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Integrating Local Science and School Science: The Benefits for Preserving Local Wisdom and Promoting Students' Learning

Yohanes Freadyanus Kasi[1*], Ari Widodo[2], Achmad Samsudin[2], Riandi Riandi[2], Novia Novia[3], Wati Sukmawati[4], and Ari Syahidul Shidiq[5]

[1]Program Studi Ilmu Perikanan, Institut Nasional Flores, Nagekeo, East Nusa Tenggara, Indonesia
[2]Universitas Pendidikan Indonesia, Indonesia
[3]Science Education Study Program, Sebelas Maret University, Indonesia
[4]University of Muhammadiyah Prof. Dr. Hamka, Indonesia
[5]Chemistry Education Study Program, Sebelas Maret University, Indonesia

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*Corresponding Author Email:
yohaneskasi@gmail.com

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Abstract: Integrating local science into science learning benefits students and the culture. However, science teaching tends to focus only on the scientific content presented in the books but ignores the local culture. This paper explores local science in community cultural activities to be implemented in science learning to introduce students to cultural values following the concept of science. It identifies local science, describes the oral arguments produced by the tribal council, and analyzes the lesson plan by five science teachers in the Nagekeo district, East Nusa Tenggara. The data used in this analysis are observation and identification, interviews, and assessment sheets. The findings show that the local science in Nagekeo cultural activities that can be integrated into science learning includes the traditional unit and measurement systems, Newton's laws in their application to the traditional game, biodiversity in the traditional hunt, the concept of heat transfer, and its application in the construction of traditional houses, and vibrations, waves, and sounds in the traditional musical instrument. Recommendations from this research are embracing local science in science learning to provide meaningful learning for students and preserve local culture for each generation in the future so that it does not become extinct.

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INTRODUCTION

Studies on culture and learning suggest that learning should integrate culture into classroom lessons (Günay & Aydin, 2015; Shidiq, 2016). In the case study in Turkey, the teacher did not have sufficient competence or experience to carry out an effective learning process tailored to the needs of Syrian students due to the absence of skills and knowledge (Kotluk & Aydin, 2021). Therefore, these innovations rely on the support of teachers because they were assumed to be their teaching knowledge (Milne et al., 2015). It is necessary to consider explaining not only their opinion but also their knowledge and skills as a new approach to learning (Lupión-Cobos et al., 2017; Wallace & Priestley, 2016). Growing teacher awareness is critical to providing students with a solid foundation for further developing their knowledge and using strategies to foster improved relationships with their students (Snoek et al.; Park & Martin, 2018). Science teachers, for example, are required to be able to create student-centered learning because it refers to the essence of science learning involving attitudes, processes, and products. Teacher's enthusiasm for learning will relate to increased student achievement (Darling-Hammond, 2000).

Teaching science in more culturally responsive ways (local science) includes linking students' activities to the curriculum, embedding real-world problems, and using examples that connect to students'

experiences (Mensah, 2021). Science is concerned with nature and some aspects of the world (Roth & Tobin, 2019). Furthermore, the culture of a society (local science) of a society determines how they educate their people because culture greatly influences individual approaches to education. Culture, as a general term, means the artifacts, beliefs, histories, information, languages, symbols, and ethics that are part of any people with our families (Mensah, n.d.). It is crucial to develop a practical approach and connect science concepts with students' daily lives, for instance, a cultural approach or local science (Fasasi, 2017). In Indonesia, a science local in science learning is recommended in science education because the process combines culture and students' science (Nuralita, 2020). Learning science with a local science is the best choice for a culturally diverse country. Even though these innovative methods and strategies have proven successful, knowledge about local science is starting to leave, so the younger generation no longer understands the meaning of cultural activities in their area (Fasasi, 2017). Additionally, science learning always uses a national curriculum, such as learning resources and learning media, referring to those issued by national standards (teacher and student books). A heavy emphasis on the national science curriculum, according to (Koirala, 2021), can be destroying teachers' teaching styles in the classroom. So, in this context, science teachers rarely even adopt local science resources to be connected to science learning in the classroom. Research shows that most science curricula in African countries are modeled on Western curricula and do not reflect African students' cultural backgrounds (Urevbu, 1984). In the East Nusa Tenggara case study, there is still a lack of research related to cultural approaches in science learning, such as the use of methods, models, and learning media to improve students' conceptual understanding, creative and critical thinking, scientific literacy, and problem-solving skills (Kasi et al., 2021). According to (Hiwatig, 2008), this impacts students' low achievement in science because of the lack of appreciation for local science resources, significantly affecting students' attitudes and knowledge.

The current educational paradigm is to balance the developmental intellect (academic intelligence), emotion, and enthusiasm, which is directed at developing cultural or local science value education. Learning by making students culturally sensitive and aware of global issues can equip them with the wisdom to form economic, political, social, and environmental decisions to create a better world (Andrews & Hasan, 2020). To achieve this goal, we need to study and develop local science in an area as an approach to learning science in the classroom that can harmonize local science inherited with modern science and reveal scientific concepts contained in local science, traditions, and local wisdom embraced by the culture of a group. Disclosure of scientific concepts through the study of knowledge by a particular cultural group and used as a learning approach in science class is called the ethnoscience approach. The ethnoscience approach teaches students about their personal and cultural experiences (Prins et al., 2019), knowledge abilities, and previous achievements (Brown & Crippen, 2016; Abonyi, 1998). This approach was chosen to investigate the community's indigenous knowledge and turn it into scientific knowledge (Davison & Miller, 1998; Jegede, 1997; Vlaardingerbroek, 1990).

The application of the ethnoscientific teaching approach refers to science learning by Science for All Movement, UNESCO (1991) in which (a) the content, language, symbols, design, and curriculum objectives must be linked to the experiences and daily goals of children; (b) theory must be linked to practice, human goals, quality of life, and experiences in school with experiences outside of school; (c) teaching and learning must start from the beliefs, interests, and learning skills that students bring to class and must help each expand and revise their abilities and understanding (e.g., Fasasi, 2017; Hiwatig, 2008). The application of the current curriculum needs to be structured to direct students to think critically and learn actively in seeking information, explaining a phenomenon, and explaining a problem. Curriculum content with science topics can be supported by involving local science and cultural activities, meaning that science teachers must be able to implement science learning with a cultural approach and local wisdom in the area where students live to build their interests and abilities (Sudarmin et al., 2019; Henno & Reiska, 2013).

Research using an ethnoscience approach in science learning has also been carried out in Indonesia, which is known for its cultural diversity, such as using traditional games and traditional musical instruments as media and learning resources. However, the East Nusa Tenggara (NTT) area, which has many cultural activities in every village, rarely uses this approach, one of which is the Nagekeo regency.

Nagekeo is a regency in NTT whose people still preserve their cultural activities, such as traditional rituals and traditions. The unifying symbol of the indigenous people of Nagekeo is 'Peo Nabe,' a two-pronged wood (Peo) and a round flat stone under Peo, both in the middle of the traditional village. Peo Nabe is also a symbol of the authority or dignity of a traditional village in Nagekeo.

The wood for making Peo and as pillars for building traditional houses is always selected as the moon is bright. Scientifically, this activity can be related to the existence of a dark moon (black moon) that occurs simultaneously with the super moon phenomenon, where the moon will be at its closest point to the earth, which can be related to the concept of rising water from the soil into the plants. In addition, Nagekeo's traditional house, Soa Waja Ji Vao, is a stilt house with a red roof. In science, a stilt house is made to circulate air (ventilation process) under the plank floor (stage) to reduce humidity in the room. Using reeds as roofs aims to isolate heat radiation from the sun because they are porous or hollow materials. Another cultural activity (social context) contrary to the scientific context is forest fire before hunting or Ndai activities so that the hunters can see the hunted animal. This activity contradicts the scientific context of biodiversity that underpins ecosystem functions and provides services essential to human well-being, contributing to economic development.

The report on the results of the national examination from the Ministry of Education and Culture (https://hasilun.puspendik.kemdikbud.go.id/) revealed that the percentage of students who answered correctly in science lessons in Nagekeo was below the average (60%). It means they still have difficulty understanding scientific concepts in the material provided by the teacher. Contextually, the students conduct observation in a cultural context that is the implementation of the science concept. For example, in the material on measurement, substances, and their properties, students have difficulty answering questions. The indicator explains the measurement concept and determines the fundamental quantities of the derived quantities. The students have not been able to explain well about the concept of measurement, mention valid measuring instruments, explain how someone is said to carry out the process of measuring, distinguish standard from non-standard units, explain the importance of using standard units and fundamental and derived quantities, and giving examples. In mechanics and solar systems, they have difficulty explaining the implementation of Newton's law and determining the acceleration of an object that is given a force. Students still find it challenging to explain the concepts of straight motion and force, gravity, Newton's first law, the effect of force, and Newton's second law. They have difficulty explaining the concepts of velocity and acceleration in everyday life. They cannot explain the relationship between force, mass, and the acceleration of an object well.

For the material on living things and their environment, it is difficult for them to determine the type of interaction between the two components in the ecosystem, explain the advantages and disadvantages of the efforts made to overcome environmental damage and analyze a more stable ecosystem if the same organism in the two ecosystems becomes extinct along with the reasons. They do not understand the concept of ecosystems and the diversity of living things in their environment. They have not shown an attitude of caring for the environment, being responsible, and thinking critically about the surrounding socio-cultural activities related to the damage to an area with diverse living things. In the material on the structure and function of living things, students in Nagekeo find it challenging to explain digestive disorders due to certain diseases and identify reproductive organs that undergo specific processes. Several explanations related to students' difficulties in answering the indicators for evaluation questions from teachers exist in the context of local science in this region. Unfortunately, the science teachers in Nagekeo have not integrated science locally into science learning (Kasi et al., 2020).

Although researchers pay less attention to cultural, social, and gender issues (Cavas et al., 2012), several ethnoscience studies have become the focus in recent years (Sturtevant, 2017). These studies concentrated on student self-confidence (Price, C. A. & Chiu, 2018; Ardianti et al., 2019) and motivation to learn science (Hiwatig, 2008). The study of contributions to learning conditions, challenges to improve students' skills, such as cognitive, affective, psychomotor, and critical thinking (Risdianto et al., 2020), and components of scientific literacy have been met (Dewi et al., 2019). Similarly, integrating local science into science learning seems to be an effective and sustainable technique for understanding the goals of some science curriculum improvements (Acharya et al., 2019). Thus, the science local in science learning allows teachers to promote students' knowledge by engaging them in thinking.

Identifying local science or culture is meaningful and valuable because customary or cultural knowledge is extensive and original as a science (local science). An educational approach focusing on student competence should be improved when we apply science to students' daily lives. The school curriculum should include Indigenous knowledge of science in cultural activities. Curriculum developers and teachers should collaborate with the elders to negotiate the inclusion of indigenous ways of life in science learning (Glasson et al., 2010). Local science must be applied in science learning as a method, model, and learning media to improve student variables such as conceptual understanding, creative and critical thinking, scientific literacy, and problem-solving skills. If the teacher can implement ethnoscience in science education well, it will result in good students with a sense of unity (Rachmawati et al., 2019). Thus, this study aims to explore and identify local science in community cultural activities to be implemented in the science classroom to introduce students to cultural values in everyday life under the concept of science and preserve local culture so that it does not become extinct.

METHOD

This ethnographic study with the interpretive design was conducted in Nagekeo Regency, East Nusa Tenggara (NTT). There were three data collection models (observation and identification, interviews, and assessment sheets). Observations were made on cultural activities and rituals in Nagekeo as local science, such as measurement activities in the market and traditional games that can be developed into science learning in the classroom, such as Dhongi Koti. The results were then analyzed to obtain the scientific concepts contained. The researchers developed a format to identify links between local science and science concepts such as the existing local science, the concept of science in the local science, conformity with essential competencies, and conformity with science topics.

Interviews were conducted during the visit to the traditional villages in Nagekeo and meeting the tribal chiefs or elders to ask about their knowledge of local culture as local science. The interview guide consists of several questions, such as how the traditional hunting ritual is carried out, why the meadow must be burned before hunting, what the implementation of the traditional ritual means, what the traditional musical instruments in Nagekeo, what the ritual is carried out, and so on.

The assessment sheet was used to analyze the lesson plans for five science teachers in Nagekeo regarding using local science in science learning. Lesson plan assessment indicators include the conformity of the formulation of learning objectives with cultural coverage, development of culture-based teaching materials, determination of culture-based media/tools/technology, determination of cultural-based learning resources, and determination of cultural-based forms of assessment. The context of the assessment of culture-based lesson plans is related to the local science of Nagekeo culture, such as whether a science teacher has planned lessons for vibration, waves, and sound associated with traditional Nagekeo musical instruments.

RESULT AND DISCUSSION

NTT is a province with a stretch of beautiful islands and people with diverse cultures. Cultural diversity includes local languages, dances, social order systems, traditional rituals, music, and games. Despite having cultural diversity within the group, the people of NTT still have similar characteristics. These characteristics are passed down over generations. Their ancestors used to believe in the spiritual relationship of humans with God, society, and nature. Historically, these beliefs were passed down from God through chosen ancestors, who then conveyed them orally and in writing from generation to generation. For the people of NTT, oral traditions are generally related to the way of life. NTT's traditional beliefs become guidelines in social life. NTT is a heterogeneous province, but its people live together peacefully and prosperously. One regency in NTT with much cultural diversity is Nagekeo.

Science concepts in Nagekeo's local science that can be integrated into science lessons

Nagekeo has a distinctive culture and is different from other tribes. Differences can be in language, traditional sarong motifs, house architecture, music, games, etc. Nagekeo has local science values that can be integrated into science learning activities, supporting contextual learning. The following are the

results of identifying local science in Nagekeo that can be integrated into science learning.

Measurement: Measurement determines quantity, dimension, or capacity, usually against a standard or unit of measure. For example, to measure height, one can measure easily because the measured object is tangible with internationally agreed units. Standard measurement tools like a ruler, gauge, caliper, etc., measure a quantity, e.g., length. In this material, students are expected to understand the concept of measuring various quantities and present the results of measurements of the quantities in themselves, living things, and the surrounding physical environment as part of the observation, as well as the importance of formulating standardized units (standard). However, the data shows that junior high school students still have difficulty understanding the concept of measurement (Meiraini & Retnawati, 2020).

They have not been able to take measurements properly and correctly, and they still use the rote method in learning how to measure an object (Khaerudin et al., 2019). In addition, most teachers teach measurement only by referring to the guidebook, namely the International Metric System, such as meter (length units), kilogram (mass unit), second (time unit), and other quantities that can be derived, like density derived from mass and length. Science teachers have not realized that the science learning approach using local science can help cultural preservation efforts and increase students' understanding of science concepts (Kasi et al., 2020). As a result, the data on the average score of junior high school students in Nagekeo on the measurement concept has not reached the minimum completeness criteria (Center for Educational Assessment, 2020). Meanwhile, in the context of local science, the people of Nagekeo are used to measuring, which science teachers can use to explain measurement material to students with these local science resources.

Most people in Nagekeo use *Ha depa/Ha Repa, Ha Pangga, Ha Pangge, Ha Siku, Fate, and Ha Mbuku* to measure the unit of length.

a. *Ha depa/Ha Repa* : 1 hand
b. *Ha Pangga* : 1 span
c. *Ha Pangge* : 1 foot
d. *Ha Siku* : 1 elbow
e. *Fate* : 1 finger joint
f. *Ha Mbuku* : distance of 1 bamboo-segment to segment

To measure the volume, some people of Nagekeo use Mboda, a container made of woven *lontar* (palm leaf), to measure the volume of crops such as rice, corn, and beans (Figure 1).

Figure 1. Mboda

The traditional measurement activities of the people of Nagekeo can be linked to science learning using a problem-based learning model by providing stimulation in the form of problems to be solved by the students to increase their achievement in learning. The strategy that can be used is the problem as an exploration of understanding (Loyens et al., 2011). The teacher begins the lesson by dividing the students into groups and giving worksheets as a study guide. Students in groups are directed to take measurements, for example, measuring the length of a table using Ha Pangga/span by two students and using a ruler. Active and engaged students will understand that measurement is a process of determining the quantity using standardized measurement tools such as a ruler instead of Ha Pangga/span because every student has a different span, so the results will also differ.

Newton's Law is related to the force acting on an object and its motion. This law describes the relationship between the force acting on an object and the resultant motion. In this material, students are expected to be able to understand the concept of Newton's law and its application in everyday life. However, due to the low interest of students during learning, they have difficulty understanding concepts, leading to misconceptions about Newton's law concepts (Sinthya et al., 2014; Ririnsia & Hau, 2019). Until now, junior high school students still have difficulty understanding Newton's laws of motion (Sutopo & Parno, 2017). The data on the percentage of students who answered correctly on Newton's law material in Nagekeo is still below the national average (Center for Educational Assessment, 2020). Therefore, the science teachers in Nagekeo can link local science, such as the traditional game Dhongi Koti or playing top, to classroom learning for students to understand motion based on Newton's law and investigate the effect of force on motion. Several studies in science education recommend the use of local science in science learning, which is also essential because it is directly related to students' daily lives Risdianto, Dinissjah, Nirwana & Kristiawan, 2020; Hiwatig, 2008; Fasasi, 2017).

Dhongi Koti, or playing top, is part of the *etu* ritual or traditional boxing in Nageke to strengthen a sense of togetherness. It is a series of traditional events commemorating planting to harvest days. The people play this game together. This game men play a koti designed using guava or *kesambi* wood and wrapped in a rope. The players throw the *koti* to the ground together by stomping the rope to spin the *koti*. This game requires high skill in throwing *koti*. The player who wins the championship is the one who has the most extended spins compared to other players (Figure 2).

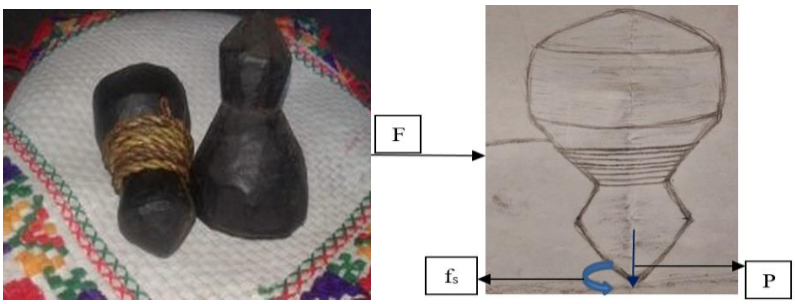

Figure 2. (a) Koti, (b) Science concepts in the traditional game "Dhongi koti"

Dhongi Koti is in accordance with Newton's first law of motion, which states that an object moving at a constant speed will continue to move at that speed unless there is a resultant force acting on it. If the *koti* is still at rest, it will remain at rest unless a resultant force is exerted so that the *koti* can rotate. Newton's second law states that the acceleration caused by a force acting on an object is proportional to the magnitude of the force in the direction of the force and inversely proportional to the inertial mass of the object. This means the greater the force is exerted, the greater the resulting acceleration. Conversely, the smaller force results in a smaller acceleration. There is also the concept of frictional force (fs), which occurs when two objects are in contact, and the force is directed against the object's motion or the object's direction of motion. When the *koti* rotates to the right, the frictional force will rotate to the left in the opposite direction to the rotation of the *koti*, and the concept of pressure (P) is given per unit area (A) where the smaller the cross-sectional area of the *koti* is, the greater the pressure is applied on the ground. On the other hand, the larger the cross-sectional area is, the less pressure is exerted on the soil (Figure 3).

Figure 3. Dhongi Koti Traditional Game

Teachers can use this traditional game to apply the discovery learning model in science learning. In discovery learning, the material is not delivered in a final form. However, students are encouraged to identify what they want to know, then look for information themselves and organize or construct what they know and understand in a final form. Students can be encouraged to watch Dhongi Koti directly or through the video in class. Using worksheets, the teacher can direct the students to identify the concepts of Newton's laws that work when the top rotates and is rotating.

Biodiversity refers to the diversity of all types of plants, animals, and micro-organisms (microorganisms) and the ecosystem and ecological processes to which they belong. The basic competence to be achieved in biodiversity is that students can collect data and classify objects, plants, and animals in the surrounding environment. Their learning outcomes on biodiversity (plants) are still low (Yensi et al., 2019). Furthermore, The number of students in Nagekeo who answered correctly on this material was still low, below the national average (Center for Educational Assessment, 2020). Related to local science in Nagekeo, the concept of biodiversity can be taught to students by science teachers using Ndai. Before doing this series of activities, the people will burn the hunting area to make the game's object easy to see. This activity is contrary to biodiversity, which refers to the diversity of all types of plants, animals, and micro-organisms, as well as ecosystem and ecological processes in which they are a part because forest burning activities will kill them.

In this hunting activity, the teacher can relate it to the topic. The learning model that can be used is problem-based learning, where students face the problem of the community burning a forest before the ritual. The teacher can ask the students to visit the nearest area that is often burned and, using worksheets, ask them to collect data on objects, plants, and animals. Students are guided to think critically regarding burning activities because it will affect the survival of objects, plants, and animals in the area. Students can educate the people not to burn the hunting area when presenting the results of data analysis to them (Figure 4).

Figure 4. Burning Area Before Hunting

Temperature, heat, and heat transfer: Temperature measures the heat energy stored in an object. High-temperature objects have high heat energy and vice versa. Heat is the transfer of heat energy from an object with a higher temperature to an object with a lower temperature. In this concept, students are expected to understand the concepts of temperature, expansion, heat, and heat transfer and their application in maintaining body temperature stability in humans, animals, and everyday life. Students are directed to understand the concepts of temperature, expansion, heat, and heat transfer and their application in everyday life. Previous studies found that students had difficulty studying temperature and heat due to differences between scientific and everyday definitions (Chu et al., 2012; Kulkarni & Tambade, 2013; Foroushani, 2019).

Concerning local science, the construction of traditional houses in the village of Tutubhada 'Soa Waja Ji Vao' in Nagekeo, science teachers can explain the concepts of temperature, heat, and heat transfer using local science. A stilt house is made to circulate air (ventilation process) under the plank floor (stage) to reduce humidity in the room. Using reeds as roofs aims to isolate heat radiation from the sun because they are porous or hollow materials. Some students live in Nagekeo's traditional house while others have visited it. The teacher can relate it to science learning on temperature, heat, and heat transfer.

Teachers can use the contextual teaching and learning models, namely the conception of teaching and learning that helps teachers connect subject matter to the real world and encourages and motivates students to connect the knowledge they have and its application in daily lives (Berns & Erickson, 2001).

Students can be directed by the teacher using worksheets about using stilt houses associated with temperature and heat and the purpose of using reeds with heat transfer (Figure 5).

Figure 5. Traditional House of Tutubhada Village, Nagekeo

Vibration, waves, and sound: Vibration is a regular back-and-forth motion of an object passing through a point of equilibrium. Sound is a longitudinal wave that propagates wave energy in the air until the listener's receptors hear it. In this material, students are expected to clearly understand the concepts of vibration, waves, and sound and their relation to everyday life. However, the number of students in Nagekeo who answered correctly on this material is still low (Center for Educational Assessment, 2020). Students still have difficulty understanding the concept of vibration and waves (Jumadin et al., 2017). A science teacher can explain the concept using a contextual approach, such as local science resources in the area where students live. Local science in Nagekeo related to vibration, waves, and sound can be explained using the traditional musical instrument, Go Genga, which means an instrument that vibrates or sounds. This instrument is played by picking. It is made of bamboo. When the strings are plucked, sound waves are generated. When the strings of Sasando are sounded, the surrounding air resonates with a reflection of sound waves from the strings. The pitch of the Go Genga tone depends on the frequency of the sound source. If the strings are tightened, the resulting sound is louder. The frequency determines the pitch (Figure 6).

Figure 6. Go Genga Traditional Musical Instrument

The topic of vibration, waves, and sound can be related to this traditional musical instrument for students to understand and experiment with this topic in everyday life. The instrument can be used as a learning media. The teacher brings this instrument into the classroom and, by using worksheets, directs the students to understand the concepts of vibration, waves, and sound.

Local integration of science in Nagekeo in science learning

In the integration, science teachers must be able to identify and analyze specific scientific concepts in the local science. The development of science learning based on local culture requires the teachers to understand the nature of science to develop science-oriented processes, products, and skills. They should also develop exploratory skills to balance local science with science learning. To help them develop culture-based science learning, teachers should pay attention to the following provisions: (1) to provide meaningful science learning for students in contextual settings with local cultural values, (2) to present examples of oddities or miracles to students who are familiar with scientific concepts, and (3) to encourage them to ask questions and actively participate.

The local culture of NTT has educational values that can be integrated into science learning activities. Integrating local science into science learning helps teachers and students learn better and more meaningfully. Culture-based science learning instills positive attitudes in students to respect their nature and culture. If their beliefs are in accordance with scientific concepts, there will be mutually

reinforcing interference. A science teacher is required to understand and have sufficient skills in developing various learning models that are effective, creative, and fun. Suppose the teacher understands the basic concept or theory of learning that refers to the learning process described above. In that case, he/she can creatively develop a unique learning model based on the real conditions in each setting, enriching the teacher's version of the learning model by the existing learning model. This integration is expected to help students understand science as modern science through contextual learning activities. The results of the lesson plan analysis in Nagekeo show that science teachers have not yet developed a science lesson plan linked to students' cultural activities and traditions (Figure 7).

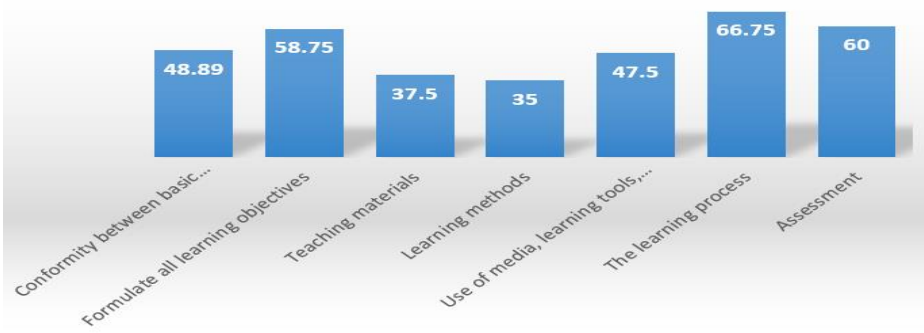

Figure 7. The results of ethnoscience-based science teacher lesson plan analysis

In the aspect of conformity between essential competencies and indicators (48.89%), science teachers have developed them. However, they are not linked to local science, both on indicators of scientific attitude (responsible and critical), knowledge (factual, conceptual, and procedural), and skills (students using, observing, and communicating experimental results in learning). Science teachers can formulate all learning objectives in measurable sentences, cover cognitive dimensions, are relevant to essential competencies, and contain achievement targets of scientific attitudes and knowledge of science concepts but are not associated with the cultural context of Nagekeo (58.75%). For teaching materials (37.5%), science teachers can determine and develop their teaching materials under the scope of learning objectives. However, they have never included Nagekeo cultural activities that can be explained scientifically according to the teaching materials to be discussed. Regarding learning methods in lesson plans (35%), science teachers can plan learning steps according to the scope of learning objectives, and the methods can encourage students to learn and understand science concepts that are not yet related to the socio-cultural context of Nagekeo. Regarding the determination and use of media, learning tools, and resources (47.5%), science teachers have determined the use of media/terms but not from the students' cultural environment. Regarding the learning process (66.75%) and assessment (60%), science teachers have designed the opening, primary, and closing activities clearly but not related to the Nagekeo cultural context. The assessment form used is clear but unrelated to the Nagekeo cultural context.

The use of local science for science learning is beneficial for students. They can have meaningful learning and knowledge so they no longer have difficulty understanding science material (Sudarmin., Febu, R., Nuswowati, M. & Sumarni, 2016; Risdianto et al.. & Kristiawan, 2020). The local science-for-science learning approach provides opportunities for students to make direct observations to identify and explain directly related problems, scientific phenomena, and natural changes through cultural activities around them (Pertiwi & Rusyda Firdausi, 2019). The material the teacher provides is associated with real-world situations of the students to encourage them to connect their knowledge and the application in their daily lives (Arsana et al., 2013). The culture-based learning approach is straightforward for teachers to use in science learning because students also know and participate in these cultural activities. In addition, local science-based science learning can also increase the students' confidence to learn science (Ardianti, S. D., Wanabuliandari, S., Saptono, S. & Alimah, 2019), foster their interest in studying science, and produce good students with a unity character (Hiwatig, 2008). Furthermore, local science-based science learning can help preserve the local culture for each generation in the future to avoid extinction because, with this approach, students will love their cultural activities and live with the culture (Soko, I. P., Setiawan, A.,

Widodo, A. & Redjeki, 2017). Students have a sense of responsibility for their environment's state as something they have to preserve (Sedawi et al., 2020). This approach can help promote students' awareness of the importance of respecting the traditions and beliefs of indigenous societies (Archila et al., 2021). It was clearly shown that many aspects of local science could provide students with new and meaningful learning experiences (Sumarni et al., 2022).

The cultural approach affects students' scientific literacy skills by connecting classroom education with everyday life and motivating them to participate actively in the educational process (Nurcahyani et al., 2021). Integrating local science into science learning is an effective and sustainable method for improving science curriculum (Meier, 2012; Acharya et al., 2019). One way to instill sustainable education is by teaching science using local science (Okwara et al., 2017). Science teachers can use local resources to link science materials. They will find it easier to explain science material to students because it is contextual. They will also be active and innovative in developing lesson plans to instill socio-scientific and related topics related to environmental issues faced by their students (Sadler et al., 2004). Learning emphasizes mastery of concepts and demands that students develop a mindset that can improve learning outcomes by linking the concepts learned with the phenomena (Sulastri, 2013). Integrating local science into science learning allows students to construct modern science concepts while maintaining their respective cultures' local wisdom (Pieter, 2012).

The limitation of this research is that there is no explanation regarding how to integrate culture into science learning in the classroom, including making a Learning Implementation Plan for the teacher. The advantage of this research is that it provides new knowledge for educators that science learning in the classroom can be carried out with a contextual approach, namely integrating local cultural activities into it. In the future, a science teacher can design learning by integrating local cultural activities so that students experience more meaningful learning, where it turns out that the cultural activities around them can be explained scientifically. Further research can explain more fully how to design learning, including creating a Learning Implementation Plan.

CONCLUSION

This local science can be implemented well in science learning as the science teacher has knowledge about the nature of science and can develop his/her observation and exploration skills of local science as a learning resource. Contextual science learning can be improved by reviewing concepts and demonstrating their application in students' daily lives, including cultural activities. Local science-based science learning is a planned and conscious effort to explore and identify the potential of local science to create meaningful learning and knowledge for students. Science teachers can easily define local science for teaching junior high school students as a learning program that meets local needs by using various natural resources, human resources, socio-cultural factors, and other potentials that are useful in developing students' knowledge and skills. To students, local science-based science learning can develop their skills, knowledge, and attitudes as a society that respects culture. Integrating local science into science learning can help students understand science as modern science based on prior knowledge through contextual and culture-based learning. The specificity of principles, customs, beliefs, traditional games, traditional rituals, views on natural phenomena, and events in everyday life is unique and different in each cultural group, so it has the potential to be integrated into science learning.

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