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Identification of Scientific Knowledge in the Making Process of Batik Tanah Liek as Teaching Materials in Ethnoscience-Based Learning

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Abstract: Minangkabau Batik Tanah Liek stands out among Indonesian batiks for its unique use of natural coloring materials derived from clay and specific plants. This study aims to identify and analyze the scientific concepts embedded in the production of Batik Tanah Liek for developing ethnoscience-based teaching materials. Employing a qualitative descriptive approach, the research utilizes the Educational Reconstruction Model (MER) to explore its ethnoscientific content. Data were gathered through interviews, observations, and field notes from three batik centers in West Sumatra. The findings reveal various science concepts in the processes of production, coloring, and waste management of Batik Tanah Liek. Indigenous knowledge of the local community was reconstructed into scientific concepts related to physics, chemistry, and biology, forming the basis of ethnoscience content. These findings demonstrate the potential to develop ethnoscience-based teaching materials suitable for elementary to high school levels. Such materials align with the Science Learning Outcomes of the Merdeka Curriculum, fostering the Pancasila Learner Profile.

Keywords: Batik Tanah Liek, Ethnoscience, Indigenous Science, Natural Dyes, Scientific Reconstruction

1. Introduction

Batik is a cultural treasure of the Indonesian people with its unique art and techniques. Batik is the pride of Indonesia in the eyes of the world and has been recognized as a world cultural heritages by UNESCO on October 2, 2009 [1], [2]. Batik that is widely known by the public is batik produced on the island of Java. There are still few people who know that batik is also found outside Java such as batik Lampung, Bengkulu, Jambi, and West Sumatra [3]. Batik in each region has different characteristics, both in terms of motifs, shapes, and materials. The typical Minangkabau batik craft of West Sumatra is Batik Tanah Liek which has its own uniqueness [4].

Batik Tanah Liek is typical of Minangkabau culture that has existed since 70 years ago. Currently, the production of Batik Tanah Liek is developed by several craftsmen in several districts / cities in West Sumatra. The uniqueness of Batik Tanah Liek lies in the coloring materials used, which come from natural materials such as tanah liek (clay) as the basic dye of the fabric, as well as utilizing certain plant parts traditionally [5], [6]. The utilization of clay as a natural dye is not found in other batik in Indonesia, only in typical Minangkabau batik, Batik Tanah Liek. Batik Tanah Liek as a Minangkabau cultural treasure needs to be preserved. In order to maintain the existence of culture and local wisdom of Minangkabau batik, future generations need to learn about culture and local wisdom, this can be done by incorporating cultural knowledge into the learning process, known as ethnoscience-based learning [7].

Ethnoscience is the knowledge possessed by a particular ethnic or social group as a system of knowledge and cognition typical of a given culture. Ethnoscience is original knowledge in the form of language, customs and culture, morals and technology created by certain communities or people that contain scientific knowledge. Knowledge derived from the norms and beliefs of the local community affects the interpretation and understanding of nature [8]. Ethnoscience of local communities must be explored, documented, reconstructed, and developed together with scientific knowledge [9], [10].

Ethnoscience-based learning can raise local culture and wisdom to be used as objects in science learning, both chemistry, biology, and physics [11], [12]. Ethnoscience-based learning has the potential to develop student centered learning. This learning is able to increase students' appreciation of culture and create a contextual and meaningful learning atmosphere. Ethnoscience-based learning has many advantages, namely encouraging students to develop the potential for science literacy, creativity, critical thinking, problem solving, character, maintaining local cultural wisdom values, and conservative behavior [11], [13], [14], [15].

Ethnoscience-based learning is a way to carry out the mandate of Law no. 20 of 2003 concerning the national education system article 36 paragraph 3 and Kepmendikbudristek No. 56 tahun 2022. It is stated that

the curriculum at all levels and types of education is developed with the principle of diversification in accordance with the education unit, regional potential, and students. Thus, the science learning process must be rooted in the nation's diverse culture, so that the younger generation can understand science as part of life, develop critical thinking skills and problem solving by exploring the potential of local culture. So, ethnoscience-based learning can be used as a strategy to implement the 2013 Curriculum and also the Merdeka Curriculum, because it has the characteristics of applying science education with local wisdom to achieve the Pancasila learner profile. This greatly supports the implementation of the curriculum and educational goals in Indonesia.

Several studies on Batik Tanah Liek have been conducted by previous researchers, but these studies only discuss the aspects of motifs and ornaments [5], [16], [17], the problems faced by the Batik Tanah Liek industry [4], [18], women artisans and entrepreneurs of Batik Tanah Liek [6], [19], product innovation strategies [20] and coloring techniques [21]. However, research that focuses on exploration, identification, and reconstruction from indigenous science to scientific knowledge on Batik Tanah Liek to be developed into ethnoscience-based teaching materials has not been found.

Based on this preliminary data, it appears that very few studies have explored and identified ethnoscience in Batik Tanah Liek. Even though the process of making batik involves many elements of science. The original science owned by batik craftsmen can be explored, identified, and reconstructed into scientific science. The results of this reconstruction can then be used as contextual science learning materials and based on Minangkabau local wisdom. For batik artisans themselves, the results of this reconstruction can add value or quality to the Batik Tanah Liek products produced.

Therefore, it is necessary to identify and analyze ethnoscience in Batik Tanah Liek. This article aims to identify and analyze the science concepts contained in the process of making Batik Tanah Liek as ethnoscience-based learning teaching materials. This research is focused on a) Indigenous knowledge about the process of making Batik Tanah Liek, b) Exploration and identification of natural dyes, and c) Analysis of ethnoscience concepts in Batik Tanah Liek that can be developed into science learning teaching materials for elementary, junior high, and high school levels. This article also offers the originality of the latest study on ethnoscience in Batik Tanah Liek, which can be used as a basis in developing ethnoscience-based science learning (chemistry, biology, and physics).

2. Method

This study used a qualitative descriptive research approach [22]. The exploration of ethnoscience content in Batik Tanah Liek was conducted using the Educational Reconstruction Model (MER). This design is typically used to reconstruct relatively new knowledge or innovative contexts in science that are not or have not been available in the school curriculum. As a complete process, MER identifies and interprets 1) the clarification of the scientific content of a particular context, 2) the learner's perspective, and 3) the learning environment including design, analysis, and evaluation to reconstruct innovative or relatively new contexts that are not available in the conventional curriculum [23]. This research specifically focuses on the first part, namely the clarification of the scientific content of a particular context in Batik Tanah Liek.

In this section, there are two contents that are investigated, namely scientific content aspects and educational aspects. First, it explores the ethnoscientific content aspects of the process of making Batik Tanah Liek, including dyes, materials and tools used, and handling of waste generated. This exploration was conducted through structured and unstructured interviews, direct observation and field notes. Structured and unstructured interviews are commonly used to explore respondents' perspectives on their knowledge of a concept [24]. Second, identifying ethnoscience concepts in the process of making Batik Tanah Liek. Furthermore, chemistry, biology, and physics content were analyzed to be developed as teaching materials for science learning [23], [25].

3. Results and Discussion

3.1 Indigenous knowledge of Batik Tanah Liek

Based on the results of the interview, it is known that the original knowledge of the community about the process of making Batik Tanah Liek was obtained from Java, so the technique in making batik is similar to Javanese batik. However, what is different is the aspect of the dyes used, where in Batik Tanah Liek the cloth is colored with basic dyes using a solution of tanah liek. Meanwhile, batik motifs are colored with natural dyes from certain plants. This process gives the batik cloth a distinctive color that is not owned by batik from other regions. Coloring with clay and several types of plants is the original knowledge of the people in Sumanik, Batusangkar. So that this color becomes one of the characteristics or characters of batik originating from West Sumatra. This knowledge was obtained long ago, and then passed on to the next generation.

3.2 Natural dyes used

Based on the exploration results, batik craftsmen use clay in their area. The type of soil commonly used in making batik is earthenware type soil. From the results of scientific reconstruction, it was found that the advantage of this earthenware soil is that it is available in several colors such as brown, red, orange, gray, and white. Due to its high iron and mineral content, earthenware soil is one of the best types of clay. The reason for choosing this type of clay is because it is not sandy and gravelly so that in the process of making extracts no more filtering is needed, making it more effective and efficient.

Clay extraction process is to use warm water in a ratio of 10:20. Before soaked with clay cloth soaked with Turkish Red Oil (TRO) first for 15 minutes, then dried. Duration of soaking the fabric with clay 1 to 20 days depending on the color you want to produce, the longer the soaking, the more intense the color will be produced. The color produced from clay is orange, yellow, brownish red final color [21], [26]. The resulting color is also influenced by the type of fixator used. The fixator can be alum, lime, arbor, or vinegar [5].

Another uniqueness of Batik Tanah Liek is that it uses natural dyes from jengkol skin (*Pithecellobium jaringa*), mangosteen skin (*Garcinia mangostana*), gambier sap (*Uncaria gambir*), rice straw (*Oryza sativa*), mahogany skin (*Sweetenia mahogani*), rambutan skin (*Nephelium lappaceum*), and any traditional plants used for coloring. The data were then analyzed and identification of the colors produced based on the mordanting used and the chemicals contained in the clay and plants [27], [28], [29], [30]. The results of exploration and identification can be seen in Table 1.

Table 1. Matrix of the results of exploration and identification of materials and dyes used in batik used in Batik Tanah Liek

No	Natural Dyes	Indigenous Science	Scientific Knowledge
1	*Tanah liek* (clay)	roloc lanif der-hsinworb ,wolley ,egnarO	Contains high amounts of iron and some minerals.
2	ribmaG	Light brown color. Changes in the color of the fabric from light brown to yellowish, reddish-brown, greenish-brown to blackish are influenced by the type of mordant and the mordanting method used.	Tannins/catechin acid (catechin), tannic catechin acid (anhydrous catechin). Color differences are influenced by the type of mordant and the mordanting method used. The pH also affects the color produced.
3	niks lokgneJ	The base color is dark brown. Several color variations using mordant.	Alkaloids, flavonoids, anthraquinone glycosides, tannins, triterpenoids/steroids, saponins, and some minerals. Cream color produced with alum ($KAl(SO_4)_{21}\cdot 2H_2O$) mordant. Brownish-yellow color with mordant soda as. The grey color is produced with the arbor ($FeSO_4$) mordant.
4	niks natubmaR	Dark red color. Brown color produces several colors depending on the mordant used.	Tannins, anthocyanins, flavonoids. $KAl(SO_4)_{21}\cdot 2H_2O$ solution produces a yellowish-cream to brown color. $FeSO_4$ produces a gray to black color. $CaCO_3$ produces a pale cream color.
5	niks neetsognaM	eulb dna elprup ,deR	eninoihtatnA
6	Areca tun	Areca nut seed extract produces a brownish-red color.	Tannins, alkaloids, saponins, anthocyanins

In the process of giving color to batik cloth, chemicals need to be given to strengthen the color. This is in accordance with research conducted by Darsih et al[31]. That natural dyes require an element to create a bond between the fabric and natural dye particles called a mordant. This mordant provides a chemical reaction so that the dye can be absorbed into the textile material and fixes the color on the fabric by increasing the durability of the color. In Indonesia, the fixation or mordanting process usually uses metal mordants such as alum ($KAl(SO_4)_{21}\cdot 2H_2O$), limestone ($CaCO_3$) and arbor ($FeSO_4$). Alum will give a yellowish color, and calcium will produce a darker bluish color. Similarly, iron will amplify dark colors.

3.3 The process of making Batik Tanah Liek

The process of making Batik Tanah Liek is not much different from making batik in general. In general, the stages of making batik begin with making patterns, *canting* (a step in the batik waxing process), giving color, *pelorodan* (wax removing), and fixation [32], [33], [34]. The batik coloring process is carried out in two ways, namely dyeing and *pencoletan*. Dyeing is done by directly inserting the waxed cloth into the prepared dye, while *pencoletan* is done using a brush or foam. The dyestuff used in *pencoletan* is different from that used for dying. [6].

Based on the results of the research, data were obtained about the process of making Batik Tanah Liek. The batik process is carried out through the preparation, batik and completion stages. The stages can be seen in Table 2 below:

Table 2. The Process of Making Batik Tanah Liek

oN	ssecorP	tnemtaerT
1	noitaraperP	Preparation of tools and materials, preparation of designs/motifs, and transferring designs/motifs.
2	hanaT fo gnikam ehT	The process of attaching wax and the coloring process.
	kitaB keiL	The cloth is soaked first with Liek soil for 2 days to 2 weeks After the cloth is dry, the process of squeezing is carried out, giving it color with natural dyes. For color reinforcement, mordanting/fixation is carried out.
3	noituloS	The final process of batik is by applying water glass to the cloth and melorod.

3.4 Waste treatment

Based on the results of the interviews, it was found that the waste from making Batik Tanah Liek did not have a negative impact, but instead had a positive impact on the rice fields affected by the waste disposal site. However, based on the analysis of the materials used in the process of making Batik Tanah Liek, it turns out that not all of them come from natural materials. In the coloring process, it also uses several chemicals, such as mordant and TRO (Turkish Red Oil) so that batik-making waste also contains chemicals that can pollute the environment, although the level of waste produced is less than batik made using chemical dyes.

Therefore, a substance is needed that can absorb chemicals before the waste is disposed of. Based on the results of science reconstruction, data obtained that West Sumatra has many typical animals, including pensi. Pensi (*Corbicula moltkiana*) is an animal similar to a mollusk but has a smaller body size. The habitat of this animal has spread to small rivers around the lake so that the pensi population is increasing. Apart from being consumed by fishermen themselves, pensi are also sold in the market and then processed into typical and delicious snacks.

The body part of the pensi that is consumed is only the meat, while the shell of the pensi will become solid waste that can damage the aesthetics of the environment. This pensi shell can be obtained as a biosorption for waste. This is relevant to research conducted by Putri[35], Yetri [36] and Zein et al[37]. Where the pensi shell can be used as a metanil yellow dye absorbent material and as an effluent water purifier by reducing phosphate, nitrate, nitrite, BOD, COD, TSS, and color levels. Based on the reconstruction results, the pensi shell can also be used as a biosorption of batik waste in Tanah Liek.

3.5 Identification of chemical ethnoscience concepts in Batik Tanah Liek

The aspects identified include: aspects of scientific contents, namely ethnoscience concepts contained in the making of Batik Tanah Liek, and educational aspects, namely ethnoscience concepts in Batik Tanah Liek that can be developed into science learning teaching materials, both at the elementary, junior high and high school levels in accordance with the Merdeka Curriculum.

Based on the results of interviews, observations, and field notes, the community's original knowledge of the batik making process and waste handling was analyzed. The original knowledge is then reconstructed into

scientific science. Many chemical concepts are found in the process of making Batik Tanah Liek, such as elemental chemistry, compounds, mixtures, acid-base, solubility, organic compounds, and others which can be seen in Table 3 below.

Table 3. Identification of chemical concepts in Batik Tanah Liek

No	Indigenous Science	Scientific Knowledge	Chemical concepts
1	Materials :		
	a. Fabric	Fabrics, both natural and synthetic, are chemically polymers composed of repeating monomers. The most common functional groups in fiber polymers are hydroxyl, carbonyl, carboxyl, amino and ester.	Cellulose, polymer, functional groups of organic compounds
	b. Natural dyes	Natural dyes have functional groups that play an important role in determining polarity, secondary bonding (both intermolecular and intramolecular)	Chemical bonding, pH, solubility, affinity to water, and chemical reactivity
2	Manufacturing process:		
	a. *Canting*	Cu, Al (elemental chemistry, metal properties.)	Elemental chemistry, properties of metals
	b. Waxing	Wax is composed of fatty acid esters and long-chain alcohol compounds. Waxes are hydrophobic so they can block the contact of (water-soluble, hydrophilic) dyes with the fabric.	Organic compounds (alcohols and lipids) Compounds and mixtures Change of form
	c. Coloring process	The dyeing process occurs when fabric molecules form chemical bonds with dye molecules	Types and properties of clays, chemical bonds, solutions, extraction, pH, reaction rates.
	d. Fixation/ color binding	Dyes are organic compounds that have a chromophoric system, which is a chemical structure capable of selectively absorbing visible light.	Hydrocarbons, chemical bonds, functional groups, pH, solubility, affinity for water, and chemical reactivity.
	e. *Pelorodan*	Dyes are organic compounds that have a chromophore system. Wax removal process	Solutions, complex compounds, and chemical bonds.
3	Batik waste processing	Water pollution, biosorption	Complex compounds, and chemical bonds.

The identification of chemical concepts in Batik Tanah Liek is relevant to the research conducted by Izzah, S. N., et al., [38] and Anugrah[25]. Based on the results of the analysis, it was found that the original science concept of the community in making Batik Tanah Liek can be reconstructed into scientific knowledge as a science learning resource. The new innovations in this article are in the type of tanah liek, the type of fabric, other natural dyes, and the use of pensi as a biopsy of batik waste.

The process of reconstruction and inculturation of indigenous knowledge into scientific knowledge in the process of making Batik Tanah Liek has not been widely carried out, so this finding provides an opportunity for research to develop ethnoscience-based chemistry learning of Batik Tanah Liek as a cultural treasure that needs to be preserved and passed down to the next generation. Furthermore, research results that refer to this review will be able to improve the quality of Batik Tanah Liek, typical of Minangkabau West Sumatra.

3.6 Identification of physics ethnoscience concepts in Batik Tanah Liek

Many physics concepts are found in the process of making Batik Tanah Liek, such as light, temperature and heat, thermodynamics, and others which can be seen in Table 4 below.

Table 4. Identification of physics concepts in Batik Tanah Liek

No	Stages	Indigenous Science	Scientific Knowledge	Physics Concepts
1	Creation Pattern	To determine the batik pattern that will be waxing (*canting*) later.	The pattern-making activity involves the concept of light.	Light Waves
2	Dyeing	The process of putting wax on batik cloth that has been given a pattern using *canting*.	Penciling activities involve the concept of changes in the form of substances if temperature and heat are not controlled.	Temperature and heat. Change in state of matter.
3	Coloring	Giving color to certain or all batik patterns.	Coloring activities involve the concept of changes in the form of substances. Temperature, and heat.	Temperature and heat. Change in state of matter.
4	Color locking	Aims to make the resulting batik not easily fade the final coloring.	Color locking activity is called fixation, involving the concept of Black's principle.	Temperature and heat. Black's principle.
5	*Melorod*	The final stage of the batik making process by boiling the batik cloth to remove the remaining wax.	The sagging activity involves the concepts of thermodynamics, heat, and others.	Temperature and heat. Thermodynamics
6	Drying	Drying is not a stage of the batik making process because it aims to dry.	Involves the concept of radiant heat transfer.	Temperature and heat

3.7 Biological ethnoscience concepts found in making Batik Tanah Liek

There are several biological concepts in the process of making Batik Tanah Liek, such as morphology, plant classification, biodiversity, bioconservation, movement systems, and others which can be seen in Table 5 below.

Table 5 Identification of biological concepts in Batik Tanah Liek.

No	Stages	Indigenous Science	Scientific Knowledge	Biology Concepts
1	Creation Pattern	Pattern designs are diverse. Nowadays, new motifs are also being introduced whose inspiration is taken from the rich natural culture of Minangkabau, such as palm flowers, etc.	The shape of Batik Tanah Liek motifs can be grouped into a) Forms of natural motifs Objects: *Tabuik, Jam Gadang, Rumah Gadang, Rangkiang.* *b) Forms of floral motifs: Bungo melati, bungo rayo, kaluak paku, siriah gadang, bungo pinang, lansek manih, pohon sawit.* c) Forms of fauna motifs: *Balam, binatang lauik, itiak pulang patang, burung merak, burung hong , kudo lauik.*	Animal and plant morphology, plant and animal classification, biodiversity and bioconservation
2	Dyeing	Painting or waxing	Involves locomotion in the	Human movement

No	Stages	Indigenous Science	Scientific Knowledge	Biology Concepts
			body. The cooperation of joints and muscles makes workers able to carry out twisting activities.	system
3	Coloring	One of the uniqueness of Batik Tanah Liek is that the coloring materials used come from natural dyes such as clay and traditional plants.	Coloring activities involve the diversity of plants and their parts (roots, stems, leaves, flowers, fruits) in the process.	Plant classification, plant morphology and anatomy, biodiversity.
4	Color locking	Color locking is an indigenous science of the people's culture (Indigineous knowledge) while the scientific science is fixation.	Fixation activities involve locomotion in the body. Joint and muscle cooperation enables workers to perform fixation activities.	Human movement system (bones, muscles, joints, skeleton), conservation of the environment.
5	*Melorod*	The final stage is to boil the batik cloth to remove the remaining wax.	*Melorod* activities involve movement tools in the body. Joint and muscle cooperation makes workers able to carry out *melorod* activities.	Human movement system (bones, muscles, joints, skeleton), conservation of the environment.
6	Drying	Drying cloth is like drying cloth in general, but there is science in it.	Drying activities involve movement tools in the body. Joint and muscle cooperation makes workers able to do *canting* activities.	Human movement system (bones, muscles, joints, skeleton)
7	*Limbah batik*	Batik waste treatment	Water pollution, biosorption	Conservation of the environment.

The concept of biological ethnoscience can be identified at every stage of making Batik Tanah Liek. These biological concepts include plant and animal classification, biodiversity, plant and animal morphology, movement systems and environmental conservation. This identification is in accordance with the results of (Kidman et al, 2013) which reveals that in a community knowledge there is scientific knowledge that must be studied and studied.

The integration of the ethnoscience concept of making Batik Tanah Liek in biology learning is expected to increase students' understanding and knowledge of the utilization of flora and fauna and environmental conservation that has been carried out by ancestors in the past. In addition, it also fosters an attitude of respect for the customs and culture inherited by the ancestors through the making of this batik by still paying attention to environmental conservation. So in the end it can be understood that the integration of community culture into a school education environment will be very beneficial, especially in increasing awareness of the utilization of biological natural resources and environmental conservation.

3.8 Ethnoscience Content of Batik Tanah Liek in Science Learning Outcomes

Based on the analysis of the Learning Outcomes (LO) of Science Subjects in elementary, junior high, and high school in each phase, the ethnoscience context of Batik Tanah Liek can be integrated in IPAS learning. Science content that can be integrated with the ethnoscience of Batik Tanah Liek can be seen in Table 6 below.

Table 6. Ethnoscience of Batik Tanah Liek that is relevant to elementary, junior high, and high school science content

oN	**Phase/Class**	**Integration of ethnoscience of Batik Tanah Liek according to LO**
1	A / Grades I and II Elementary School	-
2	B / Grades III and IV Elementary School	a. Living with Nature b. Getting Acquainted with Energy c. Stories from Hometown d. Forms of Substances and their Changes. e. Changing Forms of Energy f. Stories About My Region g. My Indonesia is Rich in Culture
3	C / Grades V and VI Elementary School	a. Seeing by Light, Hearing by Sound. b. Harmony in Ecosystems. c. My Indonesia is Rich d. My Region is My Pride e. How Does Our Body Move? f. Indonesia and the World Community: Indonesia's Global Heritage
4	D / Class VII, VIII, and IX Junior High School	a. Substances and their Changes b. Temperature, Heat and Expansion c. Motion and Force d. Classification of Living Things e. Ecology and Biodiversity of Indonesia f. Vibration, Waves and Light g. Elements, Compounds and Mixtures
5	E / Class X high school	a. Measurement in Scientific Work b. Basic Laws of Chemistry Around Us c. Atomic structure d. Chemistry of the environment e. Diversity of Living Things, Interactions, and their Role in Nature
6	F / Classes XI and XII of high school	a. Light waves. b. Heat energy. c. Thermodynamics d. Energetics e. Chemical calculations f. Compounds g. Solution h. Acid-Base i. Organic chemistry

In the Merdeka curriculum, science and social studies learning in elementary schools is simplified into one subject, namely IPAS, taking into account that elementary school children still see things as they are, whole and integrated. Elementary school-age children are still in the stage of thinking concretely/simply, holistically, comprehensively, and not in detail so that learning in elementary schools needs to provide students with opportunities to explore, investigate and develop understanding related to the environment around them [40]. Therefore, learning by integrating material with local culture such as Batik Tanah Liek is a way that is in accordance with the characteristics of elementary school children.

Natural science (IPA) plays a very big role in the lives of students so that they can maintain the safety of themselves, others, and nature, look for hidden potentials from nature, both renewable and non-renewable and

help humans make decisions in solving problems. At the junior high school level, Natural Science becomes a separate subject so that students have wider opportunities to study topics in the scientific fields of physics, chemistry, biology, and earth and space [41].

Integrated science education focuses on the competence of applying scientific research principles in the learning process. Thus, it is expected that after mastering integrated science, students have a solid foundation for thinking and acting on the basis of understanding the rules of scientific research. There are two main elements in science education, namely understanding science and process skills (inquiry) to apply science in everyday life. Each element applies to four content areas, namely living things, substances and their properties, energy and its changes, and Earth and space [42].

In essence, science which includes Physics, Chemistry and Biology includes products and processes. The product in question is knowledge about science itself. Physics deals with matter and its motion and behavior within the scope of space and time, as well as force and energy. Biology is related to living things and all the bioprocesses that occur, while chemistry is related to the composition, structure, properties and changes in matter. Chemistry is related to matter, chemical reactions, and the energy that accompanies its changes [43].

The topics studied in science are materials related to life problems to support sustainable development and knowledge that is current to attract interest and love for science. While the process includes science process skills in obtaining knowledge itself. Through science learning, students are trained to solve daily life problems related to science material. This is important to prepare students in facing their lives in the present and future. During the science learning process, students perform scientific work activities so that scientific skills, scientific attitudes and the Pancasila Student Profile will develop.

4. Conclusion

From the study, it was found that the community's original scientific knowledge about the process of making Batik Tanah Liek has existed since ancient times, starting from the process of making Batik Tanah Liek, selecting the type of tanah liek (clay), finding natural dyes, color enhancers, and processing the waste of Batik Tanah Liek. The knowledge is then passed on to the next generation. The original knowledge of the community can be reconstructed into scientific science both from the physical, chemical and biological aspects so that ethnoscience content is obtained. The ethnoscience can be developed into ethnoscience-based teaching materials in science learning, starting from elementary, junior high, and high school levels which are relevant to the Science Learning Outcomes of the Merdeka Curriculum to achieve the Pancasila Student Profile.

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