajaran IPA di SD Muhammadiyah Alam Surya Mentari Surakarta. *SEJ (Science Education Journal)*, *3*(1), 25–31. https://doi.org/10.21070/sej.v3i1.2426

Putri, F. A., & Ananda, L. J. (2020). Pengembangan Lembar Kerja Peserta Didik Berbasis Inkuiri Untuk Siswa Sekolah Dasar. *Jurnal Sekolah PGSD FIP UNIMED*, *4*(4), 70–77.

Putu Verawati, N. N. S., Harjono, A., Wahyudi, & Gummah, S. (2022). Inquiry-Creative Learning Integrated with Ethnoscience: Efforts to Encourage Prospective Science Teachers' Critical Thinking in Indonesia. *International Journal of Learning, Teaching and Educational Research*, *21*(9), 232–248. https://doi.org/10.26803/ijlter.21.9.13

Risdianto, E., Dinissjah, M. J., Nirwana, & Kristiawan, M. (2020). The effect of Ethno science-based direct instruction learning model in physics learning on students' critical thinking skill. *Universal Journal of Educational Research*, *8*(2), 611–615. https://doi.org/10.13189/ujer.2020.080233

Rumansyah, Leny, & Sofia, H. N. (2023). Improving Students ' Scientific Literacy and Cognitive Learning Outcomes through Ethnoscience-Based PjBL Model. *Journal of Innovation in Educational and Cultural Research*, *4*(1), 1–9. https://doi.org/10.46843/jiecr.v4i1.382

Saraswati, Y., Sifak Indana, & Elok Sudibyo. (2021). Science Literacy Profile of Junior High School

Students Based on Knowledge, Competence, Cognitive, and Context Aspects. *IJORER : International Journal of Recent Educational Research*, *2*(3), 329–341. https://doi.org/10.46245/ijorer.v2i3.118

Suciyati, A., Suryadarma, I. G. P., & Paidi, P. (2021). Integration of ethnoscience in problem-based learning to improve contextuality and meaning of biology learning. *Biosfer*, *14*(2), 201–215. https://doi.org/10.21009/biosferjpb.18424

Sudarmin, S., Zahro, L., Pujiastuti, S. E., Asyhar, R., Zaenuri, Z., & Rosita, A. (2019). The development of PBL-based worksheets integrated with green chemistry and ethnoscience to improve students' thinking skills. *Jurnal Pendidikan IPA Indonesia*, *8*(4), 492–499. https://doi.org/10.15294/jpii.v8i4.17546

Sulistri, E., Sunarsih, E., Utama, E. G., & Moseki, U. R. (2020). The Development of Digital Pocketbook Based on the Ethnoscience of the Singkawang City to Increase Students' Scientific Literacy on Heat Matter and Its Transfer. *JETL (Journal of Education, Teaching and Learning)*, *5*(2), 263–268. https://doi.org/10.26737/jetl.v5i2.2042

Tyas, R. A., Wilujeng, I., & Suyanta, S. (2020). Pengaruh pembelajaran IPA berbasis discovery learning terintegrasi jajanan lokal daerah terhadap keterampilan proses sains. *Jurnal Inovasi Pendidikan IPA*, *6*(1), 114–125.

Utari, R., Andayani, Y., Savalas, L. R. T., & Anwar, Y. A. S. (2021). Validity of Ethnoscience Based Chemistry Learning Media Emphasizing Character Values and Conservation Behavior. *Jurnal Penelitian Pendidikan IPA*, *7*(1), 45–48. https://doi.org/10.29303/jppipa.v7i1.469

Winarto, Sarwi, S., Cahyono, E., & Sumarni, W. (2022). Developing a Problem-Solving Essay Test Instrument (PSETI) in the Instruction of Basic Science Concepts in Ethnoscience Context. *Journal of Turkish Science Education*, *19*(1), 37–51. https://doi.org/10.36681/tused.2022.108

Yuliana, I., Cahyono, M. E., Widodo, W., & Irwanto, I. (2021). The Effect of Ethnoscience-Themed Picture Books Embedded Within Context-Based Learning on Students' Scientific Literacy. *Eurasian Journal of Educational Research*, *21*(94), 379–396. https://doi.org/10.14689/ejer.2021.94.17

Zidny, R., & Eilks, I. (2022). Learning about Pesticide Use Adapted from Ethnoscience as a Contribution to Green and Sustainable Chemistry Education. *Education Sciences*, *12*(4). https://doi.org/10.3390/educsci12040227