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MAPPING INDONESIA'S INDIGENOUS SCIENCE AS A SCIENCE LEARNING CONTEXT IN JUNIOR HIGH SCHOOL: A NEW PARADIGM

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ABSTRACT

The integration of indigenous science into learning, especially science learning for junior high school students, is very necessary. Indigenous science can be used as a context and source for learning science. Mapping Indonesian's indigenous science is needed to facilitate educators in utilizing and integrating into learning. This study aimed to: (1) analyze and identify junior high school science subject matter and (2) conduct analysis and identification of ethnoscience that is feasible and suitable to be used as a context for junior high school science learning. This research was conducted through literature studies with primary data sources in the form of junior high school science curriculum documents and secondary data sources in the form of documents, internet, books, proceedings, reputable international journals, international journals, and national journals. The stages of the research carried out are: (1) analyzing and identifying material in junior high school science subjects; (2) selecting and sorting material that has the potential to contain ethnoscience content; (3) make details of the subject matter, and (4) present the analysis result. This study succeeded in identifying 7 (seven) indigenous sciences along with their context and content in junior high school science materials, including: (1) *Karapan Sapi* Tradition from Madura, East Java; (2) Local Potential of Pottery Handicraft Center; (3) Traditional Dance "*Lilin*" from West Sumatra; (4) Local potential of "salted eggs" from Brebes, Central Java; (5) "*Kayon*" Puppet Performance Instrument; (6) Natural Potential "*Belik*" and (7) Dayak Traditional Clothing: *King Bibinge* and *King Baba.*

Keywords: Indigenous, Learning Process, Science Education Context.

INTRODUCTION

The development of science and technology is very rapid, along with the development of challenges faced by humans from various aspects (Maghfiroh & Sholeh, 2022). Learning with a new paradigm is needed to continue improve the quality of learning, including in terms of curriculum (Fitriyah & Wardani, 2022; Restu et al., 2022). There needs to be a curriculum adjustment to answer the challenges of learning a new paradigm

(Maghfiroh & Sholeh, 2022; Restu et al., 2022). The new paradigm of learning states that teaching and learning activities are not limited to the classroom with the teacher as the only source of learning (Sufyadi et al., 2021). It takes active participation from learners in searching, selecting, finding, analyzing, inferring, and communicating learning outcomes (Faiz et al., 2022; Moh. Nawafil & Junaidi, 2020). One aspect of the new paradigm learning is the availability of a variety of learning resources (Moh. Nawafil & Junaidi, 2020; Sufyadi et al., 2021).

Science is systematic knowledge obtained from observation, research, and trials that lead to the determination of the basic nature or principle of something that is being investigated and studied (Kolbachev et al., 2015; Lund & Cyvin, 2022). At the junior high school level, science becomes a separate subject so that students have a wider opportunity to explore various scientific fields in science in an integrated manner (Sangsa-ard & Thathong, 2014; Sudarto et al., 2021). Integrated science learning requires the discussion of a concept or theme studied from various fields, for example in the theme of the environment, can be discussed from the point of living things and life processes (biology), energy and its changes (physics), matter and its properties (chemistry) (Asyhari & Silvia, 2016). Integrated science learning is very beneficial, because it can develop students' thinking skills (Elfeky et al., 2020). Thus, all learning activities are more meaningful, so that learning results will remain and last a long time (Asrizal et al., 2017; Aydinli et al., 2011) The application of integrated learning will make it easier for students to recognize, accept, absorb and understand the relationship or relationship between concepts, knowledge, values or actions in several subjects (Ibrahim et al., 2019; Jeenthong et al., 2014).

Integrated science learning presents pragmatic activities in accordance with the problems that students often encounter in their environment (Hagger & Hamilton, 2018; Ruiz-Calleja et al., 2021; Sinaga & Silaban, 2020). This requires teachers to have broad knowledge and insight, high creativity, reliable methodological skills, high confidence and academic ethos, and dare to package and develop material widely and integrated (Gafur, 2018; Kuswanto, 2019). The facts encountered, many science teachers are still experiencing obstacles at the planning, implementation, and assessment stages of integrated science learning (Artawan et al., 2022). In addition, integrated science learning requires quite a lot of materials or information sources to support, enrich, and develop students' insights and knowledge (Margono, 2020; Septiana et al., 2018). This also resulted in many teachers encountering obstacles, especially in the preparation of

learning tools and facilities, in line with the limited mastery of teacher material (Indrawati & Nurpatri, 2022).

One of the objectives of science learning is to develop interest and curiosity, so that students are encouraged to study phenomena around humans, understand how the universe system works and have a reciprocal impact on human life (Kementrian Pendidikan dan Kebudayaan, 2013). One of the phenomena and problems that is very close to science and can be found around students is ethnoscience. Ethnoscience is an original science (community knowledge system) that can manifest in three forms: cultural systems, activities, and artifacts (Mukti et al., 2022; Syazali & Umar, 2022). Ethnoscience can be integrated into science learning, although between original science and scientific science have differences. The integration of ethnoscience into learning can be done both in learning tools, teaching materials, approaches, methods, models, and learning media (Rikizaputra et al., 2021).

The integration of ethnoscience into science learning makes learning more meaningful and can instill the values of local wisdom (Basuki et al., 2019; Widyaningrum, 2018). Ethnoscience that is integrated or used as a context in science learning has also been proven to be able to develop competencies needed in the 21st century such as HOTS, critical thinking skills, collaboration, science literacy, creative thinking, and the ability to solve problems (Fahrozy et al., 2022; Puspita et al., 2022; Putri et al., 2022; Sartika et al., 2022). However, the fact is that there are still many teachers who have difficulty integrating ethnoscience. One of the difficulties that teachers often encounter is the lack of understanding and knowledge of teachers about ethnoscience which contains the contents of science materials (Alfiana & Fathoni, 2022; Nuralita, 2020). It also boils down to the difficulty of teachers compiling and developing ethnoscience integrated learning tools (Andayani et al., 2020).

Besides being famous for its natural beauty, Indonesia is also rich in various local wisdom. Diversity of traditional clothing, folk songs, traditional food, regional arts, folklore, to traditional games. But unfortunately, the ownership of local culture (around 370 ethnic groups) as the identity of an Indonesian nation has not been considered as one of the learning resources in science learning. One of the terms and principles of using various local wisdom as a context for science learning is that local wisdom has a place in science learning content (Sudarmin, 2021). This study aims to: (1) analyze and identify junior high school science subject matter and (2) conduct analysis and identification of ethnoscience that is feasible and suitable to be used as a context for junior high school science learning.

With this research, it is expected to be an additional reference and inspiration for junior high school science teachers and curriculum developers to make ethnoscience a learning context, to realize science learning that pays attention to local cultural wisdom as the nation's identity, and as a means of preserving local cultural wisdom.

METHODS

This research was conducted through literature study using secondary data sources (Aziz et al., 2020; Iskandar, 2019)in the form of documents, internet, books, proceedings, reputable international journals, international journals, and national journals both accredited and unaccredited. The main document used as material for analytical studies is the junior high school science curriculum document. The analytical descriptive method was used in this study which then the source data of the study was analyzed qualitatively (Ichsan et al., 2018).

The stages of the qualitative approach carried out refer to Rahman & Sari (Rahman et al., 2021; Sari et al., 2021). These include: (1) Researchers collecting data from primary and supporting sources; (2) The implications of the data collected are in the form of words or descriptions and the results of the analysis are also in the form of descriptions; (3) The results of the analysis emphasize the analytical process, and (4) The inductive analysis of the researcher reveals the meaning of the observed state. Practically, the stages of the research carried out are: (1) analyzing and identifying material in junior high school science subjects; (2) selecting and sorting material that has the potential to contain ethnoscience content; (3) make details of the subject matter, and (4) present the results of the analysis.

RESULTS AND DISCUSSIONS

Science is born and developed from observation and experimentation, science has two important aspects, namely knowledge and methods in obtaining knowledge itself (Harefa & Sarumaha, 2020; Tarigan et al., 2023). The field of study of science education in junior high school includes physics, natural sciences that study matter and its motion and behavior in the scope of space and time, along with related concepts such as energy and force, chemistry, physical sciences that study the arrangement, structure, properties, and changes of matter, as well as biological sciences, life sciences that study life, and living organisms, including its structure, function, growth, evolution, distribution, and taxonomy (Kurnia, 2020). Nowadays, science at the junior high school level is taught in

an integrated manner, no longer separate in each field of study (Wilujeng, 2017).

Based on the results of the analysis and identification of material in junior high school science subjects, the following results were obtained.

TABLE 1. Scope of Junior High School Science Material

7th Grade	8th Grade	9th Grade
• Objects of natural science and their observations • Classification of living things • Life organization system • Energy • Interaction between living things • Environmental pollution • Climate change • Earth layers and disasters • Solar System • Elements, compounds, and mixtures	• Motion and force • Work and simple aircraft • Skeletal and Muscular • Substance pressure • Vibration, Waves, and Sound • Light • Structure and function of plant tissues • Digestive system • Circulatory system • Breathing system • Excretory system • Additives and addictive substances	• Material properties • Electrical • Magnetism • Eco-friendly technology • Reproduction • Reproduction of animals and plants • Inheritance of traits • Biotechnology • Soil Science

Based on table 1 above, it is known that the distribution of junior high school science materials is very varied and contextual, close to everyday life. Education functions to empower human potential to inherit, develop and build future culture and civilization (Sudarmin, 2021). This encourages the importance and urgency of ethnoscience integration as a context for junior high school science learning (Anisa, 2017; Mukti et al., 2022; Shufa & Khusna, 2018; Sopacuaperu et al., 2021). The results of analysis and identification that have the potential to contain ethnoscience content are obtained based on the process of reconstructing the original science of the community into scientific science according to Sudarmin (Sudarmin, 2021). The results of the reconstruction are details of the subject matter and content within the scope of junior high school science material contained in the ethnoscience.

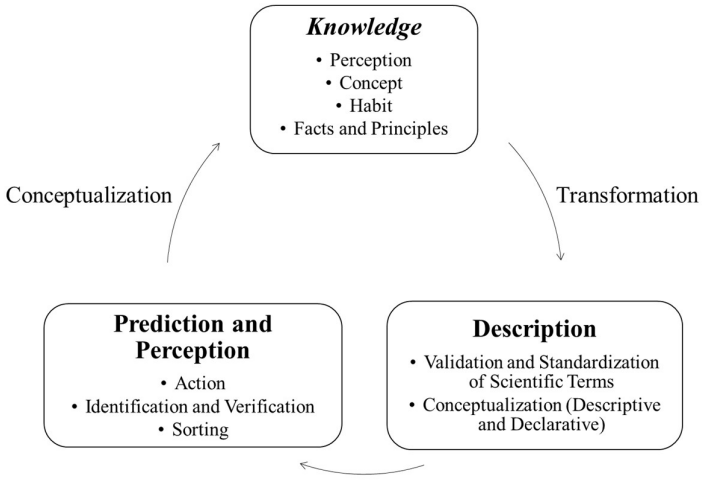

FIGURE 1. The Process of Reconstructing Original Science into Scientific Science

The things that must be paid attention to in the process of reconstructing the original science into scientific science are as follows.

1. There must be a connection between culture and science that is the object of research;
2. The original science knowledge of the community to be studied is a science that is meaningful and useful in everyday life;
3. Society's original science knowledge and common sense have a place in science education content;
4. Traditional indigenous knowledge includes an understanding of the phenologic of the universe;
5. The methodology used must bridge conventional knowledge to scientific knowledge.

There are several indigenous sciences originating from several regions in Indonesia that have been analyzed and identified. The results of the analysis and identification are as follows.

TABLE 2. Results of Indigenous Science Mapping as the Context of Junior High School Science Material

No	Indigeneous Science	Original Science Concept	Scientific Science Concept	JHS Science Material Content
1	*Karapan Sapi* Tradition from Madura, East Java	*Karapan Sapi* is a tradition from Madura. The word *Kerabhan Sape* or *Kerapan Sapi* is symbolized as a cow	**Mass of Objects** There is an influence on the jockey's body mass when riding *kaleles*, because the force is	a. Science objects and their observations, 1st semester on 7th

No	Indigeneous Science	Original Science Concept	Scientific Science Concept	JHS Science Material Content
		race. In its implementation, the *Karapan Sapi* tradition is accompanied by Madurese music called *Saronen*. The cows that are contested in the *Karapan Sapi* are usually driven by a jockey called a *tongko*. The *tongko* stood on a *kaleles* pulled by a race cow. Cultural values in this tradition include cooperation, hard work, fostering a sense of competitiveness, sportsmanship, and order. The *Karapan Sapi* tradition involves the wider community. Among them are race cow owners, *tongko* workers who are in charge of controlling race cows, pond workers who hold the cow's bridle before being released, shakers who are in charge of shaking cows so that when given a signal they can shoot fast, *tonja* workers who pull and guide cows, and *gubra* workers who cheer to encourage race cows.	influenced by the mass of the object. Cows that are boarded above the surface of the earth are affected by the force, so the earth pull becomes heavy. Thus, the smaller the person riding the cow, the faster the cow runs fast. **Newton's Law** Newton's Law II occurs when the cow runs, when the back of the cow is hit, it gives a shock effect on the cow so that a push force appears that can affect the speed of the cow. The force of action-reaction of Newton's Law III occurs when the cow's foot sets foot on the ground **Force** Kinetic friction occurs between the tip of the *kaleles* touching the ground surface when the cow is running or walking. When the cow is running or walking, it also contains straight-motion material content.	grade. The material discusses science investigations and measurements as part of the observations. b. Motion of Objects and Living Things in the Surrounding Environment, 1st semester on 8th grade. The material discusses the concept of motion, in which there is a discussion of Newton's Force and Law.
2	Local Potential of Pottery Handicraft Center	Pottery craft centers in Indonesia are found on almost every island, for example Kasongan in Yogyakarta. Pottery craft is a handicraft industry business with clay raw materials. The pottery	**Force** When making pottery crafts, craftsmen make crafts by pressing and making them into the desired shape. The compressive force used by the craftsman is related to the concept of physics.	Motion of Objects and Living Things in the Surrounding Environment, 1st semester on 8th grade. The material discusses the concept of motion, in

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		handicraft industry produces a variety of goods, such as flower pots, kitchen tools, tiles, bricks, and so on. The process of making pottery crafts involves several activities carried out, including: grinding, printing, drying, and burning until it becomes a variety of pottery that is ready to be marketed.	**Newton's Law** The craft-making process reflects Newton's Law III. In the craft-making process, there is a reaction and action between craftsmen and the crafts they make. The craftsman gives a press force while the formed craft forms according to the wishes of the craftsman.	which there is a discussion of Newton's Force and Law.
3	Traditional Dance "*Lilin*" from West Sumatra	Traditional Dance "*Lilin*" is a traditional dance originating from West Sumatra. This dance is usually performed by a group of female dancers or couples carrying candles and accompanied by music performed by a group of musicians. *Minang* people believe that traditional dance "*Lilin*" has a deep meaning, about a person who is left wandering by his lover and actually removes their engagement ring, so he/ she has to look for a ring using candles at night. The movements in the traditional dance "*Lilin*" are dominated by slow, graceful, vigorous, and gentle movements.	The opening movement of the dance is the dancer flapping his hands to the right and left sides of the movement using the concept of balance. Then the dancers are move together, it using the concept of regular straight motion. After that, the dancer must support and keep the plate filled with candles in his hands while walking and moving around, it using the concept of balance. The movement of the dancer supports his foot and stands with his heel as a support contain physical concepts, namely Newtonian gravity, balance, moment of inertia, and straight motion. The closing movement of this traditional dance is contained in the concept of motion and balance.	a. Motion of Objects and Living Things in the Surrounding Environment, 1st semester on 8th grade. The material discusses the concept of motion in which there is a discussion of straight motion and force. b. Balance and moment of inertia are 11th grade high school physics materials.
4	Local potential of "salted eggs" from Brebes, Central Java	Salted eggs are one of the typical local potentials from Brebes, Central Java which is designated as an intangible cultural heritage.	**Nomenclature of Chemical Compounds** The raw materials for making salted eggs can be used as a context for learning the	a. Material Classification and Its Changes, 1st semester on 7th grade. The

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		Historically, the commercialization process of salted eggs began in the late 1950s. The raw materials for salted eggs are duck eggs, rubbing ash or red bricks, and table salt. The process of making salted eggs is to wash all raw eggs, if the surface of the egg contains stains, it can be removed by rubbing it using a brush. After that, the eggs are dried. Gently rub the surface of the egg with sandpaper. The goal is that the pores of the egg are open and the mixture for marinating can seep into the egg. In a separate pan, make salted egg mixture by mixing rubbing ash and salt in a 1:1 ratio. Suppose, 1 kg of rubbing ash with 1 kg of salt. Add water to this mixture and stir until it becomes like a paste. Coat the eggs one by one with dough, approximately 1-2 mm thick. Store eggs in a cauldron container or plastic bucket for 15-20 days. The longer the storage time, the saltier the eggs will be. After the specified time, clean the salted eggs from the salting mixture. The eggs are ready for further processing, can be boiled or steamed. After	nomenclature of compounds, because these materials are substances formed by two or more elements. Through chemical reactions, compounds can be broken down into their constituent elements. The compounds in the raw materials for making salted eggs are as follows. a. Sodium chloride (NaCl): salt b. Aquades/ dihydrogen monooxide (H_2O): water c. Potassium oxide (K_2O): rubbing ash d. Aluminum oxide (Al_3O_2), Silicon oxide (SiO_2), Iron oxide ($Fe_2\ O_3$): brick **Osmosis** Eggs soaked in saline solution will undergo osmosis because the eggs are placed in a place / environment whose concentration is thinner than in the egg (egg contents). **Properties of Light** The egg selection process is carried out by illuminating the inside of the egg so that the conditions inside the egg crust can be seen clearly, this is because the refraction of light is continued on clear or transparent objects so that the conditions inside the egg will be clearly visible. This is related to the nature of light where objects have colorless or transparent particles that can be propagated	material discusses elements, compounds, and mixtures. Elements, compounds, and mixtures have Latin names and symbols, so knowledge of nomenclature is required. b. Substance Pressure and Its Application in Daily Life, 2nd semester on 8th grade. The material discusses the application of the concept of substance pressure to living things, for example in blood pressure and capillarity which requires the concept of osmosis. c. Light and Optical Instruments, 2nd semester on 8th grade. The material discusses the nature of light and the process of

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		that, the eggs are soaked again in the tea solution after cleaning of the salting mixture. Soaking is carried out for approximately 8 days. It aims to increase the resistance of salted eggs.	by light easily, this can happen because clear or transparent objects can transmit light.	image formation before further discussing the lens, mirror, and sense of vision in humans.
5	"*Kayon*" Puppet Performance Instrument	*Kayon* is one of the elements that support puppet performances, when opening and closing show. *Kayon* consists of two types, namely male *kayon* called *gapuran* and female *kayon* called *blumbangan.* It's another name is *gunungan* because it is triangular, like a mountain. The word *kayon* comes from the Arabic *chayu* which means life. *Gunungan* or *kayon* imaging the center of world, which is interpreted as a symbol that in the beginning before there was birth, the first time there was wood (life), there were only trees and wild animals. Ornaments on *kayon* are houses with closed doors, snakes/ dragons, tailed deer, partridges, apes, bulls, lions, birds, giant heads, two wide-mouthed giants and garuda wings, and vessels in the shape of *Padma* flowers. Each of these ornaments has its own meaning. The word *kayon* symbolizes all life	**Biodiversity** In Kayon, the term *kehati* element is known. *Kehati* is in two major kingdoms of living things, namely plants or flora and animals or fauna, in this *kayon* flora is placed as the main element of *kehati*, flora is concluded as the main home and environment for liver life. The preservation of the flora represented by this tree is the main key to the realization of the existence of other liver elements. **Environmental Sustainability** Kayon has two sides; one side has the image of fire. When the *kehati* element is still intact and in good condition, such as the number of elements are still complete, it will create good environmental conditions and have a positive impact on human life as depicted in *kayon*. The good environment described in this kayon is characterized by the presence of complete *kehati* elements, trees as a symbol of forest resources that represent strong flora communities, as well as the diversity of fauna communities that live freely and strongly in nature.	a. Indonesian Ecology and Biodiversity, 2nd semester on 7th grade. The material discusses the differences in Indonesia's biodiversity with other parts of the world, including the concept of the distribution of flora and fauna and the threat of biodiversity. b. Interaction of Living Things and the Environment, 2nd semester on 7th grade. This material discusses patterns of interaction that affect ecosystems, including human influences that can cause habitat destruction and pollution.

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		contained in the universe that undergoes three levels, namely: a. *Tanam tuwuh* (trees) found in the mountain, which people interpret Kalpataru tree, which means living tree. b. Animal paintings contained in this mountain depict animals found in Java. c. Human life that used to be depicted on the glass of the archway door on the *kayon*, is now only in the mastermind's prologue. One of the most phenomenal parts of *Kayon* is *goro-goro* which is characterized by events of changing natural stability with major earthquakes, extreme climate change and instability of social conditions in human life.	**Environmental Damage** If the *Kehati* element is damaged, then environmental conditions will also be bad and can endanger the quality of human life as depicted in the fire picture on the other side of the *kayon*. The fire describes various adverse environmental conditions, such as rising environmental temperatures, emerging natural disasters, climate change, the emergence of various diseases and health threats, as well as a decrease in environmental quality that can affect the overall quality of human life.	c. Environmental pollution, 2nd semester on 7th grade. This material discusses the definition of pollution, water, soil, and air pollution including the factors that cause pollution and the impact caused by pollution on human life.
6	Natural Potential "*Belik*"	*Belik* is a small spring, which is generally a seepage spring. This term comes from the Javanese language, *belik*, which means water source. *Belik* generally appears or is on the banks of rivers, or in the grooves of small valleys; both in the middle of the field and in the crevices of boulders. *Belik* often appears under large trees	**Hydrology** Hydrologically, *belik* is an important part of the hydrological cycle, as places where groundwater first comes out, then flow and join surface water flows: channels, rivers, and large rivers to the sea. **Conservation** Conservation is an effort made by humans to preserve or protect nature. *Belik* that often appears under a large tree makes it a	Indonesian Ecology and Biodiversity, 2nd semester on 7th grade.The material discusses: a. Interactions between the constituent components of an ecosystem. There is a concept of biogeochemical

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		growing at the base of valleys. But on the contrary, because of its important role as a source of water, the environment around *Belik* is often protected and maintained by local residents so that it is always green with trees. In its original sense, *belik* also includes shallow holes or hollows made by humans to hold water on cliffs or in dry river beds. In Javanese culture, some *belik* are sacred by local residents. For example, it is used as an object of ritual traditional events of local residents such as bathing brides or bathing heirlooms.	sacred place. Large trees need to be conserved for ecosystem balance. With the sacredness of *belik*, humans tend to be afraid and not cut down the surrounding trees, this supports environmental conservation. **Interaction of Living Things** On the *belik* with a large tree there are organisms. This can be used as a context in science learning, because in it there are interactions in the form of symbiosis and food chains, as well as relationships between organisms and the environment.	cycles, one of which is the hydrological cycle. b. Conservation. It contains the concept of conservation benefits and methods. c. Environmental influences on organisms. There are concepts about abiotic, biotic, levels of life organization, interactions between ecosystem components, and energy flow.

A paradigm shift in the form of a pattern and application of science education in the real world that leads to contextual learning, rooted in indigenous culture, and local wisdom in Indonesia, so that in the future the younger generation does not lose the identity of the Indonesian nation that is wise, love, and maintains and preserves local culture that contains scientific values and content. The rapid development of science and technology encourages the development of science education that gives impact to certain formal science as taught in an educational unit. Scientific science can only be understood scientifically, based on scientific work and how it is obtained using the scientific method, because it is objective, universal, and value-free (Milasari et al., 2021; Tresnawati, 2018). Therefore, the reconstruction of community science into scientific science is very important to do. This is one of the efforts to change the image and perception of the public towards original science which seems to be knowledge of myths, superstitions, and various negative perceptions into knowledge that can be accounted for.

The integration of indigenous science in science learning process is one form of

community science reconstruction into original science, this is because indirectly in-depth analysis and studies are carried out related to the concept of scientific science contained in indigenous science. For students, this will certainly facilitate the understanding of science concepts, because the content presented in learning is content that is close to everyday life (Destiara, 2020; Tamimiya & Suryadarma, 2019). In addition, the application of indigenous science in learning is able to foster a love for indigenous science as part of the nation's culture. Education and learning have a function to preserve positive values, empower human potential to pass on, develop, and build future culture and civilization. With the introduction of school students as the next generation of the nation with culture as a learning context, it can make a positive contribution to the student learning experience. This research is still limited to the content of junior high school science material. In addition, the integrated culture is also still limited to several cultures, even though if explored deeper, there are still many cultures and potentials that can be used as learning material content, not only in the scope of junior high school science material, but also science in elementary and senior high schools.

CONCLUSION

Indonesia with various tribes and cultures has a very diverse potential. Indigenous science can be used as a context and learning resource for students and teachers. Based on the results of the research that has been done, 7 (seven) indigenous sciences were identified that have the potential to contain science content so that they are suitable as a context for junior high school science learning, including: (1) *Karapan Sapi* Tradition from Madura, East Java; (2) Local Potential of Pottery Handicraft Center; (3) Traditional Dance "*Lilin*" from West Sumatra; (4) Local potential of "salted eggs" from Brebes, Central Java; (5) "*Kayon*" Puppet Performance Instrument; (6) Natural Potential "*Belik*" and (7) Dayak Traditional Clothing: *King Bibinge* and *King Baba.* Further research is still needed in an effort to explore the integration and suitability of indigenous science to be used as a context for wider learning materials. In addition, the results of this research can be used as a basis for further research such as the development of learning tools and the development of integrated learning media indigenous science.

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