

Research Article

Local Wisdom of Making “Gula Habang” in Balangan Regency: Ethnoscience Study

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Abstract.

Ethnoscience is a science learning approach based on local wisdom, such as making *Gula Habang*, which is closely related to the material of temperature and heat in physics subjects. The process of making brown sugar contains a lot of genuine science, which basically can be explained scientifically, namely the concepts of temperature and heat. The research objective is to analyze original science and scientific science in the manufacture of brown sugar. This study uses direct observation about making “*Gula Habang*” and analysis of the temperature and heat modules based on local wisdom in the manufacture of *Gula Habang*. The results of the literature study and the analysis carried out by the researchers, the matter of temperature and heat can be explained by linking the concepts of temperature, change of state, and heat transfer to the process of making brown sugar. Therefore, the ethno-science-based learning of making *Gula Habang*, in Balangan Regency can be applied in learning physics on temperature and heat materials as well as science on heat transfer materials, because it can accommodate basic competencies in the 2013 curriculum for high school and junior high school levels, as well as learning outcomes in the independent curriculum for junior and senior high school.

Keywords: local wisdom, Gula Habang, Balangan, ethnoscience study

1. INTRODUCTION

Ethnoscience is an approach to science learning that links tradition and knowledge to make it more attractive and easily understood by students [1]. Ethnoscience comes from the Greek word *ethnos* which means nation and the Latin word *scientia* which means knowledge. So ethnoscience is defined as knowledge from a culture [2]. The latest innovation in education is learning with an ethno-science approach because it is able to provide scientific knowledge in culture and makes learning more meaningful [3, 4].

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Indonesia is a country that consists of various tribes and customs, so it has various local wisdoms that contain genuine science but have not been pursued in the curriculum [5]. Therefore, learning with an ethno-science approach can be applied so that the knowledge gained is culturally integrated [6]. One of the ethno-science approaches that can be applied is the local wisdom of making jaggery which is closely related to the physics subject matter of temperature and heat [7]. The branch of ethnoscience related to the concept of physics is called ethno-physics [8]. Technically, *Gula Habang* is made in a traditional way which functions as a basic ingredient for food and drinks [9]. The manufacture of *Gula Habang* contains a lot of original science that develops in society and is prone to misunderstandings about local wisdom [10].

Several studies related to ethnoscience have been conducted by Risamasu (2023) which states that learning resources that are contextual and can increase students' scientific literacy are one of them by using ethnoscience learning media because students explore genuine science and try to discover the scientific science contained therein [11]. In addition to previous ethnoscience-related research such as making mountain salt in science lessons [12], making marrow porridge in science lessons [13] and developing E-Modules based on ethno-physics on temperature and heat for Senior High School Class XI [14]. As for ethno-science research on the manufacture of *Gula Habang*, there is still little. Therefore, further research is needed regarding the ethnoscience contained in the manufacture of *Gula Habang*, where the manufacture of *Gula Habang* has become local wisdom in several areas, one of which is in the Balangan Regency area. This study aims to obtain knowledge of scientific knowledge of the original science of making *Gula Habang* that develops in society that can be applied in learning physics

2. RESEARCH METHOD

This research was conducted by studying the manufacture of brown sugar scientifically using ethnoscience studies. The study is intended to present a scientific review of the habits of the community. The activity was carried out by observing the manufacture of *Gula Habang* in Balangan Regency. The data collected is in the form of documentation of the process of making *Gula Habang*. Every process of making *Gula Habang* is studied in genuine science and scientific science. Scientific science is viewed from the scientific of physics, while genuine science is obtained from the original knowledge of the community from the processes that occur. In addition, to support the analysis of original science into scientific science, a literature study was carried out on research articles on ethnoscience that are in accordance with this study.

3. RESULT AND DISCUSSION

Gula Habang, also known as palm sugar, comes from the palm plant, namely *Nira* [15]. *Nira* is a sweet, fragrant and colorless liquid found in palm fruit bunches obtained from the tapping process [16]. Tapping is done on palm trees aged 6-12 years, with a tapping yield of 20-30 liters of *Nira* per tree [17]. Palm farmers can usually tap 5-6 palm trees in one day [15]. Some processed products that use *Gula Habang* include compote, klepon, cake, apem, serabi, and putu. The drinks that use *Gula Habang* are cendeol porridge, dawet, coconut ice, and coffee. *Gula Habang* is used as a food ingredient because it has characteristics such as a refreshing aroma, easy to dissolve, high sucrose and protein content and low fat content [15, 18]. The process of making *Gula Habang* begins with taking the aren fruit from the tree, as shown in Figure 1.







Figure 1: Tapping *nira* on palm trees.

Some of the tools used in making *Gula Habang* are pans/pots for cooking the *Nira*, stirrers for stirring the *Nira*, strainers for filtering the *Nira* and molds for molding the *Gula Habang*. The stages of making *Gula Habang* consist of filtering, cooking and printing and packaging [19]. The *Nira* water from the palm trees that has been taken then goes through a long process until it becomes granulated sugar. Activities in the manufacture of brown sugar with documentation can be seen in Table 1.

The process of making *Gula Habang* from tapping to printing basically applies several concepts of temperature and heat. Activities carried out during the manufacturing process are called genuine science and scientific science obtained from the results of an analysis of local wisdom with the material temperature and heat. The results of

TABLE 1: Procedur and documentation to make *gula habang*.

Procedure	Documentation
<p><i>Nira</i> that has been collected, put into the pan. Use a pan that is larger than the volume of water. When the <i>Nira</i> is put into the crater (large pan) then the fire is lit. Cooking <i>Nira</i> until it boils \pm 3-4 hours for 5-6 liters of <i>Nira</i>.</p>	 <p>FIGURE 2. Preparation of nira for heating</p>
<p><i>Nira</i> will warm up for 3-4 hours. In order to cook evenly, the <i>Nira</i> is stirred using a wooden, iron or aluminum stirrer. But during the cooking process <i>Nira</i> usually uses a wooden stirrer. In this process the process of evaporation of the <i>Nira</i> water will occur.</p>	 <p>FIGURE 3. Nira heating 3-4 hours</p>
<p>The boiled <i>Nira</i> is continuously stirred until the water content evaporates and the <i>Nira</i> thickens.</p>	 <p>Figure 4. Nira condition after heating</p>
<p>The material that has thickened is then printed using a round mold. This process must be done quickly so that the <i>Nira</i> does not freeze. After all put in the mold. Then the <i>Nira</i> is cooled until it solidifies.</p>	 <p>FIGURE 5. <i>Gula habang</i></p>

the original scientific study of the process of making *Gula Habang* into scientific science are in Table 2.

In which the material temperature can be studied at the stage of changing the temperature of the *Nira* and changes in the form of the *Nira* until it becomes refined sugar. Furthermore, the *Nira* cooking process which applies the concept of heat transfer can be explained scientifically when the *Nira* is cooked in a pan/pot to form a thick liquid.

TABLE 2: Construction of original science and scientific science.

Original Science	Scientific Science
<i>Nira</i> is heated using burning wood	The heat from the fire, the raw material of which comes from burning wood, causes the <i>Nira</i> to become hot.
<i>Nira</i> will be cooked until cooked within 3-4 hours	Boiling and freezing points are temperatures that can be measured with a thermometer.
The heated <i>Nira</i> aims to evaporate the water so that the <i>Nira</i> shrinks	The change of state is melting, freezing and vaporization.
The <i>Nira</i> must be put in a large pan so that when it boils the <i>Nira</i> will spill out	Expansion of solids, liquids and gases.
The <i>Nira</i> that is cooked using fire/heat obtained from burning wood is then transferred to the <i>Nira</i> via an iron skillet.	Heat transfer is Conduction.
In order to cook evenly, the <i>Nira</i> is stirred using a wooden, iron or aluminum stirrer. But during the cooking process <i>Nira</i> usually uses a wooden stirrer.	The nature of wood is an insulator, while aluminum is a conductor.
<i>Gula Habang Nira</i> that turns sour is called vinegar <i>Nira</i> .	The process of fermentation by bacteria is affected by sunlight.
When the <i>Nira</i> collected is not sufficient, then the <i>Nira</i> is heated first. Then the <i>Nira</i> is mixed with the newly produced <i>Nira</i> so the <i>Nira</i> becomes warm.	If two substances with different temperatures are mixed, heat transfer will occur from high temperature to low temperature. So, there are substances that release and absorb heat. The amount of heat released must be equal to the heat absorbed (Black's Principle).

Gula Habang is made with a fairly long process because the cooking process takes several hours and the molding process takes time to turn into solid sugar, however, *Gula Habang* can last up to 5 months in a dry place and not exposed to direct sunlight [19, 20]. The process of making *Nira* can be used as a learning resource in schools. This study also examines scientific knowledge obtained based on the applicable curriculum. The results of the analysis are in Table 3.

TABLE 3: Analysis scientific science in science curriculum.

Curriculum 2013				Independent Curriculum	
Junior School	High School	Senior School	High School	Junior High School	Senior High School
3.4 Analyze the concepts of temperature, expansion, heat, heat transfer, and their application in everyday life.		3.8 Analyze the influence of heat and heat transfer in everyday life		An understanding of measuring the amount of temperature caused by a given heat energy, as well as being able to distinguish between insulators and heat conductors. Process Skills observing, predicting, planning, processing, evaluating, communicating	Understanding of applying the concepts and principles of heat. Process Skills observe, predict, process, evaluate, communicate

Table 3 shows that the process of making *Gula Habang* can be a source of learning in physics about temperature and heat. The local wisdom of making *Gula Habang* is

now starting to develop because it has become a home industry and is widely known [21]. This provides the possibility for students to learn with the culture that surrounds them. So that the learning that takes place becomes more meaningful. several studies also show that local wisdom that takes place in the community can be used as a source of learning [22]. Learning based on local wisdom can use various learning models such as inquiry, discovery learning [23], SSI approach [24], STEM [25] and other. Previous research shows that learning with local wisdom provides freedom for students to learn contextually and provides meaningful learning [22, 26]. This opportunity can improve students' thinking skills. Not only that, students can care more about the surrounding environment [23].

4. CONCLUSION

The ethnoscience of making *Gula Habang* which is applied in physics subjects, namely temperature and heat material and in science subjects, namely heat transfer. It turns out that the manufacture of *Gula Habang* has some original science that has developed in society, but basically it applies the concepts of temperature and heat which can be explained scientifically (scientific science) because during its manufacture through heating, evaporation and molding a process of temperature changes, changes in shape and displacement occurs. heat. The scientific science contained in the process of making *Gula Habang* can be an ethnoscience-based physics or natural science learning medium to make it easier for students to understand temperature and heat material at the high school level in physics subjects and heat transfer material at the junior high school level in science subjects. In addition, the ethnoscience-based learning of making *Gula Habang* in Balangan Regency can be applied to the 2013 curriculum as well as the independent curriculum because ethnoscience learning can attract students' curiosity about genuine science and find scientific science so as to create student-centered learning.

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