

Exploring Local Wisdom: Ethnoscience Study of *Durian Tempoyak*-Making in Indragiri Hilir as a Source of Science Learning

Ina Lestari^{1*}, Muhammad Ikhsan²

¹Master of Science Education, Faculty of Teacher Training and Education, Universitas Riau, Riau, Indonesia

²Master of Science Education, Faculty of Mathematics and Natural Sciences, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia

*e-mail: inalestari2202@gmail.com

Received: February 5, 2025. Accepted: March 2, 2025. Published: March 16, 2025

Abstract: Local wisdom-based learning is one of the innovative approaches in science education that enhances the relevance of scientific knowledge to everyday life. One form of local wisdom that can be studied from an ethnoscience perspective is the production of durian *tempoyak* in Indragiri Hilir, Riau. The fermentation process of durian *tempoyak* involves scientific concepts in biology and chemistry, such as microorganism activity, fermentation reactions, and changes in food's physical and chemical properties. However, research on integrating local wisdom into science education remains very limited. This study aims to analyze local wisdom in the production of durian *tempoyak* from a scientific perspective. Data were collected through interviews with informants selected using the snowball sampling method. Data analysis was conducted using the Miles and Huberman qualitative approach. The research findings indicate that the Malay community continues to preserve the tradition of making durian *tempoyak*. The production process includes preparing materials and tools, fermentation stages, and its benefits in science learning. In conclusion, exploring ethnoscience in durian *tempoyak* production provides an opportunity to link science with local culture, particularly in biotechnology. Integrating local wisdom into science education will enhance students' appreciation of culture and develop 21st-century skills.

Keywords: *Durian Tempoyak*; Local Wisdom; Science Learning.

Introduction

Indonesia has an area of 5,193,250 km² [1], Indonesia's territory consists of many islands. Various ethnic groups inhabit the islands in Indonesia, and each ethnic group has its uniqueness and characteristics [2]. Indonesia's territory consists of many islands. Various ethnic groups inhabit the islands in Indonesia, and each ethnic group has its uniqueness and characteristics [3]. Indonesia is known as a multicultural country [4]. Cultural diversity in each region has its characteristics. Every culture found in each region becomes the identity of that region. Traditions that have always been preserved and maintained to this day are what have become the value of this area [5]. Some examples of local Indonesian wisdom include the management of aquatic resources in the form of *manongkah* shells [3], and the potential of plants as traditional medicine in Madura [6]. Learning that integrates local wisdom in science is known as ethnoscience.

Ethnoscience or ethnoscience comes from the Greek word "ethnos", which means "people", and "Scientia" from the Latin word "knowledge." [7]. So, ethnoscience itself means knowledge possessed by a nation, ethnic group or certain social group [8]. Learning that integrates the concept of ethnoscience is based on the recognition that culture is an essential part of education as a form of thinking, communication and knowledge development [9]. The role of local knowledge makes a significant contribution to the development of science, especially in the fields of medicine and natural resource management [10]. However, local

knowledge also experiences changes due to changes in physical resources as well as social, political, religious and cultural changes [11]. In this era of globalization, ethnoscience studies have a crucial role in preserving local wisdom so that it can be passed on to future generations [12]. Ethnoscience studies should continue to carry out activities to transform original science (knowledge that develops in society) into scientific science. Ethnoscience studies should continue to strive to transform local knowledge that develops in society into scientific knowledge. Ethnoscience research has been carried out in various scientific disciplines, including the integration of culture in science learning in the context of the tradition of making whiting (Lestari et al., 2023), physics learning [14], chemistry learning [15], and development of integrated teaching materials with local wisdom [16], [17]. Integrating local wisdom in science learning can be studied more deeply.

Science learning includes various concepts of physics, chemistry, biology and earth-space sciences, which provide students with experience and competence to understand the natural environment [18]. In 21st-century learning, students are also required to have the skills to solve problems they encounter in their surrounding environment [19]. Thus, science learning needs to be done contextually by utilizing the local wisdom of the local community as the context.

The Merdeka Curriculum also supports a learning process that optimizes the use of local potential [20]. In reality, many schools still do not utilize local culture [21]. This is influenced by several factors, including teachers'

How to Cite:

I. Lestari and M. Ikhsan, "Exploring Local Wisdom: Ethnoscience Study of Durian Tempoyak-Making in Indragiri Hilir as a Source of Science Learning", *J. Pijar.MIPA*, vol. 20, no. 2, pp. 239-245, Mar. 2025. <https://doi.org/10.29303/jpm.v20i2.8532>

limitations in relating concepts, processes and applications to preserving values. Several studies state that teachers still have difficulty connecting the conditions of the learning environment with the local wisdom around them [22]; teachers do not know the concept of ethnoscience, so they never integrate local wisdom into learning [23]. The culture that exists in society should be introduced to students through the teaching and learning process [24].

The integration of local wisdom elements in learning has an important role in line with the demands of 21st-century skills, especially in the aspect of cultural literacy [25]. This local wisdom-based learning has a positive impact (Gumilar, 2024). The positive impact felt is that learning can improve students' critical thinking [27], [28], problem-solving and student communication [29], motivation and learning outcomes [30], and learning achievement (Jacinda et al., 2023). Therefore, studying local wisdom in formal learning is important as an effort to contribute to its preservation so that it can survive in the era of globalization [25].

Riau Province, located in Indonesia, on the island of Sumatra, has rich cultural diversity. Most of the population comes from the Malay tribe, an indigenous tribe that has inhabited the Riau region for centuries. In the traditions of Malay society, customs reflect the close connection between humans and their natural surroundings. Various forms of local Malay wisdom can be found in various fields, such as plantations, forest conservation, water resource management, animal husbandry, maritime affairs, and so on [32].

Indragiri Hilir Regency is one of the administrative regions of Riau Province, with 93.31% of its land area consisting of lowlands or areas with river deposits, swamps with peat (peat), mangroves, and consisting of large islands and small islands. Most of the declining areas are in areas near the coast or rivers. Meanwhile, around 6.69% of the population is hilly, with an average height of 6-35 meters above sea level. This part is located in the southern part of the Reteh River and Keritang sub-district. Indragiri Hilir Regency has a tropical rainforest climate, making the land of Indragiri Hilir Regency good for farming. Many people in Indragiri Hilir who live in hilly areas grow durian. When durian season arrives, the price of durian fruit becomes much cheaper in the market, and the people of the Kemuning sub-district use this to make *tempoyak*.

Tempoyak is made from durian fruit and salt, which is made through a quite long process because it has to be fermented first (Rapeka et al., 2017). *Tempoyak* making has been around since ancient ancestors and has been carried out from generation to generation to the present generation. Of course, it cannot be separated from the daily lives of the Kemuning people. The routine of making *tempoyak* has become a habit of Batu Ampar every time the durian season arrives and has been passed down to this day. In line with the demands of 21st-century skills, students are expected to have cultural literacy. Researchers see that the wealth of local wisdom of the Malay community has the potential to be explored scientifically. Therefore, this research aims to analyze the local wisdom of *Tempoyak* Durian from a scientific perspective.

Research Methods

This research was carried out in Batu Ampar village, Kemuning subdistrict in 2024. The following is a map of Batu Ampar village.

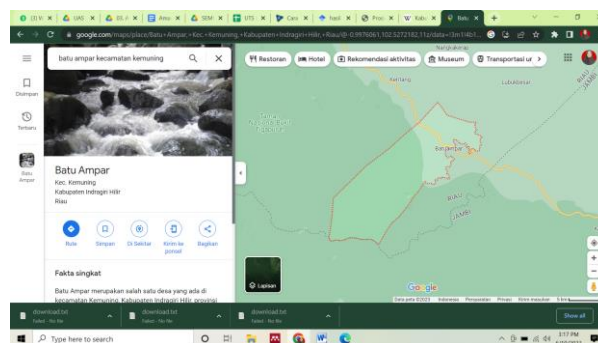


Figure 1. Map of Batu Ampar Village

This research uses a qualitative approach. The research method uses in-depth interviews and a literature review; the research design is a case study. According to Yin (2018), case studies are a research method that investigates phenomena in depth and in a real context. The resource person is a Malay ethnic community in Batu Ampar village, Kemuning subdistrict, Indragiri Hilir Regency, Riau, namely 2 Malay ethnic residents in Batu Ampar village, Kemuning subdistrict using the snowball sampling technique of selecting sources. The two speakers are residents of Batu Ampar village whose daily lives are during the fruit season, either for personal consumption or for sale. Writing in analyzing qualitative data uses the Miles-Huberman method. Qualitative data analysis using the Miles and Huberman method consists of three main stages: data reduction, data presentation, and drawing conclusions/verification. Data reduction is done by filtering, summarizing and selecting relevant data to make it more organized. Furthermore, the data is presented as descriptive narratives, tables or diagrams to facilitate further analysis. The final stage is the conclusion, namely the final analysis stage, which provides conclusions from the data obtained after data verification during the research.

Results and Discussion

The Riau Malay tribe is one of the largest tribes in the entire Riau Province and the Riau Islands Province [35]. Carrying out a livelihood system based on fisheries and plantation resources using traditional techniques, one of the benefits of plantation resources is making *tempoyak*. *Tempoyak* is a typical Malay food made from Durian. Durian trees are often found in the Kemuning sub-district. Durian trees vary in height from 20 to 40 meters and can reach up to 50 meters. The trunk of the durian tree is round with a rough and very rough surface, with a diameter ranging from 2 to 80 cm [36]. Durian is a seasonal fruit; it can only be produced twice in one year. It usually bears fruit at the end of the year and also in the middle of the year [37]. Based on the results of interviews with local people, this tradition began with the Malay tribe in Batu Ampar village, Kemuning subdistrict, making durian *tempoyak* because there was lots of durian fruit during the harvest season.

Hence, the Malay people in Batu Ampar village took advantage of this.



Figure 2. Durian fruit (*Durio zibetinus* Murr)

"Tempoyak is made because of the abundance of durian fruit during the harvest season because in Batu Ampar there are many durian trees that are continuously processed into tempoyak and not only consumed directly and sometimes mixed into porridge, not just processed into tempoyak" (interview with Siti, 2024)

Making *tempoyak* using durian fruit is done by peeling the durian fruit and then separating the seeds and flesh. After that, put the durian flesh in a container and add a little salt. The final step is to close the container tightly and store it for approximately 7 days.



Figure. 3 Making Tempoyak

"The way to make tempoyak is first to open the durian, separate it from the seeds, then put the durian meat directly into a plastic or jar. "Once it's been added, just add enough salt, then close the jar tightly and wait 7 days" (Interview with Siti, 2024).

Durian tempoyak is yellow and has a sour taste. Tempoyak is widely used as a mixture of typical Riau Malay dishes such as fish curry or chilli sauce.



Figure 4. Durian Tempoyak

"Tempoyak durian tastes sour, so if you add it to cooking, you must add sugar. "Usually, this tempoyak is used as a mixture for dishes like fish curry and can be eaten with chilli sauce straight away" (Interview with Melda, 2024).

The tradition of making *tempoyak* is reconstructed in the following table to provide a systematic overview of the manufacturing process. This table presents the stages, materials and techniques used in making *tempoyak*.

Tempoyak is made using durian, which is often found in plantations. Durian contains calcium, potassium and vitamins B1 and B2 and also contains quite high levels of vitamin C [43]. Tempoyak durian functions to facilitate the body's digestive system. In making tempoyak, salt (NaCl) is used, which is useful as a preservative and supports the fermentation of lactic acid bacteria. The fermentation process was carried out for 7 days under closed air. During fermentation, chemical changes occur in an organic substrate through the activity of enzymes produced by microorganisms. The function of fermentation is to preserve food naturally, and the fermentation process is carried out anaerobically.

Table 1. Reconstruction

Topic	Indigenous science	Scientific Knowledge
Preparation for making Tempoyak	Many durian trees grow in Batu Ampar village	Durian (<i>Durio zibetinus</i> Murr) is a seasonal fruit that bears fruit twice a year. It usually grows well in the lowlands. Durian trees grow well in lowlands. Durian trees vary in height from 20 to 40 meters and can reach up to 50 meters. The trunk of the durian tree is round with a rough and very rough surface, with a diameter ranging from 2 to 80 cm [36].
Tempoyak making process	Separate the durian flesh and seeds	Durian flesh is rich in calcium, potassium, and vitamins B1 and B2 and has a fairly high vitamin C content [38].

	Durian meat is added to salt	Salt (NaCl) is used in making tempoyak as a preservative and helps the fermentation process by lactic acid bacteria [39].
	Stored for 7 days	Fermentation is a process of chemical changes in organic substrates that occurs through the activity of enzymes produced by microorganisms. This process takes place anaerobically and plays a role in preserving food.
Product	Tempoyak	<i>Durian Tempoyak</i> contains energy, protein, carbohydrates, fat, calcium, phosphorus, iron, vitamin A, vitamin B1, and vitamin C [40].
	Tempoyak can last a long time	Tempoyak can last 4-6 days because the fermentation process takes place without additional preservatives and is stored in a tightly closed container, thus avoiding direct contamination by hands [41].
Benefit	Tempoyak is used in cooking	<i>Tempoyak</i> , which contains calories, protein, carbohydrates, phosphorus, iron and various vitamins, is often mixed in typical Riau Malay dishes. Durian <i>tempoyak</i> has good benefits for digestion (Funan et al., 2024).

In 21st-century learning, students are expected to have cultural literacy so they can know and understand the local culture, not just be limited to foreign culture [44]. So that local culture or wisdom is not lost and its existence is maintained, it is necessary to instill a sense of love for culture and local wisdom by incorporating cultural knowledge into the learning process. Regional culture, local wisdom, and the surrounding environment can contribute to student learning in the form of thought patterns (cognitive), attitude patterns (affective), and behaviour patterns (psychomotor) [45].

The tradition of making *tempoyak* has the potential to be a source of scientific learning. Science teachers, especially in Riau Province, can use this local wisdom context when studying biotechnology material. The process of making *tempoyak* by fermentation by the Malay tribe in Batu Ampar village involves the concept of IPA. Teachers can also carry out learning scientifically. Students can do science exercises by making tempoyak. Table 2 displays the basic competencies in biotechnology material in class IX SMP/MTs, the following is the basic competition that will be achieved:

Table 2. Basic Competencies

Table 2. Basic Competencies		Material	Learning objectives
3.9	Describe the application of biotechnology in supporting human survival through food production.	<ul style="list-style-type: none"> Biotechnology Conventional Biotechnology Modern Biotechnology 	<ul style="list-style-type: none"> Describe conventional biotechnology Describe modern biotechnology Conduct an experiment using the scientific method of fermentation Gather information about the main ingredients to be used as an alternative fermentation product Apply the knowledge they have acquired in making a fermentation-based product Share information about the product they have created with the community
4.9	Presenting the results of investigations, ideas or searching for information about the application of biotechnology in supporting human survival through food production.		

Students can learn conventional biotechnology concepts directly by linking the *tempoyak-making* process to learning. The fermentation process used in making *tempoyak* involves microorganisms such as lactic acid bacteria, which are applications of simple biotechnology techniques. This provides a practical understanding of how microorganisms are used in food processing and the basic principles of biotechnology that have been applied in local traditions.

Education is an effort to improve human abilities to inherit, improve and build civilization in the future (An Nisaa'an et al., 2022). Efforts to build civilization are carried

out by increasing knowledge and understanding of the surrounding environment, especially those related to culture as a legacy from previous generations. So that culture is better known, this culture can be integrated into the learning process at school, including science learning. Cultural values that reflect local wisdom vary according to the characteristics of each region, considering that Indonesia has various tribes, ethnicities and traditions. With this process, the younger generation has a high spirit of nationalism and a sense of pride in the Indonesian nation [47]. Science is a field of science that studies phenomena and everything that exists

in nature [48]. Science learning can be developed by taking advantage of the uniqueness and advantages of a region, including its cultural aspects and traditional technology [49]. Learning that applies local culture can make students love the region and their nation [50].

The curriculum for SMP/MTs/SMPLB or other equivalent forms can include education based on local excellence, as stated in Government Regulation 19 of 2005 concerning National Education Standards Article 14 paragraph (1). The regulations that have been established are then refined into a curriculum that supports the teaching and learning process utilizing culture, where the curriculum must be responsive to various fields such as science, culture, technology and the arts, which, of course, can build students' curiosity and ability to use it appropriately [50].

However, learning based on local culture is still not optimally implemented in schools. Research conducted by Rikizaputra et al., (2021) which states that most teachers have minimal knowledge of ethnoscience. In line with this research, Suastra (2010) stated that around 90% of teaching staff want to develop science learning based on local wisdom, but only 20% can implement it. Having minimal insight into looking for examples of events that contain local wisdom, which is shown in the learning implementation plans that educators have prepared, I can see that there are still few linked to local culture. Therefore, integrating local wisdom values in science learning is highly expected and makes the learning process more meaningful and not just textbook-oriented. By integrating learning with local culture, students have a high sensitivity to the environment around them.

The tradition of making *tempoyak*, as part of local science (Indigenous science), can be used as an integrated science learning medium. The fermentation processes provided an opportunity to teach biology, chemistry and physics concepts while introducing local wisdom, thereby enriching students' understanding of scientific and cultural contexts.

Conclusion

Local wisdom in making *tempoyak* contains local community knowledge (Indigenous science), including natural science concepts starting from ingredients, manufacturing, and fermentation processes. Making *tempoyak*, which involves lactic acid bacteria for fermentation, can explain scientific principles and how local communities utilize natural resources to produce useful products naturally and sustainably.

Author's Contribution

Ina Lestari created interview instruments, researched, analyzed data, and wrote articles. Muhammad Ikhsan oversaw the writing of the article.

Acknowledgements

Thank you to the people of Batu Ampar Village, especially the resource persons who have given their time and helped researchers carry out this research.

References

- [1] B. P. M. Jaya, A. Sitamala, and Danial, "State Exclusivity of Fisheries Resources on Exclusive Economic Zone in Efforts to Support the Fisheries Availability as a Means of Increasing Food Security for the State," *Jt. Proc. 2nd 3rd International Conf. Food Secur. Innov. (ICFSI 2018-2019)*, vol. 9, pp. 213–219, 2021, doi: 10.2991/absr.k.210304.039.
- [2] D. Syafrini, M. Fadhil Nurdin, Y. S. Sugandi, and A. Miko, "The impact of multiethnic cultural tourism in an Indonesian former mining city," *Tour. Recreat. Res.*, vol. 45, no. 4, pp. 511–525, 2020, doi: 10.1080/02508281.2020.1757208.
- [3] A. Ilhami, Diniya, Susilawati, C. F. Ramadhan, and R. Sugianto, "Analisis Kearifan Lokal Manongkah Kerang di Kabupaten Indragiri Hilir, Riau sebagai Sumber Belajar IPA Berbasis Etnosains," *Sos. Budaya*, vol. 18, no. 1, pp. 20–27, 2021.
- [4] C. Lasambouw, E. Sutjiredjeki, and N. Nuryati, "Excellence Ethnic Characters in Strengthening the Country National Values Identity: An Experience of Indonesia," *Proc. Annu. Civ. Educ. Conf. (ACEC 2021)*, vol. 636, no. Acec 2021, pp. 1–7, 2022, doi: 10.2991/assehr.k.220108.115.
- [5] A. F. Ellya Novera, Daharnis, Yeni Erita, "Jurnal basicedu," *J. basicedu*, vol. 5, no. 6, p. 6349_6356, 2021.
- [6] N. Vicamilia, "Etnobotani tumbuhan obat oleh masyarakat Kecamatan Tanah Merah Kabupaten Bangkalan Madura," vol. 2507, no. February, pp. 1–9, 2020.
- [7] B. J. Williams and C. A. Ortiz-Solorio, "Middle American folk soil taxonomy," *Ann. Assoc. Am. Geogr.*, vol. 71, no. 3, pp. 335–358, 1981, doi: 10.1111/j.1467-8306.1981.tb01361.x.
- [8] Sudarmin, *Pendidikan Karakter, Etnosains dan Kearifan Lokal: Konsep dan Sains., Penerapannya dalam Pembelajaran*. Semarang, 2015.
- [9] A. Emda, "Etnosains Strategi Pembelajaran Berbasis Budaya dan Kearifan Lokal," *J. Ilm. Mhs.*, vol. 1, pp. 106–116, 2023.
- [10] E. S. Brondízio et al., "Locally Based, Regionally Manifested, and Globally Relevant: Indigenous and Local Knowledge, Values, and Practices for Nature," *Annu. Rev. Environ. Resour.*, vol. 46, pp. 481–509, 2021, doi: 10.1146/annurev-environ-012220-012127.
- [11] D. P. M. Lam, E. Hinz, D. J. Lang, M. Tengö, H. von Wehrden, and B. Martín-López, "Indigenous and local knowledge in sustainability transformations research: A literature review," *Ecol. Soc.*, vol. 25, no. 1, 2020, doi: 10.5751/ES-11305-250103.
- [12] S. Nur Amalina, Y. Andayani, and P. Sedijani, "Rekonstruksi Etnosains Proses Mamaq Di Dusun Asmalang Desa Lenek Lauk Lombok Timur," *J. Classr. Action Res.*, vol. 6, no. 1, 2024, [Online]. Available: http://jppipa.unram.ac.id/index.php/jcar/index_
- [13] M. D. P. Ina Lestari, Aldeva Ilhami, Yuni Fatisa, "Ethnoscience Study of Betel Lime Making in Indragiri Hilir as a Natural Science Learning Resource," *Proceeding Symbion (Symposium Biol. Educ.)*, vol. 5726, 2023.
- [14] G. Rahayu, A. Khoiri, and F. Firdaus, "Integrasi Budaya Lokal (Bundengan) pada Pembelajaran

- Gelombang dan Bunyi untuk Meningkatkan Sikap Cinta Tanah Air dan Literasi Sains Siswa,” *J. Ilm. Pendidik. Fis.*, vol. 6, no. 1, p. 117, 2022, doi: 10.20527/jipf.v6i1.4323.
- [15] N. Azizah and S. Premono, “Identifikasi Potensi Budaya Lokal Berbasis Etnokimia Di kabupaten Bantul,” *J. Trop. Chem. Res. Educ.*, vol. 3, no. 1, pp. 53–60, 2021, doi: 10.14421/jtcre.2021.31-06.
- [16] N. Haerunnisa, A. Wahyudi, and N. Nasution, “Pengembangan Bahan Ajar Berbasis Kearifan Lokal Kampung Nambangan Sebagai Sumber Pendidikan Karakter Siswa pada Pembelajaran IPS di SD,” *ELSE (Elementary Sch. Educ. Journal) J. Pendidik. dan Pembelajaran Sekol. Dasar*, vol. 4, no. 2, p. 19, 2020, doi: 10.30651/else.v4i2.4771.
- [17] A. Nurafni, H. Pujiastuti, and A. Mutaqin, “Pengembangan Bahan Ajar Trigonometri Berbasis Kearifan Lokal,” *J. Medives J. Math. Educ. IKIP Veteran Semarang*, vol. 4, no. 1, p. 71, 2020, doi: 10.31331/medivesveteran.v4i1.978.
- [18] I. N. Yunansica, D. V. Almira, Z. N. Laily, and I. K. Mahardika, “Manfaat Lingkungan Sekolah Sebagai Sumber Belajar Mata Pelajaran IPA Untuk Meningkatkan Minat Belajar Siswa SMPN 4 Jember Kelas VIII D,” *J. Ilm. Wahana Pendidikan, Desember*, vol. 8, no. 24, pp. 385–392, 2022, [Online]. Available: <https://doi.org/10.5281/zenodo.7494465>.
- [19] J. N. Fahmi, “Pembelajaran Matematika Menggunakan Media Jaring-Jaring Timbul pada Siswa Kelas V SD Negeri Janten,” *Ideguru J. Karya Ilm. Guru*, vol. 9, no. 1, pp. 46–52, 2023, doi: 10.51169/ideguru.v9i1.636.
- [20] A.-M. Q. Haq and M. I. Fitriani, “Lingkungan Belajar Terintegrasi Melalui Kurikulum Merdeka dalam Meningkatkan Kinerja Guru,” *J. Ilm. Profesi Pendidik.*, vol. 9, no. 3, pp. 1775–1784, 2024, doi: 10.29303/jipp.v9i3.2394.
- [21] Wengki, H. M. Sumampouw, and A. Yalindua, “Peningkatan Hasil Belajar Konsep Genetika Pola Pewarisan Sifat Menggunakan Audio Visual Berbasis Budaya Mapalus Pada Kelas XII IPA SMA Negeri 2 Tondano,” *Jspb Bioedusains*, vol. 3, no. 2, pp. 168–175, 2022.
- [22] R. Arviana, “Urgensi Bahan Ajar Tematik Berbasis,” *Semin. Nas. Pendidikan, FKIP UNMA 2019*, pp. 875–882, 2019.
- [23] R. Rikizaputra, F. Festiyed, S. Diliarosta, and A. Firda, “Pengetahuan Etnosains Guru Biologi di SMA Negeri Kota Pekanbaru,” *J. Nat. Sci. Integr.*, vol. 4, no. 2, p. 186, 2021, doi: 10.24014/jnsi.v4i2.14257.
- [24] M. Muzakkir, “Pendekatan Etnopedagogi Sebagai Media Pelestarian Kearifan Lokal,” *J. HURRIAH J. Eval. Pendidik. dan Penelit.*, vol. 2, no. 2, pp. 28–39, 2021, doi: 10.56806/jh.v2i2.16.
- [25] S. Ecca and N. Kasman, “Desain Modul Ajar Berbasis Kearifan Lokal untuk Memperkuat Karakter Pelajar Pancasila,” pp. 23–32, 2017.
- [26] Y. M. hidayati Gumgum Gumilar, Fatmi Rohmah Nur Hidayati, Yustri Mindaryani, Anatri Dessty, “Pembelajaran IPA Berbasis Etnosains Pada Materi Struktur Tumbuhan dan Fungsinya di Sekolah Dasar,” *Eduproxima urnal Ilm. Pendidik. IPA*, no. 2015, 2024.
- [27] J. J. A. Idul and M. T. M. Fajardo, “Ethnoscience-based physical science learning and its effects on students’ critical thinking skills: A meta-analysis study,” *J. Math. Sci. Teach.*, vol. 3, no. 2, p. em048, 2023, doi: 10.29333/mathsciteacher/13700.
- [28] S. P. Sari, S. Mapuah, and I. Sunaryo, “Pembelajaran Ilmu Pengetahuan Alam Berbasis Etnosains untuk Mengembangkan Kemampuan Berpikir Kritis Siswa Sekolah Dasar,” *EduBase J. Basic Educ.*, vol. 2, no. 1, p. 9, 2021, doi: 10.47453/edubase.v2i1.284.
- [29] A. Fadli and Irwanto, “The effect of local wisdom-based ELSII learning model on the problem solving and communication skills of pre-service islamic teachers,” *Int. J. Instr.*, vol. 13, no. 1, pp. 731–746, 2020, doi: 10.29333/iji.2020.13147a.
- [30] Z. Khoiriyah, D. Astriani, and A. Qosyim, “Efektivitas Pendekatan Etnosains Dalam Pembelajaran Daring Untuk Meningkatkan Motivasi Dan Hasil Belajar Siswa Materi Kalor,” *PENSA E-Jurnal Pendidik. Sains*, vol. 9, no. 3, pp. 433–442, 2021.
- [31] Alma Aliya Jacinda, H. Surtikanti, and Riandi, “Pembelajaran berbasis etnosains pada materi biologi untuk meningkatkan prestasi belajar siswa : kajian literatur,” *Asian J. Collab. Soc. Environ. Educ.*, vol. 1, no. 1, pp. 18–24, 2023, doi: 10.61511/ajcsee.v1i1.2023.142.
- [32] A. Ilhami, “Kontribusi Budaya Lokal Terhadap Literasi Lingkungan : Studi Kasus di SMP Pandam Gadang Sumatera Barat,” *J. Nat. Sci. Integr.*, vol. 2, no. 2, p. 1, 2019, doi: 10.24014/jnsi.v2i2.7788.
- [33] R. Reli, E. Warsiki, and M. Rahayuningsih, “Modifikasi Pengolahan Durian Fermentasi (Tempoyak) Dan Perbaikan Kemasan Untuk Mempertahankan Mutu Dan Memperpanjang Umur Simpan,” *J. Teknol. Ind. Pertan.*, vol. 27, no. 1, pp. 43–54, 2017, doi: 10.24961/j.tek.ind.pert.2017.27.1.43.
- [34] R. K. Yin, *Case study research and applications : design and methods*, Sixth edit. California: SAGE Publications, 2018.
- [35] Y. Hiro, E. Maharani, and Kausar, “Income Analysis Of The Malay Community In Pekantua Village Kempas District Indragiri Hilir Regency,” *Jom Faperta*, vol. 3, no. 3, pp. 63–77, 2016.
- [36] E. Yuniastuti, N. Nandariyah, and S. R. Bukka, “Karakterisasi Durian (*Durio zibenthinus*) Ngrambe di Jawa Timur, Indonesia,” *Caraka Tani J. Sustain. Agric.*, vol. 33, no. 2, p. 136, 2018, doi: 10.20961/carakatani.v33i2.19610.
- [37] P. J. Santoso and C. Hermanto, “Keragaan Budidaya dan Sebaran Musim Panen Durian di Indonesia,” *Semin. Nas. 2016*, no. Kemtan 2012, pp. 139–145, 2016, [Online]. Available: <http://repository.pertanian.go.id/handle/123456789/6831>
- [38] E. Asmalia, *Yuk, Mengenal Makanan Hasil Fermentasi Khas Indonesia*. 2018.
- [39] A. Suri, B. Syefrinando, and F. R. Basuki, “Analisis Etnosains Proses Pembuatan Tempoyak Durian Dan Gula Aren Sebagai Sumber Belajar Sains,” *Phys.*

- Sci. Educ. J.*, vol. 3, pp. 142–153, 2023, doi: 10.30631/psej.v3i3.2182.
- [40] D. Ratnasari, O. Lestari, and R. Afriani, “Makanan Fermentasi Lokal Wilayah Timur Kalimantan Barat,” *Edumedia J. Kegur. dan Ilmu Pendidik.*, vol. 6, no. 1, 2022, doi: 10.51826/edumedia.v6i1.602.
- [41] W. Erfisa, N. Arpi, and A. Asmawati, “Kajian Literatur Pembuatan Produk Olahan Tempoyak (Durian Fermentasi),” *J. Ilm. Mhs. Pertan.*, vol. 7, no. 1, pp. 419–428, 2022, doi: 10.17969/jimfp.v7i1.19162.
- [42] S. Ave Maria Funan, M. Rachmawati, A. Emmawati, M. Rohmah, A. Sholeh Pujokaroni, and Y. Agus Prayitno, “Sensory Response of Durian Lai Tempoyak and Its Potential as A Functional Food,” *Bul. LOUPE*, vol. 20, no. 01, pp. 1–6, 2024.
- [43] M. M. Maharani, M. Bakrie, and N. Nurlela, “Pengaruh Jenis Ragi, Massa Ragi Dan Waktu Fermentasi Pada Pembuatan Bioetanol Dari Limbah Biji Durian,” *J. Redoks*, vol. 6, no. 1, p. 57, 2021, doi: 10.31851/redoks.v6i1.5200.
- [44] S. Saputri, E. A. Fadhilah, D. A. Dewi, and R. S. Hayat, “Integrasi Literasi Budaya Dan Kewarganegaraan Ke Dalam Pembelajaran Sebagai Upaya Membentuk Karakter Cinta Budaya Lokal,” *Pendek. J. Pendidik. Berkarakter*, vol. 2, no. 1, pp. 262–269, 2024.
- [45] Aza Nuralita, “Analisis penerapan model Pembelajaran berbasis etnosains dalam pembelajaran tematik SD,” *Mimb. PGSD Undiksha*, vol. 4, no. 1, pp. 1–8, 2020.
- [46] An Nisaa’an Najm Al Inu, D. Fitriani, E. A. S. Bani, and M. L. Winandar, “Peran Guru sebagai Agen Pembaharu dalam Meningkatkan Kualitas Pendidikan Karakter Siswa Sekolah Dasar di Era Digital,” *J. Pendidik. Tambusai*, vol. 6, no. 2, pp. 9802–9808, 2022.
- [47] W. P. Hadi and M. Ahied, “Kajian Etnosains Madura dalam Proses Produksi Garam sebagai Media Pembelajaran IPA Terpadu,” *Rekayasa*, vol. 10, no. 2, p. 79, 2017, doi: 10.21107/rys.v10i2.3608.
- [48] P. M. Purbosari, “Pembelajaran Berbasis Proyek Membuat Ensiklopedia Ilmu Pengetahuan Alam (Ipa) Untuk Meningkatkan Academic Skill Pada Mahasiswa,” *Sch. J. Pendidik. dan Kebud.*, vol. 6, no. 3, p. 231, 2016, doi: 10.24246/j.scholaria.2016.v6.i3.p231-238.
- [49] A. Asra and A. U. Akmal, “Analisis Perangkat Pembelajaran Berbasis Etnosains Di Smp Kabupaten Rokan Hulu,” *J. Pendidik. Rokania*, vol. 6, no. 1, pp. 9–22, 2021.
- [50] C. Damayanti, A. Rusilowati, S. Linuwih, and (Alamat, “Pengembangan Model Pembelajaran IPA Terintegrasi Etnosains untuk Meningkatkan Hasil Belajar dan Kemampuan Berpikir Kreatif,” *JISE*, vol. 6, no. 1, 2017.
- [51] I. W. Suastra, “Model Pembelajaran Sains Berbasis Budaya Lokal Untuk Mengembangkan Kompetensi Dasar Sains dan Nilai Kearifan Lokal di SMP,” *J. Pendidik. dan Pembelajaran*, vol. 43, no. 2, pp. 8–16, 2010.