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Ethnoscience Study of Betel Lime Making in Indragiri Hilir as a Natural Science Learning Resource

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ABSTRACT

This study aims to analyze the local wisdom of making Lokan betel lime (*Geloina erosa*) in a scientific perspective. The data collection method used in-depth interviews with the Sapat people of the Banjar tribe, namely Fauziah and Ayus, the informants were selected using the snowball sampling method. Data were analyzed using Milles and Huberman's qualitative analysis method. The results showed that the Banjar people have a tradition of making betel lime from Lokan (*Geloina erosa*). The tradition of making Lokan betel lime (*Geloina erosa*) is a local wisdom of the Banjar people which is still maintained today. The process of making whiting includes the preparation of materials and tools, the process of making whiting, the results and benefits of whiting which can be used in science learning.

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Introduction

Indonesia has a variety-various cultures and customs that are spread in all corners of the region. Cultural diversity can be influenced by different geographical aspects, such as people who live in mountains, coasts, lowlands and highlands. Some examples of Indonesian local wisdom such as the management of water resources based on customary rules in the form of lubuak ban^{1,2}. Management of aquatic resources in the form of manongkah shells³ and the potential of plants as traditional medicine in Madura⁴. Riau Province is one of the provinces that has a wealth of local wisdom, which is inhabited by multiethnic people with most of them

being ethnic Malays. The Malay community has customs and values that govern the social environment. Malay culture is one of the pillars of national culture. In the Malay natural tradition society, the concept of adat displays a deep and meaningful relationship between human beings or the natural surroundings as well as humans and their natural surroundings. Various forms of local wisdom of the Malay community in the fields of plantations, forest conservation, water resource conservation, animal husbandry, marine affairs, and others³. One example of the culture of managing aquatic resources is in the form of manongkah shells³.

Ethnoscience (ethnoscience) is etymologically derived from the word "ethnos" from the Greek meaning "nation" and "scientia" from the Latin meaning "knowledge". Ethnoscience more or less means knowledge possessed by a nation or more precisely ethnic groups or certain social groups⁵. Learning with an ethnoscience approach is based on the recognition of culture as a fundamental (fundamental and important) part of education as an expression and communication of an idea and the development of knowledge⁶.

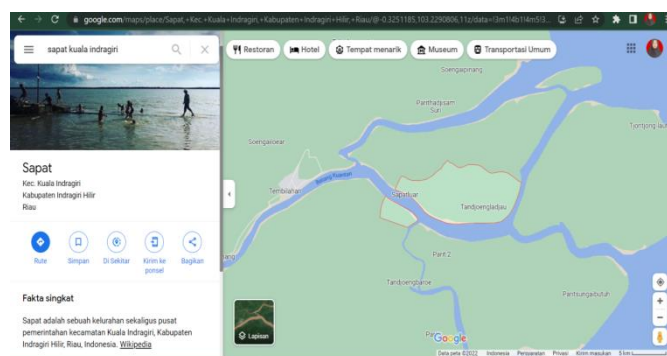
Association for Education and Communication Technology (AECT) states that learning resources are all sources that include data, people and goods that are used by students either individually or in a combined form, usually in informal situations, to facilitate learning. These sources include messages, people, materials, tools, techniques and settings⁷. Community culture should ideally be socialized to students through the learning process. There are many local wisdoms in Indonesia that have educational values and contain scientific concepts that can be used as learning resources. A teacher must be able to insert the local cultural values of a local area into the science or non-science learning process, but in reality science learning in schools pays little attention to the local culture found in the local area⁵.

Indragiri Hilir is one of the regencies in the Riau province, part of the area or 93.31% of the area of Indragiri Hilir Regency is a lowland area, namely river sediment areas, swamp areas with peat soil (peat), brackish forest areas (mangrove), and consists of large and small islands with an area of approximately 1,082,953.06 Ha with an average height of approximately 0 – 3 meters above sea level. The large number of natural resources in the waters causes a large amount of Lokan (*Geloina erosa*) shell waste, this is used by the people of Kuindra sub-district in the manufacture of whiting. Betel lime made from Lokan (*Geloina erosa*) shells goes through a long process starting from Lokan (*Geloina erosa*) shells which are burned with wood or charcoal for 1 to 2 hours. The shell is mashed to become whiting white powder. The activity of making betel lime from lokan shells has been carried out for generations and cannot be separated from the daily life of the Kuindra people. The routine of making lime from Lokan shells, which has become a tradition of the Sapat community, Kuindra sub-district, is still being inherited today. Based on the problems that occur where the teacher's lack of insight or knowledge to look for examples of events or events that contain local wisdom as indicated by the lesson plan and the demands of Government Regulation Number 19 of 2005 concerning National Education Standards Article 14 paragraph (1), it is stated that the Curriculum for SMP/MTs/SMPLB or other equivalent forms, it can include education based on local excellence. Then the researchers saw the potential wealth of Malay local wisdom that could be explored scientifically. So this study aims to analyze the local wisdom of betel lime production in a scientific perspective

Method

The research was conducted on June 4 2022. This research used a qualitative approach. The research method uses in-depth interviews and literature review, the research design is a case study. According to Yin, case study is a research method that investigates phenomena in depth and in real-world contexts⁸. The informants used were Banjar people in Sapat village Kuala Indragiri sub-district Indragiri Hilir Regency Riau namely 2 Banjar people in Sapat

village, Kuala Indragiri sub-district named Fauziah and Ayus, using a purposive sampling technique to select sources. Fauziah and Ayus are residents of Sapat village who produce Lokan betel lime (*Geloina erosa*) both for personal consumption and for sale. The research began with observations at the research site, then selecting informants, and conducting research by interviewing informants and making Lokan whiting (*Geloina erosa*), then presenting data and drawing conclusions. Qualitative data analysis used the Miles-Huberman analysis method with three stages namely; 1) data reduction (data reduction) which aims to select information obtained through interviews with informants so that the data obtained is in accordance with the research objectives; 2) data display (Data display), namely presenting selected information such as charts, graphs and tables; 3) drawing conclusions (Conclusion Drawing and Verification), namely the final analysis stage by providing conclusions from the data obtained after data verification that took place during the study. 2) data display (Data display), namely presenting selected information such as charts, graphs and tables; 3) drawing conclusions (Conclusion Drawing and Verification), namely the final analysis stage by providing conclusions from the data obtained after data verification that took place during the study. 2) data display (Data display), namely presenting selected information such as charts, graphs and tables; 3) drawing conclusions (Conclusion Drawing and Verification), namely the final analysis stage by providing conclusions from the data obtained after data verification that took place during the study.



Picture 1. Map of Sapat Kuala Indragiri Village

Results and Discussion

The Banjar people who are scattered in several villages in Indragiri Hilir, Riau Province, carry out a livelihood system based on fishery resources using traditional techniques, one of which is the utilization of fishery resources, namely the manufacture of betel lime from Lokan (*Geloina erosa*) shells. Lokan clams (*Geloina erosa*) are commonly found in mangrove forests around river basins. According to Sarong, Lokan clam (*Geloina erosa*) lives on the bottom of the water which has a sandy loam soil structure and its plants are dominated by *Nypa fruticants*⁹. Budiman stated that (1) the composition and occupancy pattern of mangrove mollusk species is more influenced by local conditions depending on the type of mangrove forest and (2) most of the species have a frequency and density presumably due to narrow environmental tolerance⁹. *Lime betel* is calcium hydroxide which is a white, odorless powder. Based on the results of interviews with the local community, this tradition originated with the Banjar tribe in Sapat village, Kuala Indragiri sub-district. Indragiri took advantage of this as a source of livelihood.



Picture 2. Lokan

"Betel lime is made using lokan shells because there is a lot of lokan shell waste around the house because the area is close to the sea and is swampy. It is also the custom of the Banjar people in Sapat village to eat betel nut"(Interview with Fauziah, 2022).

Betel lime using Lokan (*Geloina erosa*) shells is done by washing the Lokan (*Geloina erosa*) shells thoroughly and then drying them in the sun. When the lokan shells are dry, then the shells are burned using a stove and charcoal or dry wood for 1-2 hours until the lokan (*Geloina erosa*) shells turn white. After that, place the shells of Lokan (*Geloina erosa*) in a mash container using a millstone. The final step, strain the soft Lokan (*Geloina erosa*) shells using a filter and the whiting is ready to serve. If you want to make wet betel lime, add enough water and let it sit in a container for a while until the water seeps into the Lokan whiting (*Geloina erosa*).



Picture 3. Lokan Burning Process



Picture 4. Lokan Grinding Process

"Kapur betel is made from Lokan, initially the lime is washed until it is clean, then dried outside to dry, takes 1 to 2 hours. When the shell is dry, burn it using a stove, if not burn it in an ordinary fireplace using charcoal or firewood. If you have put it in a place and continue to grind it, sift it using a filter. The chalk can be wet or dry, if it's wet, just add more water and let it sit until the water dries up"(Interview with Fauziah, 2022).

The whiting from the shell of Lokan (*Geloina erosa*) is white, the whiting has a bitter taste. Betel lime from Lokan (*Geloina erosa*) shells is used not only for betel nut, but also for making cakes, for example for mixing in fried banana flour dough and other cakes.



Picture 5. Betel Lime Lokan

"Kapur betel from Lokan (*Geloina erosa*) has a bitter taste. In addition to betel nut, it is used to make cakes with the people of Sapat village. If it is mixed with flour for bananas, the fried bananas become crunchier" (Interview with Ayus, 2022).

Table 1. Reconstruction

Topic	Community Knowledge (Indigenous science)	Scientific Knowledge (science)
Preparation of Lokan whitening	Lokan can be found around the house	Lokan (<i>Geloina erosa</i>) is a clam that lives in brackish waters in coastal areas. Lokan (<i>Geloina erosa</i>) is a type of mollusc, often found in mangrove forests. Contains calcium, sodium, phosphorus, magnesium and zinc.
	Burning wood is dry wood, no special wood is required	Dry wood has a low moisture content, so when burning it can catch fire easily. High levels of H ₂ O are found in wood that has just been cut down, so when burning it will be difficult to start a fire and turn it into coals.
The process of making betel lime	Lokan shells are washed	Lokan (<i>Geloina erosa</i>) live in muddy river estuaries, generally live attached to the bottom of a hard substrate, namely rocks, wood, bamboo or hard mud. So it needs to be washed clean.

	Lokan shells are dried and burned	Washed shells will contain H ₂ O so drying in the sun is needed so that the H ₂ O levels are reduced. the shell or exoskeleton that protects the shells consists of higher calcium carbonate or limestone when compared to limestone, this can be seen from the hardness of the shell, the harder the shell, the higher the calcium carbonate content. Burning aims to make the shells brittle but not burnt. The burning process so that the shell is easily mashed.
Product	Kapur Sirih Lokan wet and dry	Lime betel contains calcium hydroxide compounds and contains strong basic properties. The alkaline in lime is also called very high (pH 11-12.5). Dry betel lime has almost no H ₂ O content, while wet betel lime contains H ₂ O so that its resistance becomes lower.
	Lime has a bitter taste	Lime betel contains calcium hydroxide compounds and contains strong basic properties. The alkaline in lime is also called very high (pH 11-12.5).
Benefit	Betel lime is used to eat betel and cake making	Lime water is often used as an ingredient that makes food more crunchy. Adding a few tablespoons of whitening water to the fried flour dough makes the flour crunchier and tastier. This is because of the content of calcium hydroxide found in lime.

Making whiting using Lokan (*Geloina erosa*). Lokan is Lokan (*Geloina erosa*) is a type of mollusk, often found in mangrove forests. Contains calcium, sodium, phosphorus, magnesium and zinc. Calcium protects bone density and health, and plays a role in blood clotting and treating injuries. Sodium is an electrolyte mineral like potassium. Minerals function to help muscles and nerves work, control blood volume, and affect blood pressure. Although useful, excessive consumption of sodium can cause high blood pressure. Phosphorus functions in the manufacture of bones and teeth, the use of fats and carbohydrates in the body, and the revision of cells and tissues. Magnesium helps metabolize fats and proteins, activates more than 300 types of body enzymes, and balances electrolytes when muscles contract.

In the burning process using dry wood, Dry wood has lower H₂O levels than recently felled wood. Burning wood undergoes a chemical change. Habitats Lokan (*Geloina erosa*) namely muddy river mouths, generally live attached to the bottom of a hard substrate, namely rocks, wood, bamboo or hard mud. Dirty Lokan shells that are washed will contain H₂O so drying in the sun is needed so that the H₂O levels are reduced. The shell or exoskeleton that protects the shells consists of calcium carbonate or higher limestone, which can be seen from the hardness of the shell, the harder the shell, the higher the calcium carbonate content. The burning process aims to make the shells brittle but not burnt. The combustion process will help in the process of physical changes.

Lokan that has been processed will become whiting which contains calcium hydroxide compounds and contains strong alkaline properties. The alkaline in lime is also called very high (pH 11-12.5). Dry whiting does not have H₂O levels while wet whiting contains H₂O so that its resistance becomes lower.

Lokan betel lime which contains many benefits is widely used by Indonesian people in their daily lives. For example, adding a few tablespoons of whiting water to the fried flour dough will make the flour crunchier and tastier. This is because of the content calcium hydroxide found in lime.

The Sapat community has already implemented the principles of environmental conservation. The Sapat community has demonstrated an environmentally friendly character as demonstrated by the effective handling of Lokan shell waste. Lokan shell including wastewhich comes from marine natural resources and contains materials that are solid, solid, strong and not easily deformed and have their own unique aesthetics. In making betel lime from Lokan it can reduce Lokan waste (*Geloina erosa*) in the surrounding environment and the use of lokan shells to turn into lime can increase the income of the local community. Lime that contains calcium hydroxide which is good for health.

In the 21st century, students are expected to have cultural literacy so that they are not only familiar with foreign cultures but also local cultures. In order for the existence of culture and local wisdom to remain strong, students as the next generation of the nation need to instill a sense of love for culture and local wisdom by integrating cultural knowledge in the learning process. Because regional culture, local wisdom, and the surrounding environment can make a certain contribution to the learning experience of students in the form of mindset (cognitive), attitude patterns (affective), and behavioral patterns (psychomotor)¹⁰.

The tradition of making lime betel lokan has potential as a source of natural science learning. Science teachers, especially Riau province, can use the context of this local wisdom in learning substances and their characteristics. The process of making betel lime by the Banjar tribe in Sapat village by burning it contains the concept of IPA. Teachers can also carry out science learning using the observation method with a scientific approach. Students can carry out science practicum by using whiting. Table 5 displays the basic competences of substance materials and their characteristics in class VII SMP/MTs schools. Which Basic Competencies are:

Table 2. Basic competencies

Science Basic Competency		Material
3.3.3	Understanding the concepts of mixtures and single substances (elements and compounds), physical and chemical properties, physical and chemical changes in everyday life.	Substances and Their Characteristics <ul style="list-style-type: none"> ● Solids, Liquids, and Gases ● Elements, Compounds, and Mixtures ● Physical and chemical properties ● Physical and chemical changes
4.3	Presenting the results of investigations or work on the nature of solutions, physical changes and chemical changes, or the separation of mixtures	

Education is an effort to empower human abilities to inherit, improve and build civilization in the future. One of the efforts to build civilization is to increase understanding of the surrounding area, especially those related to culture as a legacy from previous generations. Culture will be better known if it is included in learning activities, one of which is in the field of science. Cultural values which constitute local wisdom differ depending on each region, Indonesia which consists of various tribes, ethnicities and traditions. It is hoped that with this process the younger generation will have a higher value of nationalism and pride as the nation of Indonesia¹¹. Natural Science (IPA) is knowledge obtained through collecting data by experiment, observation, and deduction to produce a reliable explanation of a phenomenon. Science learning objectives to develop science knowledge and concepts that are useful and can be applied in everyday life and increase student awareness to participate in protecting, caring for, and appreciating the natural environment as God's creation¹². Science education can be developed by relying on the uniqueness and superiority of an area, including local (traditional) culture and technology. Learning that implements local cultural traditions is able to lead students to love their region and nation¹³.

Government Regulation Number 19 of 2005 concerning National Education Standards Article 14 paragraph (1), states that the curriculum for SMP/MTs/SMPLB or other equivalent forms can include education based on local excellence. The Government Regulation is refined in the 2013 Curriculum which supports learning to take advantage of culture, namely that the curriculum must be responsive to developments in science, culture, technology and the arts which can build curiosity and the ability of students to use it appropriately¹³. Sudarmin states that there are 370 ethnic groups in Indonesia, it is important to build (reconstruct) scientific knowledge based on culture or ethnoscience¹⁴.

However, in reality, ethnoscience-integrated science learning is still very rare in Indonesia schools. Rikizaputra et al states that many teachers do not know and do not know what ethnoscience is, but most do know and some of them do not implement ethnoscience in learning¹⁵. This statement shows that most biology teachers still have insufficient knowledge about ethnoscience. Based on interviews conducted with the chairman of the Biology MGMP, the teacher's lack of knowledge about ethnoscience is due to a lack of information about the importance of integrating ethnoscience in learning, especially biology and the absence of demands that require the integration of ethnoscience in learning. Besides that, Suastra stated

that almost 90% of teachers stated that they wanted to develop a local culture-based science learning model but in fact only 20% had the ability to implement it¹⁶. The lack of insight or knowledge of the teacher to look for examples of events/events that contain local wisdom is indicated by the lesson plan prepared by the teacher, there is still little that relates it to local culture. Therefore it is hoped that by integrating local wisdom values into science learning it is hoped that science learning will become more meaningful and not just textbook oriented. Integration is expected to increase students' sensitivity to the surrounding environment.

The tradition of making lime betel lokan (indigenous science) and lime betel lokan (indigenous science) can be used as integrated science learning media, while the way to use it is by using appropriate learning methods in the form of observation. Educators can invite students to observe by looking at the process of making Lokan betel lime (indigenous science), then students answer the questions contained in the LKPD (student worksheets).

Conclusion

The local wisdom of making betel lime has local community knowledge (indigenous science) which includes the concept of IPA. Lokan (*Geloina erosa*) is a type of mollusc, the manufacturing process begins with washing the shell Lokan (*Geloina erosa*), Lokan (*Geloina erosa*) live in muddy river estuaries, generally live attached to the bottom of a hard substrate, namely rocks, wood, bamboo or hard mud. Next, the Lokan shells are dried to remove H₂O levels and burned using wood, the wood used is dry wood with low H₂O levels. Then, the grinding process is carried out which is included in the physical changes. result, lime betel contains calcium hydroxide compounds and contains strong basic properties. The alkaline in lime is also called very high (pH 11-12.5). Dry betel lime has almost no H₂O content, while wet betel lime contains H₂O so that its resistance becomes lower. Apart from being consumed by themselves, lokan lime is traded by the people of Sapat. The use of lime aside lokan one of which is in the manufacture of cakes with adding a few tablespoons of whiting water to the fried flour dough makes the flour crunchier and tastier. This is because of the content calcium hydroxide found in lime.

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