Utilization of Ethnoscience in Arsik Fish as a Science Learning Resource

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Abstract. This research aims to review the literature on arsik fish ethnoscience in science learning so that it can be used as a science learning resource in elementary schools in the independent curriculum. The principle of science learning in the independent curriculum involves students' interaction with education and learning resources in the learning environment. Science learning in the independent curriculum is also in line with the objectives of the ethnoscience approach, where ethnoscience helps students understand the relationship between studying science and local cultural knowledge, students are also invited to look at scientific concepts from the perspective of local communities in understanding natural phenomena based on their traditions. This research discusses an ethnoscience literature review, which shows that arsik fish as local wisdom of the Toba Batak has great potential which intersects with scientific knowledge based on local potential. Arsik fish is a food that is usually served in traditional activities and can also be served using endemic fish from Batak. The use of arsik fish in ethnoscience-based science learning can increase students' understanding that apart from being studied in terms of culture and local wisdom, arsik fish can also be discussed from a science perspective regarding the plants and animals used in processing arsik fish, the sense of taste, chemical reactions, heat, and changes in the form of objects.

Keywords: Ethnoscience, Science, Arsik Fish, Learning Resources, Local Wisdom

1 Introduction

Learning in Indonesian Schools currently uses the independent curriculum. The principle of the Independent Curriculum, according to the decision of the Minister of Education, Culture, Research, and Technology‘s decision from the guidelines for implementing the curriculum in the context of learning recovery, learning in the independent curriculum involves the process of interaction between students, educators and learning resources in a learning environment. Learning is oriented towards future learning and is relevant to the context of learning, environment and culture [1].

Natural Sciences according to the National Education Standards Agency (BSNP) is a group of sciences that have special characteristics to study natural phenomena that are factual from events and realities that have a causal relationship. Science education is expected to be a vehicle for students to learn about themselves and their environment, and the development of this learning can be applied in their daily lives. The learning process understands and explores the environment scientifically based on direct experience[2]

ICONSEIR 2024, November 28, Medan, Indonesia

DOI 10.4108/eai.28-11-2024.2355429

Involving the culture that exists in the student's environment with science learning can enable students to experience learning by directly seeing, feeling and applying the learning they have in their daily live [3]. Local potential that is included in science learning provides a broad source of material about nature that is taken directly [4].

Environmental-based education needs to be included in school learning, to develop a world population that is aware, sensitive and cares about the environment and issues and problems that exist in the environment [5]The importance of ethnoscience learning used to explore indigenous knowledge that exists in society can be studied so that it can become a stepping stone towards science learning that can be used in learning at school [6].Science will be easier to understand if it is connected to the environment, human interests and aspirations [7].

Learning by utilizing place-based learning resources provides useful learning in: 1) strengthening the relationship between the community and the components involved, improving learning through the relevance and authenticity of the learning experience; 2) providing active participation to students in the process of problem solving, decision making, discussion, and increasing appreciation of local environmental learning; and 3) environmental literacy [4].

The ethnoscience approach that is included in the scientific concept of science learning is expected to make students learn happily and easily in mastering science concepts [3]. The use of ethnoscience used by teachers in science learning must be able to choose which science materials are associated with local cultural ethnoscience to be taught to students. This is because not all science materials can be associated with the ethnoscience approach [8].The selection of materials used must also be done appropriately and carefully and adjusted to the achievements and objectives of science learning to be achieved [4].

The local wisdom-based science learning model is obtained from indigenous knowledge and local genius of the community from the noble values of cultural traditions that regulate the order of community life in order to achieve the goal of increasing community welfare.[9]. Ethnoscience-based science learning provides a sustainable impact by increasing student learning outcomes, science literacy, critical thinking, High Order Thinking Skill (HOTS), science process skills, and students' understanding of concepts. The ethnoscience approach realizes meaningful culture-based science learning in improving the skills possessed by students [8].

2 Research Method

This research aims to conduct an in-depth study of the role of arsik fish ethnoscience in science learning in the classroom. This type of qualitative literature review research synthesizes and summarizes research results to obtain relevant and in-depth theories about the use of ethnoscience as a natural science learning resource. The research process is carried out by selecting existing research study sources from journals, books, and other supporting files.

3 Results and Discussion

3.1 Ethnoscience

The term ethnoscience is often equated with ethnography and ethnology. This science seeks to find universal laws of knowledge. All knowledge about nature is meta-epistemological, because it is related to the formal and substantive limitations of certain descriptions [10].

Ethnoscience is learning that is based on cultural perspectives and natural phenomena in life, thereby forming students' understanding of nature and culture [3].

Ethnoscience contains scientific knowledge that can be used in a learning process in Elementary Schools which can be used as an alternative solution for learning resources in schools by involving the environment and making it easier for students to discover the real conditions around them [3].

Ethnoscience methods can be adopted by anthropologists and anyone to reveal the intrinsic meaning and terminology of local culture. Culture is used to understand the original meaning of words and concepts used by society from their visible life behavior. Ethnoscience observation as a starting point to formulate deeper questions about the knowledge system [10]. Culture is seen as a set of knowledge and understanding shared by all members of a social group. Ethnoscience attempts to identify and describe similarities in cognitive structures and individual competencies or tries to find concepts shared by a group [11].

The position of culture in ethnoscience-based learning becomes a method for students to transform the results of observations into creative forms and principles about nature. The learning environment will change into a pleasant environment for both teachers and students. Students and teachers can also actively participate in implementing local culture [6].

The ethnoscience approach discusses the materiality aspect through the principle of various material things through the principle of culture with people involved in the same area using the same things. Ethnoscience can be grouped in various ways, namely focusing about human culture in a particular case, learning from direct involvement and long-term involvement in the field, using theoretical generalizations and various methods, building theory, and testing theory, and using a sociological perspective [11].

3.2 Arsik Fish

Arsik fish is a traditional food of the Batak Toba people. Dekke Na Niarsik (fish cooked until dry) is the local name for arsik fish. The use of the term arsik is taken from the Batak language "arsik", or a technique that is done by pouring liquid over the fish dish during the cooking process. Historically, arsik fish was a food served to Batak kings, but now it is a hereditary food from the ancestors of the Batak Toba tribe [12].

Arsik fish uses andaliman spices (Zanthoxylum Acanthopodium DC) which gives it a distinctive taste that is different from other foods [13]. Arsik fish is served in various Batak ceremonies, which are used to convey messages and good wishes given by parents to children in achieving life. Traditional ceremonies that usually use arsik fish are marriages, births, achievement, asking for healing, and graduation. Arsik fish is served on a plate together with white rice, where the fish is in a parallel position, must be covered in sauce and facing the recipient of the tradition.

The tradition of arsik fish is served at births, weddings, and even deaths. Odd numbers have their own meaning in the traditional Arsik Fish delivery event where the number of fish has a meaning: one fish is intended for a newly married couple, three fish are intended for a couple who have just had a child, five fish are intended for a couple who have just had a grandchild, and seven fish are intended for the leader of the Batak nation [14]. In traditional ceremonies, arsik symbolizes fertility and hope that the new life will be blessed [15].

Arsik is served from fresh fish, topped with natural and nutritious spices [16]The process of making arsik begins by washing and removing the gills and stomach of the fish until it is

clean, without removing the gills on the fish. Prepare red chilies, shallots, garlic, turmeric, andaliman, and candlenuts to grind. Galangal, ginger, and lemongrass are crushed and arranged in a container [17]. The ground spices are fried, then added with coconut milk and cooked over low heat until the spices are absorbed into the fish [15]. Arsik can also be added with field nuts [17].

3.3 Plants and Animals used in Arsik

The raw material for making arsik fish is fish-based, the fish used can be carp or batak fish. Carp (Ciprinus carpio) has morphological characteristics: 1) fins consisting of anal fins, dorsal fins, caudal fins, pelvic fins, and pectoral fins; 2) has a lateral line; 3) elongated body shape; 4) mouth position in the middle corner); and 5) dorso lateral body shape [18].

Batak fish is an endemic fish of North Sumatra, which can be found in the Batang Toru, Alian and Bahorok Rivers. Batak fish consists of 2 genera, namely Neolissocilus and Tor soro. This fish is used for the Batak tribe's adak ceremony [19].

In addition to the main composition of fish, arsik also uses many spices that have benefits and even become herbal medicines needed by the body. The spices used in making arsik fish are as follows:

Table 1. Plants Used in Arsik

No	Family Name	Common Name	Traditional Name	Latin Name
1	Clusiaceae	Acid Gelugur	Migar/Sotul	*Garcinia atroviridae*
2	Euphorbiaceae	Candlenut	Gambiri	Aleurites muloccana
3	Fabaceae	Long beans	Dali-dali	Purple-headed vigna
4	Lilaceae	Batak Onion	Baoang Batak	Allium schoenoprasum
5	Lilaceae	Red onion	Baoang Na Rara	Alluim fast
6	Lilaceae	Garlic	Baoang Na Bottar	Allium sativum
7	Myrtaceae	Bay leaf	Daun Salam	Syzygium polyanthum
8	Poaceae	Lemongrass	Sangge-sangge	Cymbopogon citratus
9	Rutaceae	Andaliman	Analiman	Zanthoxylum acanthopodoium
10	Solanaceae	Red chili	Lasiak Na Rara	Capsicum annum
11	Solanaceae	Cayenne pepper	Lasiak Na Gelleng	Capsicum frutescens
12	Zingiberaceae	Ginger	Pege	Zingiber officinale
13	Zingiberaceae	Tomato	Rias	The Elatior
14	Zingiberaceae	Turmeric	Hunik	Curcuma longa
15	Zingiberaceae	Galangal	Halas	Galanga language

There are 15 plants used in making arsik fish, consisting of 9 plant families. The most widely used families are from the Zingiberacea family (ginger, torch ginger, turmeric, and galangal), Liliacea (batak onion, shallot and garlic), Solanaceae (red chili, cayenne pepper). Then also using plants from the Clusiacea family (gelugur acid), Euphorbiacea (candlenut), Fabacea (long beans), myrtaceae (bay leaves), Poaceae (lemongrass), Rutaceae (Andaliman) [20].

All of these spices have their role in creating a delicious taste in arsik fish, some are used as flavor enhancers, colorants, and spicy flavors. The spices used in making arsik fish have chemical compounds and are used as herbal medicine [17].

Table 2. Plants used in arsik

No	Plant	Parts Used	Benefits and Compound Content
1	Turmeric	Rhizome	The distinctive yellow color comes from turmeric, and contains 1-6a% curcuminoid compounds (60-70%), demomethoxycurcumin (20-27%), and bisdemethoxycurcumin (10-15%). Curriculin in turmeric[21]has benefits as an anti-inflammatory, antibacterial, antiviral, anticarcinogenic, antioxidant. Anti-fibriogenic and immunomodulator
2	Ginger	Rhizome	Having bioactive compounds, and polyphenols which are gingerol derivatives produce a spicy taste. Polyphenols oleoresin, gingerol, and shogaol are useful for improving the digestive system and stimulating human appetite.
3	Galangal	Rhizome	Contains essential compounds for the taste and aroma of food. Flavanoids and essential oils are useful as anticancer, antimicrobial, anti-inflammatory, antidiabetic, etc.
4	Torch Ginger	Young stem	Contains bioactive compounds flavonoids, terpenoids, glycosides, saponins, tannins, steroids, and phenols which are useful as anti-inflammatories and inhibit the work of enzymes that cause inflammation.
5	Onion	Fruit	There are 3 types of onions used in making arsik which have organosulfur compounds, bioactive compounds, polyphenols, anthocyanins, phenols, tannins and carotenoids which are useful as antioxidants, anti-inflammatories, antimicrobials, antivirals, antidiabetics and anticancer.
6	Lemongrass	Fruit	Contains citral, flavonoid and phenolic compounds which are used as anti-obesity, antioxidant, anti-inflammatory, anti-bacterial and anti-diarrhea.
7	Chilli	Fruit	Used as a spicy flavor and burning sensation that contains capsaicinoids. Flavonoid compounds, phenolic acids, carotenoids, vitamins A, C, and tocopherols are useful as antioxidants to prevent free radicals, antiulcer reduce pain, and antidiabetic.
8	Andaliman	Fruit	Contains alkaloid compounds and saturated fatty acids, phenolics (free radical scavenging antioxidants), eucalyptol limonene, carenen and methyl cinnamate as antimicrobials.
9	Acid Gelugur	Fruit	Contains ascorbic acid as an antioxidant and prevents damage to body tissues and organs. Gelugur acid gives flavor to food.
10	Candlenut	Meat seeds	Contains linoleate, oleic, linolenan, palmitic fatty acids, which are used as compound oelutes and flavor and aroma givers.

The benefits and compounds contained in these foods can be used to increase human immunity and be used as an alternative to antiviral drugs, such as Covid-19 [17].

3.4 Local Wisdom

Local wisdom is a way human use their understanding to interact with the environment and natural resources. Local wisdom in this term specifically directs that there is limited interaction which involves a pattern of relationships between humans and humans and humans with their physical environment.[9]. The functions of local wisdom are 1) conservation of natural resources; 2) development of human resources; 3) observation of culture and science, traditional ceremonies; and 4) messages from ancestors.

The utilization of Lake Toba's resources must be balanced with conservation, because such utilization not only has good consequences for culture and tourism, but can also lead to the conversion of native forests into fields, bushes, settlements and home industries. This conversion results in water pollution, which is produced from domestic waste and human waste [22].

3.5 Utilization of Arsik Fish as a Science Learning Resource

The learning resources required by students are learning resources that must make it easier for students to understand the material, thereby increasing the effectiveness of their learning and directly increasing their understanding of the local wealth around their residence.

The use of ethnoscience as a learning resource does not only focus on what is explained by the teacher, but also gets interaction with the objects that students are studying to achieve learning goals. Involving nature directly can also reduce conceptual theory errors in learning [5].

Ethnoscience as a source of science learning in elementary schools provides learning with the phenomenon of science education in constructing culture from real social elements, and socio-cultural context conditions that can be used as sources of information. The dimensions of science constructed in science learning are processes, products, applications, and attitudes that are developed by utilizing culture as a source of learning [23].

Ethnoscience-based learning resources in elementary schools have a relationship between educational phenomena as cultural reconstruction with social elements and socio-cultural conditions that can be used as sources of information that construct science with students themselves [23]. The use of arsik fish in ethnoscience-based science learning can improve students' understanding that in addition to being studied from a cultural and local wisdom perspective, arsik fish can also be discussed from a scientific perspective regarding plants and animals used in processing arsik fish, the sense of taste, chemical reactions, heat, and changes in the shape of objects.

Food that is used as an object in learning can introduce students to the function of the senses: taste, diversion, smell, hearing, and touch. Learning by incorporating sensory methodology adapted in testing food sensory foods [24]. The spicy and salty taste felt after consuming arsik fish is a natural taste felt because humans have a sense of taste. The level of

spiciness and saltiness felt by humans varies according to the level of sensitivity of the sense of taste.

In the food processing process, there is also a heating process up to a temperature of 100oC so that the processed food is tastier with a soft texture. This process also affects the nutritional value of the resulting food. Overcooked food can also damage nutritional components because there is a change in various anti-nutrient compounds [25].

A change in the state of an object is a change in an object into a different state from before, including changes in size, shape, aroma and color [26]. The process of changing physical form (evaporation) also occurs due to high temperatures, so that the molecules in the food move more and experience evaporation, the surface area of the broth exposed to water molecules.

4 Conclusion

This study conducted a literature study that included an ethnoscience approach into science learning, where the ethnoscience used in this study was a typical Batak food, namely arsik fish. Arsik fish as ethnoscience can be studied from various scientific perspectives that are in accordance with learning in schools, we can see the science study of arsik fish in terms of plants and animals used in cooking, the taste of food, chemical reactions that occur in the process of making arsik. From the literature review, it was found that ethnoscience in science learning is considered effective and enjoyable, and is also considered to be able to improve students' critical thinking, improve learning outcomes, improve students' conservation traits, and improve science literacy. Science learning is oriented towards ethnoscience in accordance with the Merdeka curriculum, where learning involves interaction between students and their learning resources.

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