Volume 39 Nomor 1 Tahun 2024
https://ppjp.ulm.ac.id/journal/index.php/JVK/index
p-ISSN: 0215-9619
e-ISSN: 2614-7149

VIDYA KARYA

Ethnoscience Study in Lambaleko Weaving in Tana Righu

Yohanes Engge*, Geterudis Kerans, and Meinfi Yanti Malo
Science Education Study Program, Faculty of Education
Universitas Katolik Weetebula, Indonesia
*engge_yohanes@yahoo.com

Abstract. Sumba Island has cultural characteristics that can be integrated into science learning, including Sumba woven cloth. The process of making Sumba weaving has cultural and scientific value. This research aims to determine the meaning and ethnoscientific value of making Lambaleko woven cloth. This study used qualitative research methods. This data was obtained through observation, interviews and documentation. The instruments used in this research were observation sheets, interview sheets, and documentation. The data analysis involves data reduction, data presentation, and concluding. The research results show that the tools and materials used in the weaving process are traditional tools and materials with varying classifications, showing the biodiversity level on the island of Sumba. Making Lambaleko weaving consists of eleven stages: a) preparing tools and materials such as *Mbola, Bei tonnu, Koba, Malirra, Ghunna, Ghobola, Laketta, Bedo, Kalerre, Tent, Laka, Kalamaka, Ghobola ghunna, Ghobola zodo, Rande, Tukka, Kanagho,* scissors and thread, b) tools starting to be assembled on the *Mbola*, c) unfurling the warp threads on the *Bei tonnu*, e) removing the weave from the *Mbola*, d) winding the threads on the *Kanagho*, f) straightening the threads on the woven fabric, g) installing the *Rande*, h) installing *Tukka*, i) installing *Ghobola ghunna, Ghobola zodo*, j) making motifs, and k) the process of making weaving until it becomes cloth. The weaving process is also related to physical material, frictional forces, pressure, gravitational forces, biological material, plant biodiversity, and chemical material, additives. In conclusion, Lambaleko woven cloth has ethnoscientific and cultural values that the community believes to be used in science learning related to biodiversity, friction, pressure, gravitational forces, and additives.

Keywords: ethnoscience; indigenous science; lambaleko weaving

© 2024 Vidya Karya
DOI : https://doi.org/10.20527/jvk.v39i1.19218
Received: 20 October 2023 Accepted: 21 May 2024 Published: 6 June 2024

How to cite: Engge. Y., Kerans. G., & Malo. M. Y. (2024). Ethnoscience Study in lambaleko weaving in tana righu. *Vidya Karya*, 39(1), 80-87

INTRODUCTION

Ethnoscience is a strategy to create a learning environment by integrating cultural values and traditions into the learning process to benefit students' lives (Mukti et al., 2022; Nuralita, 2020; Suastra et al., 2010). Meaningful learning through an ethnoscience approach can enhance students' competence, increasing their motivation and enthusiasm (Damayanti et al., 2017; Misbah et al., 2024). Ethnoscience encompasses the cultural and traditional knowledge unique to a particular region or nation (Asra & Akmal, 2021; Nurdeni et al., 2022; Wahyu, 2017). This approach can be used to reconstruct indigenous science developed in communities into scientific knowledge (Khoiri et al., 2018; Risamasu et al., 2023; Sarini & Selamet, 2019).

This article is under license CC-BY-SA

Indigenous science refers to scientific knowledge acquired by communities through long-standing traditions or local cultures.

Ethnoscience learning is crucial as it can foster an appreciation for local culture and wisdom by introducing a region's cultural potential (Paris et al., 2010). Meaningful learning can facilitate students' learning through hands-on activities or learning by doing (Alvonco, 2014). This method allows students to connect scientific concepts with cultural and traditional values daily (Puspasari et al., 2019).

Sumba Island is part of the administrative region of East Nusa Tenggara province. The island is divided into four regencies: West Sumba, Southwest Sumba, Central Sumba, and East Sumba. One of Sumba's local wisdom is weaving. Weaving is deeply integrated into every aspect of Sumbanese life. For the Sumbanese, woven cloth is not just any fabric; each pattern and motif carries significant meaning. Creating a single piece of woven cloth takes quite a long time, ranging from two to three weeks, using natural materials. The process involves multiple stages and simple tools (Firmansyah et al., 2017). One way to preserve this local wisdom is through school education and learning processes.

East Nusa Tenggara is a province in Indonesia known for its distinctive culture in each region, where plants are used to make woven fabrics. Plants commonly used by weavers for dyeing include the Wora/Indigo plant *(Indigo tinctoria)* for black to dark blue colours, the Kombu plant, locally known as Mengkudu *(Morinda citrifolia),* for red, and Kawalu/Kemiri *(Aleurites moluccana)* as a colour fixer. The dye-fixing process takes a significant amount of time.

Science learning can be developed based on a region's unique characteristics and potentials, such as local culture and traditions (Hairida et al., 2010). Ethnoscience learning is important because it can foster an appreciation for local culture and wisdom by introducing a region's cultural potential (Paris et al., 2010). This is essential for preserving local culture and wisdom and educating students to understand science through real-life occurrences.

Future generations must preserve the weaving culture. However, many people, especially women, are no longer paying attention to it, raising concerns that it might disappear. One way to preserve this culture is by incorporating it into school learning.

Through scientific knowledge, there is a connection or relevance to scientific knowledge in weaving activities, such as the use of plant biodiversity for various daily needs, including cultural preservation. Plants used to make weaving tools include Kaboa wood (*Dipterocarpus gracilis Bl.)*, black teak/Ghasu Mette wood *(Tectona grandis Linn. f.),* Pule/Ghasu Ritta wood *(Alstonia scholaris)*, bamboo/Pollo *(Bambusa vulgaris Schrad)*, and the palm tree/Kalamaka Bullung *(Arenga pinnata),* whose stems are used to make traditional weaving tools.

One effort to preserve this culture is by integrating it into Biology, Physics, and Chemistry school lessons. In the curriculum covering plant biodiversity, the weaving tools and weaving process are relevant to concepts like friction, pressure, gravity, and additives. This study addresses how the ethnoscience of Lambaleko weaving in Tana Righu encompasses the local wisdom values of West Sumba weaving. Based on this background, the researchers conducted a study titled "Study of Ethnoscience in Lambaleko Weaving in Tana Righu." Thus, the problem can be formulated as follows: How does the ethnoscience study of Lambaleko weaving in Tana Righu incorporate the local wisdom values of West Sumba woven fabrics?

METHOD

This study uses a qualitative method. Qualitative research is a method based on philosophy used to investigate in scientific conditions (experiments) where the researcher becomes the instrument, data collection techniques, and qualitative analysis that emphasize meaning (Sugiono, 2018). Data was collected through observation, interviews, and documentation (Sugiono, 2018). Observations were made to see the tools and materials used in the making of woven cloth, interviews were conducted to gather information about the weaving process, and documentation was used to support the research with images. This research was conducted over two weeks from March 26 to April 8, 2024, in Lingu Lango Village because this village has local wisdom, which is the Lambaleko woven cloth, in Tana Righu District, West Sumba Regency, East Nusa Tenggara Province. The subjects of this study are people involved in the research or those who are part of the Lambaleko woven cloth makers in Tana Righu.

Data collection techniques include 1) observation of weaving tools and materials, 2) interviews providing information about the weaving process, and 3) documentation in the form of images of tools, materials, and the weaving process in the field. The instruments used in this research are observation sheets, interview sheets, and documentation. The data analysis technique used involves 1) data reduction, which is the process of filtering data, summarizing it, focusing on relevant aspects, and eliminating irrelevant data, 2) data presentation, which involves organizing data or information into a framework of relationships to present the data clearly and understandably, 3) drawing conclusions, which is collecting data from the beginning to the end of the research to imply that the information or data presented initially was supported by substantial evidence from field research, leading to a reliable conclusion.

RESULT AND DISCUSSION

Definition of Lambaleko Woven Cloth

Weaving is making fabric by weaving threads, which is traditionally done by women using traditional tools. Lambaleko woven cloth is made by the women of Lingu Lango Village using their hands and traditional tools. "Lambaleko" refers to the combination of thread colours woven together. Weavers in Lingu Lango Village, Tana Righu District, explain that learning to weave involves practice and knowledge passed down from parents.

Study of Local Science and Scientific Science in the Lambaleko Weaving Process

Local science refers to the knowledge and research conducted focusing on a region or culture's local context or wisdom. One local wisdom in Lingu Lango Village, Tana Righu District, is Lambaleko woven cloth.

Weaving Tools

Local Science:

In making Lambaleko woven cloth, the tools used are still traditional. The weaving tools of Lambaleko are strong, durable, and not easily weathered because they are cut during the full moon or dark moon. The wood used to make these tools is typically obtained from the forests around Lingu Lango Village, including types such as Kaboa wood *(Dipterocarpus gracilis Bl.),* locally known as Ghasu Kadebila, black teak/Ghasu Mette *(Tectona grandis Linn. f.),* Pule/Ghasu Ritta wood *(Alstonia scholaris),* bamboo/Pollo *(Bambusa vulgaris Schrad),* and the palm tree/Kalamaka Bullung *(Arenga pinnata)*. These traditional tools are made from trees or wood found around the community of Lingu Lango Village. These plants have their characteristics or classifications, which, through scientific

knowledge, are relevant to the scientific knowledge in Biology, particularly the use of plant biodiversity. Plant biodiversity refers to the number and variety of plant species within an area or ecosystem. The tools used exhibit various classifications of plant biodiversity, as shown in Table 1.

Table 1 Plant biodiversity classification

Scientific Information

a) Classification of Kaboa Wood

Kaboa wood is a type of wood that is hard, strong, and durable.

Indonesian	: kayu Kaboa
Local Language	: *ghasu Kadebila*
Kingdom	: *Plantae*
Sub Kingdom	: *Tracheobionta*
Superdivision	: *Spermatophyta*
Division	: *Magnoliophyta*
Class	: *Magnoliopsida*
Subclass	: *Dilleniidae*
Order	: *Theales*
Family	: *Dipterocarpaceae*
Genus	: *Dipterocarpus*
Species	:*Dipterocarpus gracilis Bl.*

b) Classification of Black Teak Wood

Black teak wood is a type of wood with superior and high quality characteristics.

Indonesian	: kayu Jati Hitam
Local	: *ghasu Mette*
Language	: *Plantae*
Kingdom	: *Tracheobionta*
Sub Kingdom	: *Spermatophyta*
Superdivision	: *Magnoliophyta*
Division	: *Magnoliopsida*
Class	: *Asteridae*
Subclass	: *Lamiales*
Order	: *Verbenaceae*
Family	: *Tectona*
Genus	: *Tectona grandis Linn. f.*
Species	

c) Classification of Pulai Wood

Pulai wood is a type of wood that is light yet strong, with a colour ranging from light brown to reddish.

Indonesian	: kayu Pulai
Local	: *ghasu Ritta*
Language	: *Plantae*
Kingdom	: *Tracheobionta*
Sub Kingdom	: *Spermatophyta*
Superdivision	: *Magnoliophyta*
Division	: *Magnoliopsida*
Class	: *Asteridae*
Subclass	: *Gentianales*
Order	: *Apocynaceae*
Family	: *Alstonia*
Genus	: *Alstonia scholaris R. Br*
Species	

d) Classification of Bamboo

Bamboo is a type of plant with a strong stem and flexible fibers.

Indonesian	: Bambu
Local	: *Pollo*
Language	: *Plantae*
Kingdom	: *Tracheobionta*
Sub Kingdom	: *Spermatophyta*
Superdivision	: *Magnoliophyta*
Division	: *Spermatophytina*
Class	: *Liliopsida*
Subclass	: *Commelinidae*
Order	: *Poales*
Family	: *Poaceae*
Genus	: *Bambusa Schreb*
Species	:*Bambusa vulgaris Schrad. ex J.C. Wendl.*

e) Classification of the Palm Tree

The palm tree is typically used to make brooms from its leaf spines.

Indonesian	: Pohon Aren
Local	: *ghasu Bullung*
Language	: *Plantae*
Kingdom	: *Spermatophyta*
Sub Kingdom	: *Angiospermae*
Superdivision	: *Monocotyledonae*
Division	: *Spadicitlorae*
Class	: *Palmae*
Subclass	: *Arecales*
Order	: *Arecaceae*
Family	: *Arenga*
Genus	: *Arenga pinnata Merr.*
Species	

Malirra

Local Science:

Malirra is a tool used in Lambaleko woven cloth. It is made from black teak wood, locally known as ghasu Mette. *Malirra* is shaped like a machete with a sharp, thin upper end and a blunt, thick lower end. The process of making *Malirra* involves peeling the black teak *(ghasu Mette)* bark, shaping it like a machete, smoothing it with sandpaper, applying oil to make it slick, and drying it so that when it is used to rub the woven fabric, the threads do not tangle or get damaged.

In weaving activities, the community's knowledge about rubbing *Malirra* from top to bottom or vice versa is relevant to Physics lessons. When *Malirra* is pulled through the threads from top to bottom or vice versa, a friction force is generated that opposes the movement. This process is related to Physics lessons on friction force. The formula for friction force is:

$$f_{friction} = \mu \times N$$

The normal force ***N*** is the force exerted by the weaving tool on the thread, and ***μ*** is the coefficient of friction between the thread and the weaving tool. *Malirra* is made slick to reduce the coefficient of friction ***(μ)*** between the thread surface and *Malirra's* surface. The relationship between *Malirra* and friction force is shown in Table 2.

Table 2 The relationship of malirra to friction force

Scientific Information

Malirra is shaped with a sharp tip and made slick to pass through the thread easily. *Malirra* is used by rubbing it from top to bottom or vice versa to produce fabric. In weaving activities, the term "rubbing" is related to the concept of friction force in Physics. The friction force is a force that arises due to the contact between surfaces (Riyadi, 2019). The formula for friction force is:

$$f_{friction} = \mu \times N$$

where:

N = normal force (force exerted by the weaving tool on the thread), **μ** = coefficient of friction (friction coefficient between the thread and the weaving tool).

Ghunna

Local Science:

Ghunna is a tool used in Lambaleko woven cloth to separate the upper and lower threads. This movement allows the upper and lower threads to interact in a certain way, forming the desired pattern in the fabric.

In this context, *Ghunna* can be related to gravitational force through its up and down movement. The gravitational force formula describes the attractive force between two objects with mass. The relationship between *Ghunna* and gravitational force is visually shown in Table 3. The use of *Ghunna* in weaving aligns with Physics principles, particularly gravity, by understanding how its movement is mediated by gravity and how the mass of *Ghunna* affects the gravitational force acting on it. This is why *Ghunna* always uses relatively lightweight wood to minimize the weight force when lifted.

Table 3 The relationship of ghunna to gravitational force

Scientific Information

When Malirra is inserted into the threads, Ghunna is lifted and released back down. This process is relevant to the concept of gravitational force in Physics. Gravitational force is the attractive force between two masses, objects, or particles. The formula for gravitational force is:

$$F = m.g$$

where: **F** = gravitational force, **m** = mass of *Ghunna*, **g** = gravitational acceleration.

Ghobola

Local Science:

Ghobola is a tool used in Lambaleko weaving. Its function is to press the woven fabric so Ghunna can be lifted upwards. *Ghobola* can be considered a source of pressure applied to the surface of the woven fabric. When *Ghobola* is pressed onto the fabric, it exerts a certain force on the surface. This process is relevant to the concept of pressure in Physics. Pressure is the force exerted by an object on a specific area. Given that the surface area being pressed is constant, this can be related to the formula for pressure, as shown in Table 4.

Table 4 The relationship between ghobola and pressure

Scientific Information
In weaving activities, Ghobola presses the woven fabric so that Ghunna can be lifted upwards. When Ghobola is pressed onto the fabric, it exerts a certain force on the surface. This process is relevant to the concept of pressure in Physics. Pressure is the force exerted by an object on a specific area. The formula for pressure ***(P)*** is: $$\mathbf{P} = \frac{\mathbf{F}}{\mathbf{A}}$$ **P** is the pressure, **F** is the force applied (in this context, the force applied by Ghobola on the woven fabric), and A is the surface area pressed (in this context, the area pressed by Ghobola on the woven fabric).

Bedo

Local Science:

Bedo is a tool made of wood, with smoothed sides and a middle section curved to fit the weaver's waist, preventing back pain. The *Bedo* weaving tool, designed according to the weaver's waist shape to avoid back pain, is related to scientific knowledge, particularly in Biology concerning the human skeletal system.

The human skeletal system is a major body part of bones and joints. The spinal column is an important part of the human skeletal system. It consists of a series of bones (vertebrae) that form a canal to protect the spinal cord and provide structural support for the body. Using the *Bedo* weaving tool, which is designed to fit the weaver's waist, helps maintain the correct and natural position of the spine during weaving. This helps reduce the pressure applied to the spine and prevents injury or discomfort.

Additionally, the middle section of *Bedo* is curved and wide enough to fit the weaver's waist, which is relevant to the concept of pressure in physics, as shown in Table 5. The relationship between Bedo, the human skeletal system, and pressure is shown in Table 5.

Table 5 The relationship between bedo, the human skeletal system, and pressure

Scientific Information
Bedo supports the weavers' backs in weaving to prevent spinal pain. This is relevant to the human skeletal system material in Biology. The human skeletal system is a major body part of a series of bones and joints. The middle section of *Bedo*, which is curved and wide enough to fit the weaver's waist, is also relevant to the concept of pressure in physics. Pressure is the force exerted by an object on a specific area. The formula for pressure (**P**) is expressed as: $$\mathbf{P} = \frac{\mathbf{F}}{\mathbf{A}}$$ where: **P** = Pressure, **F** = Force applied, **A** = Surface area being pressed

Thread Colors

Local Science:

The thread colours used in Lambaleko woven fabrics include various colours such as red, yellow, blue, green, and black. These colours are often used as the base colour of the fabric and for motifs. The colours of the threads used in Lambaleko woven fabrics are related to Chemistry lessons, particularly in the material on additives. The relationship between additives and thread colours can be seen in Table 6. The black thread also affects heat absorption from solar radiation. Black fabric absorbs heat more quickly, making it less commonly used.

Table 6 The relationship between thread colours and additives

Scientific Information
The thread colours used are relevant to the material used in the chemistry of additives. Additives are chemical compounds added to products for specific purposes, such as enhancing colour, texture, or durability. One common additive used for synthetic thread colouring is synthetic dyes. Synthetic dyes are not derived from natural sources. Making synthetic dyes involves complex chemical reactions to create the desired dye molecules.

CONCLUSION

The process of making Lambaleko woven fabrics still uses traditional tools and materials. This study found several scientific aspects of Biology, Physics, and Chemistry. Traditional tools are made from plants, specifically trees or wood, found around the Lingu Lango Village community. These plants have their characteristics or classifications, and through scientific knowledge, the material is relevant for utilizing plant biodiversity in Biology. Weavers choose specific types of wood for making weaving tools, such as Kaboa wood *(Dipterocarpus gracilis Bl.)* or locally known as ghasu Kadebila, black teak wood / ghasu Mette *(Tectona grandis Linn. f.),* Pule wood/ghasu Ritta *(Alstonia scholaris)*, Bamboo/Pollo *(Bambusa vulgaris Schrad)*, and Aren tree/ Kalamaka Bullung *(Arenga pinnata)*. These tools show a connection to scientific knowledge in Biology, particularly in the utilization of plant biodiversity.

Tools such as *Malirra, Ghunna, Ghobola,* and *Bedo* are used in the weaving process. The use of *Malirra* is relevant to the concept of Physics, particularly friction, while Ghunna is related to gravitational force. *Ghobola*, as a source of pressure on the surface of the woven fabric, can be explained by the formula for pressure in Physics. The use of *Bedo*, which is designed according to the weaver's waist shape, shows a connection to Biological knowledge about the human skeletal system. In Physics, the curved and wide part of *Bedo* is relevant to the concept of pressure, where a larger surface area reduces the pressure on the spine. Thread colors are relevant to chemistry, particularly the material used in additives.

REFERENCES

Alvonco, J. (2014). *Practical communication skill.* Jakarta: Elex Media Komputindo.

Asra, A., & Akmal, A. U. (2021). Analisis perangkat pembelajaran berbasis etnosains di smp kabupaten rokan hulu. *Jurnal Pendidikan Rokania*, *6*(1), 9-22.

Damayanti, C., A. Rusilowati, & S. Linuwih. (2017). Pengembagan model pembelajaran ipa terintegrasi etnosains untuk meningkatkan hasil belajar dan kemampuan berpikir kreatif. *Journal of Innovative Science Education*, 6 (1), 117-128. https://doi.org/10.15294/jise.v6i1.17071

Firmasyah M, Lomi A., & Gustopo, D. (2017). Meningkatkan mutu kain tenun ikat tradisional di desa/kelurahan roworena secara berkesinambungan di kabupaten ende dengan pendekatan metode TQM. *Jurnal teknologi dan manajemen industry,* 3 (1), 5-13. https://doi.org/10.36040/jtmi.V3iI.171

Kartono, K., Hairida, H., & Bujang, G. (2010) *Penelusuran budaya teknologi lokal dalam rangka rekontruksi dan pengembangan sains di sekolah dasar.* Pontianak: FKIP, Universitas Tanjungpura.

Khoiri, A. & Sunarno, W. (2018). Pendekatan etnosains dalam tinjauan filsafat. *SPEKTRA: Jurnal Kajian Pendidikan Sains*, *4*(2), 145.

Misbah, M., Purwasih, D., Muhammad, N., Syahidi, K., Komariyah, L., Wahyudi, W., & Nurhayati, N. (2024). Is science concept can analyze by study ethnoscience? Study bibliometric and analysis. *AIP Conference Proceedings*, 3058(1). AIP Publishing.

Mukti, H., Suastra, I. W., & Aryana, I. B. P. (2022). Integrasi etnosains dalam pembelajaran ipa. *JPGI (Jurnal Penelitian Guru Indonesia)*, *7*(2), 356-362.

Nuralita, A. (2020). Analisis penerapan model Pembelajaran berbasis etnosains dalam pembelajaran

tematik SD. *Mimbar PGSD Undiksha*, *8*(1), 1-8.

Nurdeni, N., Bhakti, Y. B., Alfin, E., Marhento, G., & Purwanti, P. (2022). Kemampuan siswa sekolah menegah pertama dengan pembelajaran etnosains. *Jurnal Pendidikan Dan Konseling (JPDK)*, *4*(6), 9799-9807.

Parris, P. & Linder VanBerschot, JJJ.A (2010) Cultural dimensions of learning: addressing the callengges of multicultural instruction. *International Review of Research in Open and Distance Learning*, 11 (2), 1-19. https://dx.doi.org10.18173/irrodl.vIIi2.809

Puspasari, A., Susilowati, I., Kurniawati, L., Utami, R.R., Gunawan, I.,v Sayekti, I.C. (2019). Implementasi etnosains dalam pembelajaran ipa di sd muhammadiyah alam surya mentari surakarta. *Science Education Journal* (SEJ), 3 (1), 25-31. https://doi.org/10.21070/sej.v3i1.2426.

Risamasu, P. V. M., Pieter, J., & Gunada, I. W. (2023). Pengembangan bahan ajar ipa smp tema perpindahan kalor berkonteks etnosains jayapura papua. *Jurnal Ilmiah Profesi Pendidikan*, *8*(1b), 948-958.

Riyadi, Agus, (2019). *Gaya dan gerak*. Semarang. Alprin.

Sarini, P., & Selamet, K. (2019). Pengembangan bahan ajar etnosains bali bagi calon guru IPA. *Wahana Matematika dan Sains: Jurnal Matematika, Sains, dan Pembelajarannya*, *13*(1).

Suastra, I.W. (2010). Model pembelajaran sains berbasis budaya untuk mengembangkan potensi dasar sains dan nilai kearifan lokal di smp. *Jurnal Pendidikan dan Pengajaran*, 43 (1), 8-16. https://doi.org/10.23887/jppundiksha.v43iI1697

Sugiyono. (2017). Metode penelitian kualitatif, kuantitatif, dan R&D. Bandung: Alfabeta

Wahyu, Y. (2017). Pembelajaran berbasis etnosains di sekolah dasar. *Journal Inovasi Pendidikan Dasar,* 192.