JPPIPA 9(5) (2023)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Ethnoscience-Based Science Learning in *Sasak* Ethnic Culture: Literature Review

M. Harja Efendi[1*], Agus Muliadi[2]

[1]Department of Biology Education, Universitas Islam Negeri Mataram, Mataram, Indonesia.
[2]Department of Biology Education, Universitas Pendidikan Mandalika, Mataram, Indonesia.

Received: March 12, 2023
Revised: May 23, 2023
Accepted: May 26, 2023
Published: May 31, 2023

Corresponding Author:
M. Harja Efendi
harjaefendi@uinmataram.ac.id

DOI: 10.29303/jppipa.v9i5.3769

Abstract: This study aims to elaborate on science learning based on indigenous science, the culture of the *Sasak* ethnics of Lombok. This study is library research with data sources from previous research articles that have topics related to science learning, science concepts, ethnoscience, and *songket* cloth, *poteng jaje tujak*, and *bale adat*. The procedure in literature study research is carried out in stages, namely collecting library data, reading, taking notes, studying, collecting concepts or manuscripts, then carrying out elaboration and explanation of the collected data/text. The study results show that (1) the nature of learning science can be classified into three dimensions, namely science as a product, science as a process, and science as an attitude; (2) indigenous science in *songket wayang* motifs, *subahnale* motifs *keker* motifs *four star*, and *alang/lumbung* which have relevance to the basic science competence of "analyzing the reproductive system in plants and animals and the application of technology to the reproductive system of plants and animal"; (3) indigenous science in the materials for making *bale adat* has relevance to the basic competence of natural science on "analyzing the interrelationships of plant tissue structures and their functions, as well as technology inspired by plant structures"; (4) indigenous science in the process of making *poteng jaje tujak* has relevance to the basic competence of natural science regarding "applying the concept of biotechnology and its role in human life".

Keywords: Ethnoscience; S*asak* ethnic culture; Science learning

Introduction

Education is a planned and structured activity (Purwanto, 2011; Darmiwati, 2006) to develop the potential of each generation in order to be able to build civilization in the future (Hadi & Ahied, 2017; Hadi, et al., 2019). Civilization development can be carried out by strengthening the understanding of the nation's children towards the heritage of their predecessors in the surrounding environment such as culture and customs (Sarini & Selamet, 2019). Hadi & Ahied (2017) emphasized that education is an effective, structured effort to introduce culture through learning activities. According to Suastra (2011) that education has a formal role in cultivating and acculturating student behavior in preserving culture. Education and socio-culture have a positive correspondence that must be realized in learning for the nation's generation (Trianto, 2014). Social culture can make a certain contribution to student learning experiences both in cognitive, affective, and psychomotor aspects (Irawan & Muhartati, 2019). Hadi, et al. (2019) state that socio-cultural diversity in Indonesia can be optimized to support multidimensional science learning in schools. Science learning is the initial foundation in creating students who have dimensional competencies such as knowledge, skills and scientific attitudes (Mardiana, 2018; Ali, 2018).

Natural Science (IPA) is a science that studies natural phenomena in people's lives (Khoiri & Sunarno, 2018). The concept of science has a relationship with the social life of society (Setyowati et al., 2013), so that through learning science, direct experience can be obtained in exploring and applying concepts related to everyday life (Puspasari et al., 2019). Seroto (2012) emphasized that the concept of natural science originates from and refers to daily activities, thus enabling students to think scientifically about the

How to Cite:
Efendi, M.H., & Muliadi, A. (2023). Ethnoscience-Based Science Learning in Sasak Ethnic Culture: Literature Review. *Jurnal Penelitian Pendidikan IPA*, *9*(5), 22–33. https://doi.org/10.29303/jppipa.v9i5.3769

surrounding environment (Listyawati, 2012). Science learning can be developed by relying on the uniqueness and potential of an area such as local culture and traditions (Kartono et al., 2010). Local wisdom is a characteristic (uniqueness) of an area that develops in a local environment from generation to generation (Toharudin, et al., 2017). Mardianti, Kasmantoni & Walid (2020) explain that local wisdom is original knowledge (indigenous science) that comes from the noble values of cultural traditions (Rahayu, et. al., 2021; Ardianti, et. al., 2019; Sudarmin, et. al., 2019; Setiawan, et. al., 2017). Science learning is important to contain local wisdom-based concepts in order to prevent the loss of cultural and traditional characteristics in an area (Kasa, 2011).

Science learning is a process of discovery and formation of scientific attitudes (Mardiana, 2018). According to Suastra (2009) that learning science is an ideal way to acquire competency skills, maintain attitudes, and develop mastery of concepts related to everyday life. Science education is expected to be a vehicle for students to learn about the natural surroundings and prospects for further development in everyday life (Ali, 2018). Rizkianawati et al. (2014) explained that the science learning process prioritizes giving direct experience to develop competencies in order to explore and understand the natural surroundings scientifically. Thus, science learning is directed to inquiry and project-based (Zulfa, et al., 2022; Samsudin, et al., 2020; Afriana, Permanasari & Fitriani 2016) to build students' direct experience about nature (Kubicek, 2005), creativity and thinking skills (Ummah et al., 2019; Anazifa & Djukri, 2017). Indriani (2013) explains that science learning can also be developed with scientific inquiry to foster creative thinking and literacy skills (Atmojo et al., 2021; Suryadari, et al., 2018) as important aspects of life skills (Rizkianawati et al., 2014).

Science learning is expected to be able to explore the dimensions of science as a product, science as a process, and science as an attitude (Ali, 2018), as well as dimensions of procedure and science as technology as a result of the development of these three components (Chain & Evan, 1990). To realize the multidimensional science learning, active involvement of students is required to interact with concrete objects in everyday life (Ali, 2018; Mardiana, 2018; Rizkianawati et al., 2014; Koes, 2003). This is emphasized by Khoiri & Sunarno (2018) that science learning must be contextual so that it can present natural phenomena in people's lives in every science concept learning activity (Khoiri & Sunarno, 2018; Setyowati et al., 2013). Science learning can facilitate students to gain direct experience in exploring and applying science concepts related to everyday life (Puspasari et al., 2019). This learning activity certainly allows students to think scientifically about a natural condition and the surrounding environment (Listyawati, 2012; Seroto, 2012). Thus, the development of science learning should rely on the uniqueness and potential of the environment around students in each region such as local culture and traditions (Kartono et al., 2010). Local culture and traditions that are characteristic (uniqueness) of an area (Toharudin, et al., 2017) contain indigenous science originating from the noble values f tradition (Rahayu, et. al., 2021; Ardianti, et. al., 2019; Sudarmin, et. al., 2019; Setiawan, et. al., 2017) can be scientifically based on the concept of natural science (Khoiri & Sunarno, 2018). Learning the concept of science based on indigenous science is known as ethnoscience (Wati et al., 2020; Sudarmin et al., 2018). Integrating ethnoscience in science learning is in order to present contextual learning, accommodate regional uniqueness, explore natural science dimensions comprehensively, and prevent the loss of cultural and traditional uniqueness in an area (Kasa, 2011).

The diversity and uniqueness of the traditions and culture of an area (Sarini & Selamet, 2019), contains indigenous sciences (Battiste, 2005). According to Arlinovita, Setiawan & Sudibyo (2015), daily social activities cannot be separated from the culture that developed and was passed down by previous generations (Rahayu, et. al., 2021; Ardianti, et. al., 2019; Sudarmin, et. al., 2019; Setiawan, et. al., 2017). Indigenous science can be elaborated scientifically (Khoiri & Sunarno, 2018) in science learning (Hadi, et al., 2019). Toharudin, et al. values indigenous science in learning natural sciences (Parmin, et al., 2017; Wati et al., 2020). Thus, science learning is based on ethnoscience as a system of knowledge and cognition typical of a given culture (Hume, 1999; Sudarmin et al., 2018). Ethnoscience-based science learning can build an effective learning environment (Wahyu, 2017) by associating cultural and traditional values (Puspasari et al., 2019), so that it is useful for students' lives (Mardianti et al., 2020; Sudarmin, et al., 2019). Ethnoscience-based science learning is based on constructivism principles (& Pujani, 2020) and prioritizes meaningful learning (Akmal et al, 2020; Sudarmin, et al. (2019), so as to facilitate students to learn while doing (learning by doing) (Atmojo et al., 2021; Alvonco 2014; Sudarmin, et al., 2019)

Lombok's *Sasak* societies have various cultures and traditions inherited from their predecessor generations (Arlinovita, Setiawan & Sudibyo, 2015). Some of the distinctive traditions of the *Sasak* ethnics which contain indigenous science cloth motifs *Songket* have a philosophical meaning in the life of the *Sasak* (Sumadewa & Hasbullah, 2021), because *Songket* reconstructed from images of humans, stars, flowers, animals, nature, and customary property (Misnawati, 2016). According to Muliadi et al. (2022) that the motif of the *Songket* contains indigenous science that has

relevance become a source of learning science in schools. (2) Typical food of the *Sasak* societies such as *poteng reket* contains indigenous science in the manufacturing process that is relevant to the concept of biotechnology (Hikmawati et al., 2020). According to Anwar, Supardi & Sugiharto (2012), the concept of biotechnology has a very real contribution in various local community products through the use of microorganisms to speed up the productivity process (Anwar et al., 2012). (3) The making *bale adat* (traditional house) currently still maintains indigenous science which has been passed down from generation to generation, using natural materials that are often found around the community, such as wood, bamboo, reed leaves, and tree sap which function to clean the house and prevent from insect attacks (Wir'aeni, 2017). Spreading buffalo dung on the floor of the house functions as a remover of soil moisture and also functions as a mosquito repellent, so residents have a distinctive habit of mopping the floor using buffalo dung every two weeks (Widianti, 2017; Wir'aeni, 2017).

Indigenous science contained in the culture and traditions of the *Sasak* societies can be integrated into science learning (Sudarmin et al., 2018). This is supported by the opinion of Chiapetta & Koballa (2010) that one of the important dimensions in studying natural science is to construct the relationship between science and technology and society. Ethnoscience-based science learning is important for students to build an attitude of loving culture and local wisdom through an introduction to the cultural potential of an area (Sudarmin, et al., 2019; Parris & Linder-VanBerschot, 2010). Ethnoscience as knowledge of local wisdom is effective for developing students' tolerance for the diversity of cultures and local traditions in each region (Hikmawati et al., 2020; Akmal et al., 2020; Wahyu, 2017). The technoscientific approach can fortify students from the acculturation of foreign cultures transformed by today's very massive electronic media (Sudarmin, et al., 2019; Mardianti et al., 2020). Thus, Ethnoscience-based learning can comprehensively construct students' knowledge about the surrounding environment and avoid alienation from their environment (Parmin, et al., 2017; Wahyu, 2017; Listyawati, 2012). According to Krajcik et al. (1999) that ethnoscience learning is more oriented towards an integrated (interdisciplinary) understanding rather than just an in-depth understanding (Chiapetta & Koballa, 2010).

Method

This study is a literature study (*library*) (Andi, 2012; Sugiyono, 2017), to elaborate the concept of science learning based on indigenous science in the culture of the Lombok *Sasak* ethnics (Khoiri & Sunarno, 2018). The data sources for this research were previous research articles published in journals with topics related to science learning, science concepts, ethnoscience, *songket* cloth, *poteng jaje tujak*, and *bale adat*. This is in accordance with the opinion of Sukmadinata (2007) that literature study research data is data that has a certain quality of meaning that is expected to find meaning in reality, events, social activities, perceptions and thoughts that are put forward as the object of analysis or the main research discourse.

The procedure in literature study research is carried out in stages, namely collecting library data, reading, taking notes, studying, collecting concepts or texts, then elaborating and explaining the data/text collected about ethnoscience-based science learning (Rahayu, 2018). This is in accordance with opinion of Zed (2018) that library research is not just a matter of reading and recording literature or books, but a series of activities related to methods of collecting library data, reading and recording and processing research materials.

Result and Discussion

Description of The Nature of Science Learning

Natural Science (IPA) is a science that studies natural phenomena in people's lives (Khoiri & Sunarno, 2018). The concept of science has a relationship with the social life of society (Setyowati et al., 2013), so that through learning science, direct experience can be obtained in exploring and applying concepts related to everyday life (Puspasari et al., 2019). Seroto (2012) emphasized that the concept of natural science originates from and refers to daily activities, thus enabling students to think scientifically about the surrounding environment (Listyawati, 2012). Science learning can be developed by relying on the uniqueness and potential of an area such as local culture and traditions (Kartono et al., 2010). Local wisdom is a characteristic (uniqueness) of an area that develops in a local environment for generations between generations (Toharudin, et al., 2017). Mardianti et al. (2020) explain that local wisdom is original knowledge (indigenous science) that comes from the noble values of cultural traditions (Rahayu, et. al., 2021; Ardianti, et. al., 2019; Sudarmin, et. al., 2019; Setiawan, et. al., 2017). Science learning is important to contain local wisdom-based concepts in order to prevent the loss of cultural and traditional characteristics in an area (Kasa, 2011).

Science learning is a process of discovery and formation of scientific attitudes about (Mardiana, 2018). According to Suastra (2009) that learning science is an ideal way to acquire competency skills, maintain attitudes, and develop mastery of concepts related to everyday life. Science education is expected to be a vehicle for students to learn about the natural surroundings and prospects for further development in everyday life (Ali, 2018). Rizkianawati et al. (2014)

explained that the science learning process prioritizes giving direct experience to develop competencies in order to explore and understand the natural surroundings scientifically. Thus, science learning is directed to inquiry and project-based (Zulfa, et al., 2022; Samsudin, et al., 2020; Afriana et al., 2016) to build students' direct experience about nature (Kubicek, 2005), creativity and thinking skills (Ummah et al., 2019; Anazifa & Djukri, 2017). Indriani (2013) explains that science learning can also be developed with scientific inquiry to foster creative thinking and literacy skills (Suryadari, et al., 2018) as important aspects of life skills (Rizkianawati et al., 2014).

Science learning does not only develop mastery of knowledge of facts and concepts alone, but is also a process of finding out inquiry, discovery and creative skills (Agusti, 2017). The nature of science learning contains four main dimensions, namely scientific processes, scientific knowledge, scientific attitudes, and technology (Puskur, 2006). Muliadi (2019) explains that scientific processes mean scientific methods or activities to describe natural phenomena so that scientific products are obtained in the form of facts, principles, laws, theories. On Science a Process Approach states that a learning approach that is oriented towards scientific process skills involves intellectual, manual, and social skills (Carin, 1997). Scientific is an attitude, belief, values, ideas and objectivity that will emerge after carrying out a scientific process known as a scientific attitude (Sulthon, 2016), such as being honest, thorough, objective, patient, not giving up easily (resilient), respecting people. others, and others (Muliadi, 2019). Technology in science is interpreted as the application of science which acts as a tool to solve problems in everyday life (Sudarisman, 2015). Another opinion was conveyed by Ali (2018) that the nature of learning science can be classified into three dimensions, namely science as a product, process, and attitude. While science is also referred to as procedure and technology which is the result of the development of these three components (Chain & Evan, 1990).

Science learning is expected to be able to develop multidimensional science dimensions (Ali, 2018), so that active involvement of students is needed to interact with concrete objects in everyday life (Ali, 2018; Mardiana, 2018; Rizkianawati et al., 2014; Koes, 2003). This is emphasized by Khoiri & Sunarno (2018) that science learning must be contextual so that it can present natural phenomena in people's lives in every science concept learning activity (Khoiri & Sunarno, 2018; Setyowati et al., 2013). Science learning can facilitate students to gain direct experience in exploring and applying science concepts related to everyday life (Puspasari et al., 2019). This learning activity certainly allows students to think scientifically about a natural condition and the surrounding environment (Listyawati, 2012; Seroto, 2012). Thus, the development of science learning should rely on the uniqueness and potential of the environment around students in each region such as local culture and traditions (Kartono et al., 2010). Local culture and traditions that are characteristic (uniqueness) of an area (Toharudin, et al., 2017) contain indigenous science originating from the noble values of tradition (Rahayu, et. al., 2021; Ardianti, et. al., 2019; Sudarmin, et. al., 2019; Setiawan, et. al., 2017) can be scientifically based on the concept of natural science (Khoiri & Sunarno, 2018). Learning the concept of science based on indigenous science is known as ethnoscience (Wati et al., 2020; Sudarmin et al., 2018). Thus, the integration of ethnoscience in science learning is expected to present contextual learning, accommodate regional uniqueness, comprehensively explore natural science dimensions, and prevent the loss of cultural and traditional uniqueness in an area (Kasa, 2011).

Ethnoscience-based science learning can facilitate students to learn to find out about nature systematically, so learning science is not only about conceptual knowledge, but there is a process of discovery and the formation of scientific attitudes (Mardiana, 2018). According to Panggabean et al. (2021) that science learning can equip students with knowledge, ideas, and concepts about life around them through scientific processes (Lestari, 2019). The scientific process dimension has a very important role in facilitating students to develop knowledge, thinking habits, attitudes, and life skills (Yunita, 2018). Suastra (2009) emphasized that learning science is an ideal way to acquire competency skills, maintain attitudes, and develop mastery of concepts related to everyday life. The science learning process must prioritize the provision of direct experience to develop students' competencies in exploring and understanding the natural surroundings scientifically (Rizkianawati et al., 2014). Thus, science learning is directed to inquiry and project-based (Zulfa, et al., 2022; Samsudin, et al., 2020; Afriana et al., 2016) to build students' direct experience about nature (Kubicek, 2005), creativity and thinking skills (Ummah, In'am & Azmi, 2019; Anazifa & Djukri, 2017). Indriani (2013) explains that science learning can also be developed with scientific inquiry to foster creative thinking and literacy skills (Suryadari, et al., 2018) as important aspects of life skills (Rizkianawati et al., 2014).

According to Koes (2003), realizing multidimensional science learning, students must be actively involved in interacting with concrete objects in everyday life. Indigenous science in the culture and traditions of the *Sasak* societies is an object of contextual study that is relevant for exploring students' multidimensional competencies. This is in accordance with the opinion of Kartono et al. (2010) that the concept of learning science can be explored from indigenous

science in everyday life to strengthen mastery of concepts, attitudes and skills. Ethnoscience-based science learning can present a meaningful learning and constructivist learning process (Akmal et al, 2020). In addition, according to Alvonco (2014) that ethnoscience-based science learning can facilitate students to learn learning by doing, making it possible to connect the science concepts learned with indigenous science contained in *Sasak* Traditional House (Puspasari et al., 2019). Muliadi et al., (2022) explained that science learning must contain 5 elements, namely: 1) active learning, which involves active students in a series of scientific processes through science process skills; 2) inquiry activity approach, namely learning that encourages ; students' curiosity and seeks answers through discovery 3) scientific literacy, namely learning that can accommodate students regarding content knowledge of science concepts, competencies/scientific skills, and scientific attitudes; 4) constructivism, namely learning that allows students to construct knowledge through their experiences independently; 5) science, technology, and society, namely using science to solve everyday problems that exist in society.

Description of Ethnoscience Study in Sasak Ethnic Culture

Ethnoscience is knowledge that comes from norms, customs, culture, traditions, and beliefs that influence people's understanding and interpretation (Sudarmin, 2014). Ethnoscience is said to be an activity of transforming of indigenous science from people's knowledge of typical facts that have been passed down from generation to generation (Putra, 2021). Ethnoscience is an activity to transform indigenous science into scientific knowledge (Wati et al., 2020). Sudarmin et al. (2018) explained that culture is the result of human taste creation and initiative which then develops into indigenous science which is transformed into scientific science. Indigenous science is described from the culture of society which includes everything that a person must know and believe in doing activities according to the roles and ways that are acceptable to its members in a community (Putra, 2021). Regional culture, local wisdom, traditions, and the surrounding environment will make a certain contribution in constructing students' cognition about indigenous science (Hikmawati et al., 2020) Ethnoscience can increase students' knowledge (cognition) about the surrounding environment, especially those related to traditions, culture as ancestral heritage (Hadi & Ahied, 2017). Furthermore Hikmawati et al. (2020) explained that the indigenous science contained in each culture is different depending on the peculiarities of each region in Indonesia.

The Lombok *Sasak* societies have various cultures and traditions inherited from their predecessor generations (Arlinovita et al., 2015). Some of the typical cultures and traditions of the *Sasak* ethnics which contain indigenous knowledge motifs *Songket* which are reconstructed from images of humans, stars, flowers, animals, nature, and customary properties (Misnawati, 2016); (2) The special food of *poteng jaje tujak* which is made using a fermentation mechanism (Hikmawati et al., 2020); (3) Making *Bale adat* (traditional house) that still maintains ancestral teachings in using natural materials that are often found around the community, such as *galih* wood, bamboo, reed leaves, tree sap, and rubbing buffalo dung on the floor of the house functions as a remover of soil moisture (Widianti, 2017; Wir'aeni, 2017).

1. Indigenous science in songket motifs songket

Typical cloth of the *Sasak* ethnics of Lombok has varied motifs with strong philosophical meanings in the life of the *Sasak* societies (Sumadewa & Hasbullah, 2021). Motif *songket* is a symbol resulting from the reconstruction of social values in the *Sasak* ethnics which was deduced from generation to generation (Jayadi, 2016). Knowledge Indigenous science contained in *songket* constructed through symbols in *wayang, subahnale, keker atau merak, bintang empat, dan alang* (Nurmeisarah et al., 2015). The results of Misnawati's research (2016) explain indigenous science in the *songket cloth*, namely (1) the *wayang* reconstructed from the image of a *tanjung* flower, with the meaning that humans must live together and respect each other; (2) the *subahnale* reconstructed from images of *tanjung* flowers and *kenanga* flowers, with the meaning *of* God Almighty because it is based on the word *Subhanallah*; (3) motifs *keker atau merak*, with the meaning of a symbol of eternal holy love; (4) motif *bintang empat* of the four stars (morning star) and the fried flower, with the meaning of the cardinal directions to determine the calendar; (5) motif *alang* in the form of *alang* or barn, *tanjung* flower, and *kenanga* flower, with the meaning of a symbol of welfare and prosperity.

Motifs *Songket* are reconstructed from images of humans, stars, flowers, animals, nature, and customary properties (Misnawati, 2016), allowing it to be used as a source of learning natural science/science concepts in schools. This is supported by the opinion of Hadi & Ahied (2017) that cultural diversity and local wisdom are important to be utilized as a source of ethnoscience learning. Nadhifatuzzahro & Suliyanah (2019) emphasized that integrating *songket* in ethnographic learning is one of the innovations for creating an effective learning environment. This is in accordance with the opinion of Sapitri et al. (2020) that ethnoscience learning needs to be adapted to the culture and environment around students. Ethnoscience learning by utilizing *songket* can facilitate students to identify, elaborate, communicate and conclude about scientific science from indigenous science contained in *songket*.

Thus, educators must have the competence, creativity, and innovation to integrate local cultural values in science and non-science learning processes (Wati et al., 2020).

2. *Indogenous science in making poteng jaje tujak*

Poteng jaje tujak is a typical food of the *Sasak* ethnics of Lombok which is made from sticky rice. *Poteng* jaje *tujak* is a traditional snack of the *Sasak* which is usually served only during certain celebrations such as traditional celebrations or *Eid al-Fitr* or *Eid al-Adha. Poteng Jaje Tujak* consists of two types of typical snacks, namely *Poteng Reket* and *Jaje Tujak* (Hikmawati et al., 2020). *Poteng Jaje Tujak* is a type of sticky tape food in other regions of Indonesia (Nurhidayah et al., 2017). *Poteng Jaje Tujak* is produced from the fermentation process of white sticky rice or black sticky rice and even a mixture thereof (Hidayat et al., 2006). Devindo et al. (2021) explained that food products such as *Poteng Reket* are produced from a fermentation process through the breakdown of carbohydrates in sticky rice into a simple form, namely sugar, with the help of a microorganism called yeast or yeast. *Jaje Tujak pots* contain probiotics which can provide health benefits (Salminen et al., 1998). According to Dede et al. (2018), food nowadays, especially in developed countries, not only has filling properties but also has to be healthy, such as consuming food ingredients that contain probiotics.

Ingredients for making *Poteng Reket* are sticky rice, tape, and clean water (Nurhidayah et al., 2017). The main process in making *Poteng Reket* is fermentation using a starter (bio activator) in the form of microbes found in tape yeast derived from molds, yeasts and bacteria such as Endomycopsis sp, Saccharomyces sp, Hansenula sp, and Candida sp (Badrisyiyani, 2012; Waluyo, 2011). Lombok's societies, the production of *Poteng Reket* is usually added with *katuk* leaf juice which is used as a natural dye for *Poteng Reket* made from white sticky rice so that it looks attractive for consumption and produces a sweet taste and can be stored even longer (Nurhidayah et al., 2017). *Katuk* leaves contain tannins, flavonoids, steroids, saponins and tripertenoids which act as antibacterial in the presence of these bacterial substances that can inhibit fungal-plaguing bacteria that play a role in the fermenting process of glutinous rice (Malaningttyas, 2010).

3.** Indigenous **science in materials for making bale adat

Lombok has several tourist destinations which are famous for preserving traditional houses typical of the *Sasak* ethnics, for example Sade Village, Central Lombok (Muliadi et al., 2022). The typical house of the Lombok *Sasak* societies is known as the *Bale adat* (traditional house) and contains indigenous science such as the use of materials, manufacturing processes, and architecture (Hikmawati et al.,2020). Traditional house scattered in several locations, such as *Bale* (house), Segenter traditional house in Bayan District, North Lombok, Sade traditional house in Pujut District, Central Lombok, and *Limbungan* traditional house in the village of Perigi, Suela District, East Lombok (Wir'aen, 2017). Widianti (2017) explains that the traditional house typical of the *Sasak* ethnics consists of several types, namely *bale beleq bencingah*, *bonter*, *bale tani*, *bale jajar*, *bale tajuk*, *berugag (sekepat-sekenem)*. Puspita (2017) and Widianti (2017) describe the seven types *of Sasak* traditional house as presented in the following Table 1.

Table 1. Description of *Indigenous Science* in the Construction and Functions of *Bale Adat Sasak*

Bale Adat Type	Indigenous Science Society
Bale Beleq Bencingah	*Bale Beleq* is one of the important facilities in a kingdom that is designated as a place for major royal activities so it is often also called *Bencingah*. The royal ceremonies that are usually performed at *Bale Beleq* include the inauguration of royal officials, the coronation of the royal Crown Prince, the inauguration of the royal *Kiai Penghulu* (Priests), and the storage of royal heirlooms.
Bale Bonter	*Bale Bonter* is generally owned by *Perkanggo*/Village Officials, hamlets/village. *Bale Bonter* is usually built in the middle of a settlement or in the center of village/village government which is used as a place for customary trials to resolve problems of violations of customary law. *Bale Bonter* also called *is* inauguration building and a storage place for historical objects or family heirlooms.
Bale Tani	*Bale Tani* is in the form of a pyramid which is used as the residence of the *Sasak* societies who work as farmers. *Bale Tani* has a dirt floor with rooms consisting of one room for the foyer (*sesangkok*), one room for the bedroom (*dalem bale*), and a cooking room/kitchen (*pawon*). *Dalem bale* is used as a place to store belongings (properties) owned or a girl's bed. Other family are sleep in a *sesangkok*
Bale Jajar	*Bale Jajar* is a residential building for the *Sasak* societies of the middle to upper economic class. The shape of *Bale Jajar* is almost the same as *Bale Tani* and the only difference is the number of *palaces*. *Bale Jajar* has two rooms (*dalem bale*) and are separated by a corridor from *Sesangkok* to *Pawon*. buildings *Bale Jajar* are usually located in large residential complexes and are marked by the presence *sambi* as a storage area for household or other family needs.
Bale Tajuk	*Bale Tajuk* is one of the supporting facilities for residential buildings with large families. *Bale Tajuk* is pentagonal in shape with five pillars. Usually in the middle of a family environment and used as a place for large family meetings and training to add insight and manners.

Bale Adat Type	Indigenous Science Society
Bale Berugag (Sekepat-Sekenem)	*Bale Barugag* has an equilateral rectangular shape (square) without walls with four pillars (*sekepat*). The supports are made of wood and bamboo, the roof is made of reeds. *Berugaq* is usually located in front of the left or right side of *Bale Jajar* which is used as a place to receive guests, because according to the custom of the *Sasak* societies, not everyone is allowed to enter the house. *Berugaq* is also used by homeowners who have girls to receive young people who come to *midang* (dating).

Bale adat (traditional house) is still used by living monument as a place to live and as a cultural heritage/tourist destination, such as *Sade* Traditional Village (Widianti, 2017). The materials for making traditional house still follow hereditary teachings by using natural materials that are often found around the community, such as wood, bamboo, reed leaves, and tree sap which function to clean the house and prevent insect attacks (Wir'aeni, 2017; Muliadi et al., 2022). Widianti (2017) further emphasized that the floor of the house is made from a mixture of soil, tree sap and ash which is then smeared with buffalo dung. According to local residents, buffalo dung functions as a soil moisture remover, so residents have a distinctive habit of mopping floors using buffalo dung every two weeks (Wir'aeni, 2017; Widianti, 2017).

Widianti (2017) explains that traditional house *of* all types uses main poles made of *galih* wood, the walls are made of woven bamboo (*bedek*). To connect the wooden parts, they use bamboo nails. Meanwhile, the roof and ridges are made of straw or reeds and thatch (Muliadi et al., 2022). The use of materials for making *Bale adat* (traditional house) contains indigenous science that can be developed in science learning on the concept of network structure and function, as well as the concept of material properties and their use in everyday life (Zubaidah, et al., 2018). Thus, science learning based on *Sasak* Traditional House can build meaningful learning *ethnoscience* (Akmal et al, 2020) and can construct science competence in the process, product, and attitude dimensions (Ali, 2018; Wahyu, 2017). This is confirmed by the results of Emdin's research (2011) that meaningful learning experiences can increase student competence, because they can increase student motivation and enthusiasm (Damayanti et al., 2017). According to Chiapetta & Koballa (2010), one very important dimension in studying ethnoscience-based science is to construct the relationship between science and technology and society (Parmin, 2017).

Opportunities for the Implementation of Ethnoscience-Based Science Learning

Ethnoscience as a set of knowledge owned by communities, ethnicss, and nations in an area which is obtained by certain methods that are traditional and empirically, the truth of which can be tested and accounted for (Sudarmin, 2014). Indigenous science in the culture and traditions of the *Sasak* societies can be taught in science lessons (Parmin, 2017). This is confirmed by the opinion of Sudarmin et al. (2017) that local culture found in society can be used for education or learning. Indigenous science contained in the culture and traditions of the Sasak societies such as *songket* motifs, making *poteng jaje tujak*, and materials for making *bale adat* can be integrated into science learning at schools (Sudarmin et al., 2018). This is supported by the opinion of Chiapetta & Koballa (2010) that one of the important dimensions in studying natural science is to construct the relationship between science and technology and society. Thus, learning science based on indigenous science in *songket* motifs, making *poteng jaje tujak*, and materials for making *bale adat is* important for students to build an attitude of loving culture and local wisdom through introducing the cultural potential of the *Sasak* societies (Sudarmin, et al., 2019; Parris & Linder-Van Berschot, 2010). Indigenous science as indigenous knowledge of local communities is effective in developing students' tolerance for the diversity of local cultures and traditions in each region (Hikmawati et al., 2020; Akmal et al., 2020; Wahyu, 2017). Based learning science of the culture of the *Sasak* societies can fortify students from acculturation of foreign cultures transformed by today's very massive electronic media (Sudarmin, et al., 2019; Mardianti et al., 2020). Thus, Ethnoscience-based science learning can construct students' knowledge comprehensively about indigenous science contained in its culture and traditions and avoid alienation from its own environment (Parmin, et al., 2017; Wahyu, 2017; Listyawati, 2012). According to Krajcik et al. (1999) that ethnoscience-based learning is more oriented towards an integrated (interdisciplinary) understanding rather than just an in-depth understanding (Chiapetta & Koballa, 2010).

Natural Science learning based on indigenous science in *songket* motifs, making *poteng jaje tujak*, and materials for making *bale adat* in building process skills and forming scientific attitudes (Mardiana, 2018), as well as developing mastery of concepts related to everyday life (Suastra, 2009). This is in accordance with the opinion of Ali (2018) that science learning is expected to be a vehicle *for* students to learn about the natural surroundings and prospects for further development in everyday life. The process of learning science based on indigenous science in *songket* motifs, making *poteng jaje tujak*, and materials for making *bale adat* will provide direct experience for students in developing competencies and understanding the natural surroundings scientifically (Rizkianawati et al., 2014). Thus, indigenous science in *songket* motifs, making

poteng jaje tujak, and materials for making traditional house can be carried out through a project-based learning (Zulfa, et al., 2022; Samsudin, et al., 2020; Sudarmin et. al, 2019; Afriana, Permanasari & Fitriani 2016) to build students' direct experience of culture and traditions (Kubicek, 2005) and increase creativity and thinking skills (Ummah et al., 2019; Anazifa & Djukri, 2017). In addition, Indriani (2013) explained that indigenous science in *songket* motifs, making *poteng jaje tujak*, and materials for making *bale adat* models' scientific inquiry to foster creative thinking and literacy skills (Suryadari, et al., 2018; Rizkianawati et al., 2014).

Natural Science learning based on indigenous science in *songket* motifs, making *poteng jaje tujak*, and materials for making *bale adat is* expected to develop product dimensions, processes, attitudes, procedures, and technology (Ali, 2018; Chain & Evan, 1990). This is possible because indigenous science is contextual in nature which facilitates the active involvement of students to interact with concrete objects in everyday life (Ali, 2018; Mardiana, 2018; Rizkianawati et al., 2014; Koes, 2003). Khoiri & Sunarno (2018) emphasized that science learning must be contextual in order to be able to present natural phenomena in people's lives in every science concept learning activity (Khoiri & Sunarno, 2018; Setyowati et al., 2013). *learning science* in *songket* motifs, making *poteng jaje tujak*, and materials for making *bale adat* can facilitate students to gain direct experience in exploring and applying science concepts related to culture in everyday life (Puspasari et al., 2019). This learning activity certainly allows students to think scientifically about indigenous science in *songket* motifs, making *poteng jaje tujak*, and materials for making *bale adat* (Listyawati, 2012; Seroto, 2012; Kartono et al., 2010). This is in accordance with the opinion of Toharudin, et al. (2017) that local culture and traditions that characterize the *Sasak* societies contain indigenous science (Rahayu, et. al., 2021; Ardianti, et. al., 2019; Sudarmin, et. al., 2019; Setiawan, et. al., 2017) can be learned in the concept of natural science (Wati et al., 2020; Khoiri & Sunarno, 2018; Sudarmin, Sumarni & Mursiti, 2018). Thus, integrating indigenous science in *songket* motifs, making *poteng jaje tujak*, and materials for making *bale adat* in science learning can present contextual learning, accommodate regional specificities, comprehensively explore the dimensions of natural science, and prevent the loss of cultural and traditional uniqueness in an area. (Kasa, 2011).

Integrating indigenous science in *songket* motifs, making *jaje tujak poteng*, and materials for making *bale adat* in the IPA concept can be carried out in stages, namely (1) Observation, gathering information on indigenous science in *songket* cloth motifs, making *jaje tujak poteng*, and materials for making *bale adat*; (2) Transformation, mapping the IPA concept that is relevant to indigenous science in *songket* motifs, making *poteng jaje tujak*, and materials for making *bale adat*; (3) Integration, reconstructing learning relevant science concepts by integrating indigenous science in *songket* motifs, making *poteng jaje tujak*, and materials for making *bale adat*. The potential for integrating the concept of science learning in indigenous science- based schools in the motif of *songket* cloth, making *poteng jaje tujak*, and materials for making *bale adat is* presented in the following table 2.

Table 2. The Potential of *Indigenous Science* in the motif of *songket* cloth, making *poteng jaje tujak*, and materials for making *bale adat* to be Constructed in Learning Science

Indigenous science	Scientific Science	Basic Competency of Science Learning in School
▪ The use *of kayu galih* as the main pillar of the *Bale* so that it is study and durable ▪ The use of woven bamboo sticks as material for *bale adat* walls *so* that they are not quickly damaged by heat and rain water ▪ Use of bamboo sticks as nails between poles ▪ The use of woven reed stems as roofing material for the *bale adat* so that they are not quickly damaged by heat and rain water	▪ Secondary growth is caused by the activity of the vascular cambium, causing an increase in the amount of vascular tissue in the stem. In general, the secondary growth of the vascular cambium produces continuous loops of xylem and phloem and causes changes in the dense texture of the interior of the stem. ▪ Bamboo are strong enough from rainwater and hot temperatures because the bamboo stems contain silica, namely one of the inorganic materials that has the advantage of having high stability against mechanical influences, temperature, and acidity conditions	Analyzing the interrelationships of plant tissue structures and their functions, as well as technologies inspired by plant structures
▪ The use of buffalo dung to smear the *Bale* to prevent it from getting damp, broken, and dusty	▪ Buffalo manure contains silica (SiO2) which can have pozzolanic properties so that it can serve to glue and harden the floor surface of *bale adat* such as cement.	Connecting the concept of matter particles, the structure of simple substances with the properties of materials used in everyday life, as

Indigenous science	Scientific Science	Basic Competency of Science Learning in School
		well as the impact of their use on human health
▪ The Wayang motif is reconstructed from a sketch of a human couple and an umbrella in the process of marriage (*nyongkolan*); cape flower petals sketch ▪ The Subahnale motif is reconstructed from sketches of cape flower petals and *kenanga* flower ▪ Motif Keker reconstructed from a sketch of a pair of peacocks and a tree branch ▪ Motif Four Star is reconstructed from a sketch of a morning star and a fried flower crown ▪ Motif *Alang/Lumbung* is reconstructed from sketches of the *Alang/Lumbung*, tanjung flower petals, and kenanga flower	▪ The petals and corolla are the structures of the generative reproductive organs of plants ▪ Petals and kenanga flower are the characteristics of spermatophyte plants	Analyzing the reproductive system in plants and animals and applying technology to the reproductive system of plants and animals
▪ Poteng Reket is a typical food of the people of Lombok which is produced based on conventional biotechnology ▪ The basic ingredients are sticky rice, tape, clean water ▪ The procedure for making the sticky rice is washed and soaked in clean water for 4-5 hours; sticky rice is steamed until cooked; after that it is cooled and leavened; incubated for about 2 days.	▪ In the process of making *poteng jaje tujak*, a fermentation reaction occurs. The reaction that occurs in the process of fermenting cassava into tape is glucose (C6H12O6) which is the simplest sugar, through fermentation it will produce ethanol (2C2H5OH) and carbon dioxide (CO2).	Applying the concept of biotechnology and its role in human life

Conclusion

Based on the results and discussion, it is concluded that (1) the nature of learning science can be classified into three dimensions, namely science as a product, science as a process, and science as an attitude; (2) indigenous science in *songket wayang* motifs, *subahnale* motifs *keker* motifs *four star*, and *alang/lumbung* which have relevance to the basic science competence of "analyzing the reproductive system in plants and animals and the application of technology to the reproductive system of plants and animal"; (3) indigenous science in the materials for making traditional house has relevance to the basic competence of natural science on "analyzing the interrelationships of plant tissue structures and their functions, as well as technology inspired by plant structures"; (4) indigenous science in the process of making *poteng jaje tujak* has relevance to the basic competence of natural science regarding "applying the concept of biotechnology and its role in human life".

Acknowledgements
We would like to thank to all the parties that help to complete the research entitled "Ethnoscience-Based Science Learning in *Sasak* Ethnics Culture: Literature Review".

Author Contributions
M. Harja Efendi: developing literature study topics, defining literature analysis methodology, analyzing literature related to literature study topics.
Agus Muliadi: browsing and mapping literature related to the topic of literature study, writing draft articles, revising, and editing final articles.

Funding
This research received no external funding.

Conflicts of Interest
The authors declare no conflict of interest.

References

Agusti, E. 2017. Pengembangan *Handout* Pembelajaran IPA berbasis *Entrepreneurship* untuk Siswa Kelas XI Tata Niaga di Sekolah Menengah Kejuruan. Artikel Skripsi Fakultas Keguruan dan Ilmu Pendidikan Universitas jambi (Tidak diterbitkan).

Ali, L. U. (2018). Pengelolaan Pembelajaran IPA Ditinjau Dari Hakikat Sains Pada SMP Di Kabupaten Lombok Timur. *Prisma Sains: Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram,* 6 (2), 103-112. https://doi.org/10.33394/j-ps.v6i2.1020

Alvonco, J. (2014). *Practical Communication Skill*. Jakarta: Elex Media Komputindo.

Andi, P. (2012). *Metode Penelitian Kualitatif dalam Perspektif Rancangan Penelitian*. Jogjakarta: Ar-Ruzz Media.

Akmal, A.U., Lia, Lestari, T., Asra, A., Effendy, Festiyed, Skunda. (2020). Analisis Etnosains dalam Pembelajaran IPA di Sekolah Dasar Kota Padang dan Bukittinggi. *Jurnal Inovasi Pendidikan dan Pembelajaran Sekolah Dasar*, 4 (2), 68-77. https://doi.org/10.24036/jippsd.v4i2.111385

Ardianti, S.D., Wanabuliandari, S., Saptono, S. & Alimah, S. (2019). Needs assessment of edutainment module with Ethnoscience approach oriented to the love of the Country. *Indonesian Journal of Science Education*, 8 (2), 153-161.

Atmojo, S.E., Lukitoaji, B.D. & Muhtarom T. (2021). Improving Science Literation and Citizen Literation Through Thematic Learning Based on Ethnoscience. *Journal of Physics*, 1823, 1-6.

Carin, AA. 1997. *Teaching Modern Science.* (7 th Edition). New Jersey: Merril Publishing Company.

Chain & Evan. (1990). *Sciencing An Involvement Approach to Elementary Science Methods*, (Edisi ke III. *Korinna*: Merrill.

Chiapetta, E.L. & Koballa T. R. (2010). *Science instruction in the middle and secondary school*. Boston: Allyn & Bacon.

Damayanti, C., A. Rusilowati, & S. Linuwih. (2017). Pengembangan 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

Darmiwati. (2006). *Implementasi Model Pembelajaran Perubahan Konseptual Untuk Meningkatkan Prestasi Belajar*. Banda Aceh: FKIP Unsyiah.

Emdin, C. (2011). *Droppin' science and dropping science: African American Males and Urban Science Education*. *JAAME*, 2 (1), 1-15.

Fatsyaf, H. (2013). Pengertian dan Dimensi IPA. (*Online*) https://hartatyfatshaf.blogspot.com/2013/10/pengertian-dan-dimensi-pendidikan-ipa.html (diakses tanggal 27 September 2022).

Hadi, W.P. & Ahied, M. (2017). Kajian Etnosains Madura dalam Proses Produksi Garam sebagai Media Pembelajaran IPA Terpadu. *Jurnal Rekayasa*, 10 (2), 79-86.

Hardy.T & Fleer. M.,(1996). S*cience for Children: Developing a Personal Approach to Teaching*. Sydney: Prentice Hall.

Hikmawati, Suastra, I.W. & Pujani, N.M. (2020) Local wisdom in Lombok island with the potential of ethnoscience for the development of learning models in junior high school. *Journal of Physics: Conference Series*, 1-12. https://doi:10.1088/1742-6596/1816/1/012105

Indriani, W. 2013. *Penerapan Pembelajaran Fisika Menggunakan Model Multidimensioanal terhadap Keterampilan Proses Sains Siswa*. Skripsi: Universitas Islam Negeri Sunan Kalijaga.

Istikhomah, R.I. & Wachid, A. (2021). Filsafat Sebagai Landasan Ilmu dalam Pengembangan Sains. *Jurnal Filsafat Indonesia*, 4 (1), 59-64.

Kartono, Hairida, & G. Bujang. (2010). *Penelusuran Budaya Teknologi Lokal dalam Rangka Rekonstruksi dan Pengembangan Sains di Sekolah Dasar.* Pontianak: FKIP, Universitas Tanjungpura.

Khoiri, A. & Sunarno, W. (2018). Pendekatan Etnosains Dalam Tinjauan Fisafat (Implementasi Model Pembelajaran STEM: *Science, Technology, Enginering, and Mathematic*). *SPKETRA: Jurnal Kajian Pendidikan Sains*, 4 (2), 145-153. http://dx.doi.org/10.32699/spektra.v4i2.55

Koes, S. H. (2003). *Strategi pembelajaran Fisika*. Malang: Universitas Negeri Malang.

Kubicek, J. P. (2005). Inquiry based learning, the nature of science, and computer technology: New possibilities in science education. *Canadian Journal of Learning and Technology*, 31 (1), 1-7.

Lestari, T. (2019). *Pengembangan Rencana Pelaksanaan Pembelajaran Mata Pelajaran Akutansi Dasar Berorientasi Peraturan Dirjen Dikdasmen Kemendikbud No. 07/D. D5/Kk/2018*. Seminar Nasional Keindonesiaan IV. Http://Conference.Upgris.Ac.Id/Index.Php/Snk/Article/View/542

Mardiana. (2018). Penerapan Pembelajaran IPA Berbasis Konstruktivisme dalam Meningkatkan Sikap Ilmiah pada Siswa Madrasah Ibtidayah. *Jurnal Ilmiah AL-MADRASAH*, 3 (1), 61-80. http://dx.doi.org/10.35931/am.v0i0.69

Mirnawati, Fuldiaratman & Yusnidar. (2021). Penerapan Model Project Based Learning (PJBL) Berbasis Etnosains pada Materi Koloid dan Kaitannya dengan Kemampuan Berpikir Kreatif Siswa di SMA Negeri 2 Kota Jambi. *Jurnal Penelitian Pendidikan Kimia*, 8 (1), 85-96.

Muliadi, A. (2019). Pembelajaran Biologi Berbasis Entrpreneurship. *Proceeding National Conference: Education, Social Science, and Humaniora*, 1 (1), 269-275.

Mutia, R., Adlim & Halim, A. (2017). Pengembangan video Pembelajaran IPA Pada Materi Pencemaran dan Kerusakan. *Jurnal Pendidikan Sains Indonesia,* 5 (2), 108-114. https://doi.org/10.24815/jpsi.v5i2.9825

Panggabean, F., Simanjuntak, M. P., Florenza, M., Sinaga, L. & Rahmadani, S. (2021). Analisis Peran Media Video Pembelajaran dalam Meningkatkan Hasil Belajar IPA SMP. Jurnal Pendidikan Pembelajaran IPA Indonesia (JPPIPAI), 2 (1), 7-12.

Parmin. (2017). *Ethnosains*. Semarang: Swadaya Manunggal

Puskur. (2006). *Kurikulum Tingkat Satuan Pendidikan*. Jakarta: Depdiknas.

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. *Science Education Journal (SEJ),* 3 (1), 25-31. https://doi.org/10.21070/sej.v3i1.2426

Puspita, P. (2017). 7 Rumah Bale Suku Sasak yang Menarik Wisatawan Bule. (*Online*) https://bobo.grid.id/read/08673866/7-rumah-bale-suku-sasak-yang-menarik-wisatawan-bule?page=all (diakses 27 September 2022).

Rahayu, M., Keim, A.P., Nikmatullah, M., Rustiami, H., Susan, D. & Sujarwo, W. (2021). The Ethnoecology of Sasak People in Mandalika, Lombok Island: Local Knowledge and Wisdom in Relation with Land Use. *Indonesian Journal of Science Education*, 10 (3), 407-415.

Rahayu, A.S. (2018). *Pengantar Pemerintahan Daerah Teori Hukum dan Aplikasinya*. Jakarta: Sinar Grafika.

Rizkianawati, A., Wiyanto & Masturi. (2014). Implementasi Model Pembelajaran *Multidimensional* pada Pembelajaran Fisika untuk Meningkatkan Keterampilan Proses Sains Siswa. *Unnes Physics Education Journal*, 4 (2), 62-68. https://doi.org/10.15294/upej.v4i2.7429

Rusman. (2017). *Belajar dan Pembelajaran Berorientasi Standar Proses Pendidikan*. Jakarta: PT Kharisma Putra Utama.

Sarkim, T. (1998). "*Humaniora dalam Pendidikan Sains" dalam Pendidikan Sains yang Humanistis*. Yogyakarta: Universitas Sanata Darna - Kanisius.

Setiawan, B., Innatesari, D.K. & Sabtiawan, W.B. (2017). The Development Of Local Wisdom-Based Natural Science Module To Improve Science Literation Of Students. *Jurnal Pendidikan IPA Indonesia*, 6 (1), 49-54.

Suastra, I W. (2009). *Pembelajaran Sains Terkini: Mendekatkan Siswa dengan Lingkungan Alamiah dan Sosial Budayanya*. Singaraja: Penerbit Universitas Pendidikan Ganesha.

Sudarmin, Zahro, L., Pujiastuti, Rr.S.E., Asyhar, R., Zaenuri & Rosita, A. (2019). The Development of PBL-Based Worksheets Integrated With Green Chemistry and Ethnoscience to Improve Students' Thinking Skills. *Indonesian Journal of Science Education*, 8 (4), 492-499.

Sudarmin, S., Sumarni, W., Pujiastuti, Rr.S.E. & Susilogati S. (2019). Implementing the Model of Project-Based Learning: Integrated with ETHNO-STEM to Develop Students' Entrepreneurial Characters. *Journal of Physics*, 1317, 1-8.

Sudarmin. (2014). *Pendidikan karakter, etnosains dan kearifan lokal (pertama ed.)*. Semarang: Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Negeri Semarang.

Sudarmin, Sumarni, W. & Mursiti, S. (2018). The learning models of essential oil with science technology engineering mathematic (STEM) approach integrated ethnoscience. *Journal of Physics: Conference Series*, 1-7. https://doi:10.1088/1742-6596/1321/3/032058

Sudarmin, Febu, R., Nuswowati, M., & Sumarni, W. (2017). Developmen of Ethnoscience Approach in The Module Theme Substance Additives to Improve the Cognitive Learning Outcome and Student's Entrepreneurship. *Journal of Physics: Conference Series* 824 (1).

Sudarisman, S. (2015). Memahami hakikat dan Karakteristik Pembelajaran Biologi dalam Upaya Menjawab Tantangan Abad 21 serta Optimalisasi Implementasi Kurikulum 2013. *Jurnal Florea,* 2 (1), 29-35.

Sugiyono. (2017). *Metode Penelitian Kualitatif, Kuantitatif, dan R&D*. Bandung: Alfabeta.

Sukardjo. (2008). *Kumpulan Materi Evaluasi Pembelajaran. Yogyakarta*: PPs Universitas Negeri Yogyakarta.

Sukmadinata, S.N. (2007). *Metode Penelitian Pendidikan*. Bandung: Rosda Karya.

Sulistyorini, S. (2007). *Pembelajaran IPA Sekolah Dasar, Dan Penerapan Dalam KTSP.* Yogyakarta: Unnes dan Tiara Wacana.

Sulistyowati, Reffiane, F. & Handayani, D. E. (2020). Pengaruh Model Project Based Learning Berbasis Etnosains Tema Ekosistem Terhadap Aktivitas Belajar Siswa. *Jurnal Pendidikan Surya Edukasi (JPSE)*, 6 (2), 120-132.

Sulthon, S. (2016). Pembelajaran IPA yang Efektif dan Menyenangkan bagi Siswa MI. *Elementary: Islamic Teacher Journal*, 4 (1), 38-54. http://dx.doi.org/10.21043/elementary.v4i1.1969

Putra, H.S.A. (2021). Ethnoscience A Bridge To Back To Nature. *E3S Web of Conferences*, 1-9. https://doi.org/10.1051/e3sconf/202124901002

Wahyu, Y. (2017). Pembelajaran Berbasis Etnosains Di Sekolah Dasar. *Jurnal Inovasi Pendidikan Dasar,* 1 (2). 140-147.

Wati, E., Yuberti, Saregar, A., Fasa, M.I., Aziz, A. (2020). Literature Research: Ethnoscience in Science Learning. Journal of Physics: Conference Series, 1-9. https://doi:10.1088/1742-6596/1796/1/012087

Widianti, A.K. (2017). Preservasi Rumah Adat Desa Sade Rembitan Lombok Sebagai Upaya Konservasi. *Vitruvian: Jurnal Arsitektur, Bangunan, & Lingkungan,* 6 (3), 79-84.

Widyasari, F., Indriyanti, N. Y. & Mulyani, S. (2018). The Effect of Chemistry Learning with PjBL and PBL Model Based on Tetrahedral Chemistry

Representation in term of Student's Creativity. *JKPK (Jurnal Kimia Dan Pendidikan Kimia)*, 3 (2).

Wir'aen, R. (2017). Nilai Edukatif pada Arsitektur Rumah Adat Bale Sasak di Dusun Limbungan Lombok Timur Nusa Tenggara Barat. Skripsi: Rogram Studi Pendidikan Seni Rupa Fakultas Bahasa Dan Seni Universitas Negeri Yogyakarta.

Yuniati, S. (2018). Implementasi Pendidikan Karakter Dalam Pembelajaran Matematika Melalui endekatan Kontekstual. *Al-Khwarizmi: Jurnal Pendidikan Matematika dan Ilmu Pengetahuan Alam.* https://Doi.Org/10.24256/Jpmipa.V2i1.101

Zed, M. (2008). *Metode Penelitian Kepustakaan*. Jakarta: Yayasan Obor Indonesia.