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Integration of ethnoscience and science in making banana cake as a learning media

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ABSTRACT

Banana cake is a type of processed food found among the people in Air Bungkal Village, Hamparan Rawang District, Sungai Penuh City which has developed into a business that can be used as a source of income. The purpose of this study is to analyze and transform the original knowledge of a group or community into scientific knowledge with the concept of science so that it can be a learning medium in biology learning in the community of Air Bungkal Village, Hamparan Rawang District, Sungai Penuh City. The method used in this study is a qualitative method with an exploratory approach with a research flow, namely observation, interviews, and documentation carried out in depth. The results of the study showed that there were several stages in the process of making bananas, starting from the selection of raw materials, processing raw materials, mixing, printing, baking, cutting, decorating with candied fruit, and packaging. The process of processing bananas into banana cakes transforming community knowledge into scientific knowledge with the concept of science can be used as a learning medium in biology that can be implemented for further research.

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INTRODUCTION

In a region or nation, of course, there is original knowledge about the culture and traditions of each region that will reflect the characteristics of the region, so this can be called ethnoscience (Sarini & Selamet, 2019). Ethnoscience (ethoschience) comes from the word "ethnos" which comes from Greek and means "nation" and "science" which comes from Latin and means "knowledge". From this understanding, ethnoscience is knowledge or science about a matter owned by a particular nation or group (Sarini & Selamet, 2019). Ethnoscience is also defined as

knowledge owned by a local community group that can be integrated into scientific knowledge (Mahendrani & Sudarmin, 2015).

Ethnoscience studies need to be carried out because they will reveal the characteristics of each region that we need to preserve together. After all, Indonesia is known as a country with diverse customs and cultures (Kencanawati & Angela, 2022). Through ethnoscience studies, we can understand the relationship between humans and their environment. Traditional knowledge contained in local culture often deviates from the values of sustainability and ecosystem balance so it needs to be maintained (Sarini & Selamet, 2019).

Sungai Penuh City presents various beautiful and interesting tourist attractions for tourists, the tourism in Sungai Penuh City area includes nature, religious, and cultural tourism (Wiseza, 2017). In addition to presenting interesting tourist attractions, Sungai Penuh City also has land that is used by the surrounding community to plant various types of plants, especially in Hamparan Rawang District, which has utilized the land by planting banana plants, especially the type (Musa Paradisiaca) which in the local language is known as "Pise Dingung".

Bananas (Musa Paradisiaca) have nutrition and have a distinctive aroma (Pratomo, 2013). Bananas (Musa Paradisiaca) economically have a relatively cheap selling price, the fruit is larger compared to other types of bananas. This banana also has a high carbohydrate content so it is suitable for making banana cake (Unika & Astuti, 2016). Indonesia is also a country that is famous for its various processed foods that are different in each region and these foods will become the characteristics of the region. One of the processed foods that we know is bolu. Bolu is a cake that is very popular among the general public. Bolu is a cake made from a mixture of basic ingredients such as wheat flour, granulated sugar and eggs which are generally processed through the baking method (Putri et al., 2023).

It is known that there are various kinds of sponge cake preparations that we often encounter. The sponge cake preparation found in Air Bungkal Village, Hamparan Rawang District, Sungai Penuh City is banana cake. Banana preparations that become banana cakes are used by the community as snacks and by businesses to earn income for the surrounding community. Banana cake is a sponge cake variant that has a sweet taste and uses bananas as the main ingredient, suitable for those who do not want a dominant egg aroma because this banana cake is more characteristic of the aroma of bananas than the aroma of eggs (Putri & Perhotelan, 2023). Banana cake is rich in taste and nutrition. Banana cake is unique in the way it is made which is often passed down from generation to generation (Sipayung et al., 2021).

The advantages of banana cake found in Air Bungkal Village, Hamparan Rawang District, Sungai Penuh City, are that it uses typical Kerinci bananas, which the local people call "Pise dingung". People use this banana because it is easy to get around Kerinci, this banana is softer than other bananas so it is easy to process, it tastes sweeter and has no seeds. In addition to having advantages, there are also disadvantages to this banana cake, namely using several bananas that have undergone carbide treatment, where these bananas can be harmful to the body because the carbide process contains chemicals such as arsenic and phosphorus (Aprida et al., 2018).

The banana cake also provides an interesting variation in the world of cakes, the presence of bananas not only provides taste but also contains fiber and vitamins that can nourish the body so the banana cake is not only a delicious dessert but also provides good nutritional value (Arinta et al., 2021). Banana cake with all its uniqueness and deliciousness can steal the attention and satisfy the tastes of cake lovers in various parts of the world (Kono et al., 2023). In the process of making banana cake, there is local knowledge contained such as the selection of natural ingredients that are around the community. The process of processing bananas into processed banana cake food can be a science that is studied with a science called ethnoscience and can be used as a learning medium.

Learning media is something that is used to connect learning materials by educators in the teaching process so that the teaching materials are easier for students to understand. The use of learning media in the teaching and learning process aims to increase the effectiveness and efficiency of learning (Ekayani, 2017). The use of learning media can also help personalize learning for each student. With various types of media available, educators can adjust the learning approach according to each individual's learning style (Aghni, 2018).

Learning media has a big role in the educational process, media is an important element that supports improving student understanding (Suryadi, 2019). Learning media as a source of learning, by presenting and utilizing media in the educational process can enrich students' perspectives and can be utilized by educators with various types of variations and can be an effective tool in conveying student knowledge (Nurrita, 2023). The application of biology in practical learning still faces various challenges. Many students see biology as a difficult subject because of its broad scope and the high complexity of the material (Azrai et al., 2024).

Study Regarding the making of banana cake, the focus is more on the integration of biological science into learning through an ethnoscience approach that uses the cake-making process as a learning medium. In this study, students can learn biological concepts such as plant morphology, classification, and biochemical interactions during the processing of banana cake ingredients. In this study, students can learn biological concepts such as plant morphology, classification, and biochemical interactions during the processing of banana cake ingredients. Different from previous research conducted by (Kencanawati & Angela, 2022) titled "*Reconstruction of community knowledge in the process of making Kerinci potato dodol regarding product halal criteria using an ethnoscience approach*" which focuses more on the halal aspect of the product. Potato dodol research focuses on the transformation of local knowledge to meet halal product standards, including analysis of materials, tools, and processes that meet halal criteria but are not specifically intended as a medium for learning biology.

With this, of course, the media used must be interesting for students so that they better understand the material being taught and learning media can also be learned from the local community environment (Nurrita, 2018). Such as the process of processing bananas into banana cake food which in the manufacturing process is related to biology and can be used as a learning medium. Thus, the purpose of this study is to analyze and transform the local knowledge of the people of Air Bungkal Village, Hamparan Rawang District, Sungai Penuh City regarding the knowledge of making banana cake into scientific knowledge by integrating scientific concepts so that it can become a learning medium in the field of biology.

RESEARCH METHODS

Research Design

This research was conducted using a qualitative method with an exploratory approach in Air Bungkal Village, Hamparan Rawang District, Sungai Penuh City, Jambi Province. The exploratory approach is a learning method that provides space for students to build understanding through direct experience, making it easier for them to relate knowledge to real situations and apply it in everyday life. (Lestari et al., 2019). Qualitative research has two main objectives, namely, first, describing and exploring and the second objective is describing and explaining. (Azrai et al., 2024) . This means that qualitative research focuses more on providing details or a clear picture of an object, event, or phenomenon, which explains a person's behavior in an ongoing activity. There are three stages in research, namely observation, interviews, and documentation (Fadli, 2021).

Population and Samples

The population in this study is the community or workers making banana cake, namely the type of banana " Musa Paradisiaca" in Air Bungkal Village, Hamparan Rawang District, Sungai

Penuh City. The sample in this study is business actors (D) who are considered to have relevant knowledge about making banana cake.

Instruments

To obtain more in-depth information about the stages and processes of making the banana cake as a learning medium, this study uses interviews. Interviews were conducted with experienced banana cake makers to find out the ingredients, mixing techniques, and time needed at each step. The data collected will be analyzed, so that this study can help develop more practical and appropriate teaching methods. This research uses interview instruments as in Table 1.

Table 1. Interview instruments

No	Interview Questions
1	What is a banana?
2	What are the benefits of bananas in everyday life?
3	What types of bananas are commonly consumed?
4	What kind of bananas are used in making banana cake?
5	Explain the benefits of horn bananas *(Musa Paradisiaca)* for local communities?
6	What tools are used in making banana cake?
7	What ingredients are needed to make banana cake?
8	How is banana cake made?
9	How long does it take to cook banana cake?
10	How long can banana cake last after packaging?
11	How long does it take to mix banana cake?

Procedures

This study uses 3 stages, namely the observation stage focused on document examination based on the reconstruction of community knowledge in making banana cake, while the interview stage was conducted with business actors (D) and workers totaling 15 people in January 2024 and documentation focused on collecting primary data and secondary data. The procedure for making banana cake starts from selecting raw materials, processing raw materials, mixing, printing, baking, cutting, decorating with candied fruit and packaging.

Data Analysis

Data analysis was carried out using qualitative descriptive methods. Qualitative analysis was carried out by describing people's knowledge about making banana cakes in everyday life (Kencanawati, 2019). This study focuses on exploring the local knowledge of the people of Air Bungkal Village, Hamparan Rawang District, Sungai Penuh City regarding the process of making banana cake and its relation to biology. This study aims to reconstruct and describe the community's knowledge about making banana cake into scientific science.

RESULTS

Based on the results of document analysis, interviews, and documentation to business actors (D) as well as the community in Air Bungkal Village, Hamparan Rawang District, Sungai Penuh City, it was obtained information that the making of banana cake was passed down from generation to generation. This heritage includes the original recipe, techniques, and methods of making banana cake as well as cultural values related to making banana cake such as using typical Kerinci bananas, namely bananas of the type (*Musa Paradisiaca)*. In addition, each generation always maintains the authenticity of the taste of the banana cake. The tools used in making banana

cake are basins , bottles, mixers, spoons, baking pans, gas ovens, wooden rulers, cutting knives, plastic mica and the materials used are bananas of the *"Musa Paradisiaca"* type , chicken eggs, TBM, sugar, triangle wheat flour, vegetable oil, soda, vanilla, candied fruit . The stages in making banana cake in Air Bungkal Village, Hamparan Rawang District, Sungai Penuh City are as follows:

a) Selection of raw materials b) Raw material processing c) Mixing d) Printing

e) Oven f) Cutting g) Decorate with Sukade h) Packaging

Figure 1. Preparation of raw materials for making banana cake and banana cake-making process

From Figure 1. several stages in making banana cake are visible, namely in the first stage the process of selecting raw materials consists of two stages, namely selecting ripe and unripe bananas. Ripe bananas can be used directly as raw materials and ripe bananas are marked by the characteristics of bananas, namely the skin becomes yellow with brown or black spots, the texture of ripe banana skin will be softer and easier to peel, the flesh of the fruit is softer and sweeter. Unripe bananas go through a carbide process the local community calls it *"mram pisang"* the process is that the bananas are placed in a sack then inserted with a carbide that has been perforated with plastic storage so that the carbide emits heat then the sack is tied tightly and left for a maximum of 3 days.

The second stage is the processing of raw materials in making banana cake, namely by smoothing peeled bananas using a bottle until smooth and with a liquid texture. The third stage is mixing banana cake ingredients by adding wheat flour, eggs, TBM, sugar, vegetable oil, vanilla, and mashed bananas, then mixing using a mixer.

The fourth stage is molding, after the banana cake ingredients have undergone a kneading process and have been mixed evenly, the dough is then molded using a baking pan and flattened, then in the fifth stage is baking, after the dough is molded, the dough is put into a gas oven to be baked. The sixth stage is cutting, after the banana cake is cooked and left to cool, then the banana cake is cut using a cutting knife so that the cutting is not slanted and the size is the same, a wooden ruler is used.

The seventh stage is decorating with candied fruit, the banana cake has been cut so that the banana cake looks attractive, the banana cake is decorated with candied fruit, then in the eighth stage, the banana cake is packaged using plastic mica to avoid dust and make it easier when sell.

DISCUSSION

The use of bananas made into banana cakes is used by the community as a source of income for the community which has developed into a banana cake processing business that can be consumed so from this, the community's knowledge of the process of making the banana cake will be reconstructed into scientific knowledge as in Table 2.

Table 2. Results of the reconstruction of community knowledge into scientific knowledge

Community Knowledge	Scientific Knowledge
Banana is a fruit that tastes sweet and has many types	Bananas are herbaceous plants and belong to the Musaceae family, originating from Southeast Asia. Banana plants have various parts such as roots, fruit stems, and leaves (Ryan & Pigai, 2009) . **Science concept:** Various kinds of plants
Bananas are used as food that can be consumed directly	Bananas are a fruit rich in nutrients such as potassium, vitamin C, and fiber. Consuming them directly is a great way to get the nutrients contained in bananas (Junus & Mamu, 2022) . **Science concept:** Nutrition in bananas
Horned banana *"Pise dingung "* and Pisang uli *"Pise manaih".*	The horn banana *(Musa Paradisiaca)* has fibrous roots with pseudo stems, large and elongated horn banana leaves with a length that can reach 2 meters and a width of around 30-50 cm, The horn banana fruit is oval and curved with a larger size compared to other types of bananas. The skin is thick and green when raw, then turns yellow when ripe. This fruit has sweet and chewy flesh (Sitti et al., 2016) . Uli banana *(Musa Sapientum)* has fibrous roots with pseudo stems, large, wide and elongated uli banana leaves with a length of about 1.5 -2 meters and a width of about 30-50 cm, uli banana fruit is shorter and larger than horn banana. The skin of the fruit is green when raw and turns bright yellow when ripe (Rikomah, 2016) . **Science concept:** Morphology of horn banana *(Musa Paradisiaca)* and cauliflower banana *(Musa Sapientum)*
Horn banana *(Musa Paradisiaca)*	Sungai Penuh City has one type of banana that is used as an ingredient in making banana cake, namely the horn banana which has green skin when raw and yellow when ripe with a sweet and chewy taste (Sitti et al., 2016) . Horn bananas are included in the Kingdom: Plantae, Phylum: Magnoliophyta, Class: Liliopsida, Order: Zingiberales, Family: Musaceae, Genus: Musa, Species: Musa Paradisiaca.

	Science concept: Plants used by local communities and the taxonomy of horn bananas
According to local people, the benefits of bananas are that they make bowel movements easier, contain vitamin C, can be used as a dessert and make the body fitter. .	Banana horns contain tannins which contain an astringent effect that is useful in treating diarrhea and maintaining digestive health so that it can make bowel movements easier also vitamin C helps strengthen the immune system by stimulating the production of white blood cells (Hapsari et al., 2019) **Science concepts:** Nutrional value of bananas
The tools used in making banana cake are a bowl, bottle, mixer, spoon, baking pan, gas oven, wooden ruler, cutting knife, plastic mica.	In making banana cake, the tools used are according to their respective functions and remain conventional (Kencanawati & Angela, 2022) **Science concept:** Conventional tools
Bananas, chicken eggs, TBM, sugar, triangle wheat flour, vegetable oil, soda, vanilla, candied fruit.	The composition of the ingredients for identifying banana texture uses traditional or conventional procedures so that it is in accordance with the legality of the ingredients (Kencanawati & Angela, 2022) . **Science concept:** Banana cake composition
Peeled bananas are then mashed manually using a bottle, then the bananas are mixed into a mixture containing eggs, TBM, sugar, triangle wheat flour, vegetable oil, soda, and vanilla after the ingredients are evenly mixed and placed in a baking pan and leveled then the dough is put into a gas oven after the dough is cooked then the dough is left to cool after the dough is cold then the next process is cutting, decorating the banana cake with candied fruit and packaging.	The procedure for making a banana cake using the main ingredient of banana *(Musa Paradisiaca)* and an ethnoscience study approach begins with studying the morphology and classification of bananas. The ingredients include 65 banana seeds, 60 chicken eggs, a quarter kg of tbm, 3 kg of sugar, 10 kg of triangle wheat flour, 10 glasses of vegetable oil, 1 ounce of soda, 1 bottle of vanilla, and a quarter of candied fruit (Kencanawati & Angela, 2022) **Science concepts**: Morphology, classification, procedures
Bake the banana cake for about 1 hour	Baking banana cake for about an hour with a gas oven results in energy exchange, where the gas burning in the oven produces heat. This process heats the ingredients in the banana cake dough, which contain water molecules. The heat increases the kinetic energy of the water molecules, allowing the water to evaporate. This heat energy also triggers chemical reactions between banana cake ingredients such as flour, sugar, eggs, and bananas which change the structure of the dough into a denser and more fluffy texture (Hamdi & Tritisari, 2022) . **Science Concept:** The concept of energy in making banana cake
The banana cake lasts about 1 week	Banana cake that has been packaged in plastic mica only lasts for one week and does not use preservatives (Maharani & Wulandari, 2010) **Science concept:** Sterilization of materials without

	preservatives
Kneading takes about 30 minutes	The mixing takes about 30 minutes with the banana cake ingredients being beaten until they reach the right consistency before being put into the pan. The mixing is done using a mixer so that the dough becomes a smooth texture, has cavities and is evenly mixed (Siregar et al., 2023) **Science concept:** Principles of physics, chemistry and interactions between banana cake ingredients

Based on Table 2 above, we can explain that the process of making banana cake can be a learning medium used for students in biology because it involves various biological concepts that can be explained practically. Some biological concepts that can be explained include the morphology and taxonomy of bananas where the type of banana (Musa Paradisiaca) is classified in the Kingdom: Plantae, Phylum: Magnoliophyta, Class: Liliopsida, Order: Zingiberales, Family: Musaceae, Genus: Musa, Species: Musa Paradisiaca. In addition, the concept of carbohydrate metabolism is also explained through the banana ripening process which converts starch into simple sugars, which makes bananas sweeter and softer (Suryalita, 2019).

The concept of nutrition in bananas includes vitamin C, potassium, and fiber content that provides health benefits such as strengthening the immune system and making it easier to defecate (Hapsari et al., 2019). The process of making banana cake has a biochemical concept, namely a chemical reaction between the ingredients used so that changes in chemical substances occur during the mixing and baking process, resulting in a dense and fluffy cake (Suryalita, 2019).

The advantages of bananas (Musa Paradisiaca) as the main ingredient in making sponge cakes include their high nutritional content, such as vitamin C, potassium, and fiber, which makes banana sponge cakes healthier than cakes that only rely on sugar and flour (Hapsari et al., 2019). Bananas (Musa Paradisiaca) also provide a natural texture and sweetness to the sponge cake, reducing the need for additional sugar. In addition, bananas (Musa Paradisiaca) are easily available and relatively inexpensive, making them an economical choice for raw materials for making sponge cakes. By utilizing the process of making banana sponge cakes, students can learn biological concepts more deeply and practically, connecting theory with real practices in everyday life.

In addition, students can relate biology to other learning, such as in the surrounding environment or the context of society. Researchers understand that the original knowledge of the community in making banana cake can be transformed into scientific knowledge. This is in line with research by (Kencanawati, 2019) on the ethnoscience study of making potato dodol (potato jam) as a learning medium in this case the making of potato dodol is still done traditionally and hereditarily so that the original knowledge of the community can be transformed into scientific knowledge. Students can make banana cake as a medium for learning biology and connect it to the concept of science (Ilhami et al., 2020).

Table 3. The relationship between the process of making banana cake and the concept of science

Competency standards	Science Concept in Making Banana Cake
Explain what kind of banana it is. used in the process of making sponge cake banana?	Several types of bananas can be used as raw materials in making banana cake, one of which is the horn banana *(Musa Paradisiaca)* is one type of banana found in Kerinci, has an oval and curved fruit with a larger size, thick skin, and this fruit has sweet and chewy flesh. This type of banana *(Musa Paradisiaca)*

	has a softer fruit structure than other bananas, the taste of this banana is also sweeter and this banana does not have seeds so it is easy to process into cake (Sitti et al., 2016) .
Explain the biological concept of making banana cake?	Making banana cake involves various biological concepts from selecting raw materials to packaging. Bananas (*Musa Paradisiaca)* are chosen because they are rich in carbohydrates, fiber, vitamins, and minerals that help in forming a good cake texture and taste. Enzymes such as amylase in bananas break down starch into simple sugars, providing a natural sweetness. The process of mixing the ingredients involves eggs containing albumin protein and fat from butter or oil for softness. During baking, a reaction occurs that produces a brown color and a distinctive aroma, while the starch in the flour provides a solid cake structure and hygienic packaging prevents microbial contamination. Bananas *(Musa Paradisiaca)* have the advantage of natural sugar content, soft texture, and high nutrition, which produces high-quality and healthy banana cakes. (Siregar & Andika, 2022).
Analysis of banana cake durability after packaging?	Banana cake can last for I week without preservatives that can harm the body (Maharani & Wulandari, 2010).

Based on Table 3 above, it can be explained that the concept of science in the process of making banana cake can be used as a learning medium in biology. The concept of science that can be used as a learning medium such as botany in the selection of raw materials. Horn bananas (Musa paradisiaca) are chosen because of their superior biological properties, such as sweet fruit flesh, soft texture, and seedless, which makes processing easier. Furthermore, the concept of biochemical science, namely in making cake, involves the amylase enzyme which breaks down starch into sugar, albumin protein from eggs, and fat from butter which helps the texture of the cake to be better (Siregar & Andika, 2022).

During baking, a reaction occurs that produces a distinctive color and aroma, as well as a dense sponge cake structure, then the concept of microbiology science, namely hygienic packaging, prevents microbial contamination so that the sponge cake can last up to one week without preservatives (Maharani & Wulandari, 2010). Using the process of making banana sponge cake as a medium for learning biology provides an opportunity to teach various science concepts, such as botany, biochemistry, and microbiology, practically and applicatively.

Students can understand how biology is applied in everyday life, especially in the food industry, to produce high-quality and safe products. With ethnoscience, a community can delve deeper into its unique culture, recognizing cultural values as an important element in education as a way to convey ideas broaden understanding, and become a foundation for cultural learning (Kencanawati & Angela, 2022).

CONCLUSION

Based on the research results, it can be seen that the process of making banana cake based on the knowledge of the community and business actors can be used as knowledge and passed down

from generation to generation. The procedure for making banana cake starts with selecting the ingredients. raw materials, raw material processing, mixing, molding, baking, cutting, decorating with candied fruit, and packaging. The method of making banana cake can be passed down from generation to generation and can be studied with a scientific concept with an ethnoscience approach. The researcher hopes that the results of this study can be the basis for the development of broader ethnoscience-based learning media in the field of biology. By transforming local knowledge such as the process of making banana cake into scientific concepts, it is hoped that students or students can understand biology more contextually and applicatively. In addition, the researcher hopes that this study can encourage the preservation of local culture and strengthen the integration of science in everyday life so that science and culture can develop side by side.

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