



The Tradition of Making *Lontong Tuyuhan* in Rembang Regency as a Science Learning Resource

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Abstract: The aim of the research is to reconstruct the original science of the community into scientific science in the product of *lontong tuyuhan* located in Rembang Regency, Pancur District, Jeruk Village. The output of this research is the result of the reconstruction of the community's original science into scientific science in the product of *lontong tuyuhan*. This study uses a qualitative descriptive method through in-depth interviews, firsthand observation, and documentation studies of making *lontong tuyuhan*. Data processing techniques include analysis, verification, reconstructing the community's original science into scientific science, and linking it with science learning competency standards. The results of this study are several concepts of indigenous knowledge of science in the manufacture of *lontong tuyuhan* which can be reconstructed into scientific science and integrated into science learning in schools, both senior high school, junior high school, and elementary school.

Keywords: Community original science; *Lontong tuyuhan*; Scientific science; Science learning resources

Introduction

The rapid-fire expansion of technology and science in various western nations has encouraged the expansion of science education in Indonesian schools and difference evolving nations, thus giving birth to certain formal sciences or what is commonly called western modern science (WMS) (Sumarni et al., 2016). Western knowledge contains principles, concepts, facts, and scientific wisdom that are conceptual and tiered, causing students to have difficulty understanding western science concepts. Meanwhile, learning in schools has linked the material with the original wisdom of the community.

The original wisdom of the community (indigenous science) is erected in the form of emblematic, socio-cultural, and customary dispatches. The original wisdom of the community is a relic from the progenitors which contains a holistic comprehension of the community in their everyday lives according to their interactions with the surrounding environment. Public

knowledge usually contains principles, concepts, or scientific wisdom that haven't been homogenized (Lestari et al., 2022). However, most of this community knowledge has been forgotten due to an absence of comprehension of the significance of conserving and maintaining the diversity of community knowledge (Halim et al., 2013). There needs to be an effort in science learning so that there is a balance between knowledge and the implantation of scientific attitudes, and the value of local culture that grows in the community. Students do not only study western (modern) science which is universal, objective, and a value-free process (Chaudhuri, 2015), but also study the original science that's wisdom, ethical, and contextual (Rahmatih et al., 2020).

Learning by connecting to the surrounding terrain has a good effect on learners. The good effects can take the form of affective and cognitive expansion (Kiyaci et al., 2016). In science education, learning from the surroundings needs to be applied to make harmony between wisdom and scientific attitudes, which will

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latterly elaborate the grades of original wisdom in the community. This is be supported by the content of the 2013 curriculum that's being enforced in Indonesia stating that education can take utilise of culture (Kemendikbud, 2013).

Yuliati (2013) state that teaching materials that are presented contextually and relate to science, the environment, and society can make it facilitate for learners to reason the material as a whole. The preparation of student learning resources that link knowledge with indigenous science knowledge

(Indigenous Science) makes it easier for students to associate concepts with life (Khusniati, 2014). A similar opinion was expressed by (McKinley et al., 2012) who states that it is important to explore the existing culture in learning indigenous knowledge of the community that is integrated into schools, to create a balance between western (modern) science and traditional (original) science. Some examples of indigenous knowledge of the community used as a source of contextual learning such as Table 1.

Table 1. The Relation of Society's Native Sciences with the Concept of Chemistry Learning (Sumarni, 2018)

Community Original Science	Chemical concept
The tradition of making traditional herbal medicine.	The mixture, mixture separation, solution, colloid, filtration, maceration, extraction, digestion, precipitation, evaporation
Ripe avocados by piling them in rice	Reaction rate, alkene, catalyst
Smoked fish production	Aldehydes, ketones, organic compounds, evaporation
Batik fabric coloring	Complex compounds, bases, colloids

Rembang Regency is one of the regencies located at the eastern end of Central Java Province. Rembang has distinctive original wisdom, both in of religion, natural potential, traditional ceremonies, language, and traditional food. One of the typical traditional foods owned by Rembang Regency is *lontong tuyuhan*. The name *lontong tuyuhan* is taken from the early history of *lontong* makers and sellers located in Tuyuhan Village, Pancur District, but now this special food has been developed by the people around the area. *Lontong tuyuhan* which has developed to date contains inherited cultural values. *Lontong* in general has an oval shape, but the characteristic of *lontong tuyuhan* it is triangular. The triangular shape in *lontong tuyuhan* has a fairly deep meaning, namely 3 goals of love, namely *hablum minallah* (love of God), *hablum minal alam* (love of nature), and *hablum minannas* (love of fellow living beings). A portion of *lontong tuyuhan* consists of lontong and chicken opor sauce.

The original science of making *lontong tuyuhan* contains local culture followed by the surrounding community which has been neglected in learning, one of which is science learning. The obstacles encountered so far haven't been many sweats to explore the potential of the local science of making *lontong tuyuhan*, both in its content and pedagogical context. Indigenous Science is mostly only assessed orally, based on symbols and experience. As a result, it is currently difficult to convey knowledge (Sudarmin et al., 2012).

Based on the background explanation, the problem observed is how are scientific science concepts related to the process of making *lontong tuyuhan*? The aim of this research is to identify the relevance of scientific science concepts in the process of making *lontong tuyuhan*, so

that the concepts obtained can be used as a source of scientific learning.

Method

This study uses qualitative research methods for an organized study of knowledge from the cultivation that exists in community (Crewell et al., 2018). The cultivation of the people classified in this research is the cultivation of producing *lontong tuyuhan*. This study involved 2 respondents making and selling *lontong tuyuhan* located in Rembang Regency, Pancur District, Jeruk Village. The data collection location can be seen in Figure 1.



Jeruk
Kec. Pancur, Kabupaten Rembang, Jawa Tengah

Figure 1. Data collection location

This research data collection technique adopted from the research carried out (Sumarni et al., 2016) namely by focusing on the culture of the community of making *lontong tuyuhan* which has been organized for a long time where community knowledge was built and believed to be in accordance with the geographical location of the area. During data collection, the

researcher directly observed the activities of making *lontong tuyuhan*. Primary data collection uses observation, in-depth interviews, and discussions in the field. While secondary data was collected through literature studies related to the culture of making *lontong tuyuhan*. In this study, the researcher became the main instrument in data collection, in verifying, reconstructing, formulating, and conceptualizing the process of making *lontong tuyuhan* into scientific knowledge. The process of data analysis is carried out continuously and the data is intensively extracted, categorized and then reconstructed into scientific knowledge.

Result and Discussion

From the results of surveillances and in-depth debriefings with 2 repliers who make and sell local food typical of Rembang *lontong tuyuhan* in Jeruk Village, Pancur District, Rembang Regency, information was obtained that the knowledge possessed by the community directly comes from experience in everyday life and has not been mixed with western culture. Respondents' knowledge about making *lontong tuyuhan* is the knowledge that is acquired and inherited from their progenitors.

The conditioning carried out during the process of producing *lontong tuyuhan* are shown in Figures 2 to 4.



Figure 2. *Lontong tuyuhan* and one of the *lontong tuyuhan* respondents



Figure 3. The Process of cooking *lontong*



Figure 4. The process of cooking the soup of *lontong tuyuhan*

The results of in-depth interviews and exploration of public knowledge about the process of making *lontong tuyuhan* were reconstructed into scientific wisdom as displayed in Table 2.

Table 2. Results of the Reconstruction of Society's Original Science Knowledge and Scientific Science in the Product of *Lontong Tuyuhan*

Interrogatory	Community Local Science	Scientific Science
What tools and materials are used to make lontong?	Alat: <i>pisau, ember</i> Bahan: <i>godhong gedang, sodo, beras</i> In English Tools: knife, bucket Ingredients: banana leaves, sticks, and rice	Rice is rice grains (<i>Oryza sativa L.</i>) that have been separated from the husks. The classification of rice plants is as follows: Kingdom: Plantae Division: Tracheophyte Order: Poales Family: Poaceae Genus: <i>Oryza L.</i> Species: <i>Oryza sativa L.</i> Banana leaves a leaf produced by the banana plant (<i>Musa paradisiaca</i>). The classification of banana plants is as follows: Kingdom: Plantae Division: Magnoliophyte Order: Zingiberales Family: Musaceae Genus: <i>Musa</i> Species: <i>Musa paradisiaca</i> A stick is a bone from a coconut leaf (<i>Cocos nucifera L.</i>) that can be used as a skewer to wrap rice cake. The classification of coconut plants is as follows: Kingdom: Plantae

		<p>Division: Tracheophyte Class: Magnoliopsida Order: Arecales Family: Arecaceae Genus: Cocos L. Species: <i>Cocos nucifera L.</i> Science concept: plant taxonomy</p>
<p>Why is the shape of the <i>lontong</i> triangular?</p>	<p><i>Ya, dari dulunya gitu, dan lebih mudah pembuatan dan cepat</i></p> <p>In English Yes, it's been like that before, and it's easier and faster to make</p>	<p>The characteristic feature of <i>lontong tuyuhan</i> is that it has a triangular shape. <i>Lontong</i> with a triangular shape has a larger surface area than <i>lontong</i> with an oval shape so that triangular <i>lontong</i> can be cooked faster.</p> <p>Science concept: rate of reaction</p>
<p>What is the process of making <i>lontong</i>?</p>	<p><i>Gawe wadahe teko godhong gedang, diisi beras setengah dhuwur, banjur digodok sampe mateng</i></p> <p>In English Make a container from banana leaves, fill it with a container of rice, then boil until cooked.</p>	<p>The <i>lontong</i> container made of banana leaves is triangular which is the hallmark of <i>lontong tuyuhan</i>. Rice washing serves to ensure that there is no dirt on the rice so that the <i>lontong</i> produced is clean and delicious Soaking the rice helps the rice cake to cook faster. Besides the functionsoaking rice facilitates the process of absorption of vitamins and minerals from rice and provides phytic acid which prevents the body from absorbing rice nutrients. The function of filling half the <i>lontong</i> container is because later after the rice is cooked it will expand and fill the wrapper (banana leaves) to produce fluffier and denser <i>lontong</i>. The process of cooking rice cake applies the concept of exothermic. The concept of exothermic occurs in the process of burning wood in a fire. The burning of this wood releases heat from the system to the environment producing heat that is used to cook rice cake. In this process, the temperature of the boiler air becomes hot so that the water boils and turns into water vapor. The process absorbs heat from the environment (pot) to the system (water). Science concepts: thermochemistry, heat transfer, colloids</p>
<p>What spices are used in making <i>lontong Tuyuhan</i>?</p>	<p><i>Brambang, cengeh, bawang, laos, kencur, kunir, ketumbar, jinten, misoi, uyah, gulo, kecap, moto</i></p> <p>In English Shallots, chilies, garlic, kencur, galangal, turmeric, cumin, misoi, coriander, salt, sugar, soy sauce, flavoring</p>	<p>Classification of chili plants (<i>Capsicum annum L.</i>): Kingdom: Plantae Division: Spetmatophyte Class: Dicotyledon Family: Solanaceae Genus: Capsicum Species: <i>Capsicum annum L.</i></p> <p>Classification of shallot plants (<i>Allium cepa L.var. aggregatum</i>): Kingdom: Plantae Division: Magnoliophyta Class: Liliopsida Family: Liliaceae Genus: Allium Species: <i>Allium cepa L.var. aggregate</i></p>
		<p>Garlic plant classification Kingdom: Plantae Division: Magnoliophyta Class: Liliopsida family: Alliaceae Genus: Allium Species: <i>A. sativum</i></p> <p>Galangal plant classification: Kingdom: Plantae Division: Magnoliophyta Class: Liliopsida</p>

Family: Zingiberaceae
 Genus: *Alpinia*
 Species: *A. fail*
 Classification of kencur plants:
 Kingdom: Plantae
 Division: Tracheophyta
 Class: Liliopsida
 Family: Zingiberaceae
 Genus: *Kaempferia*
 Species: *Kaempferia galangal* L.
 Classification of turmeric plants:
 Kingdom: Plantae
 Class: Liliopsida
 Division: Magnoliopsida
 Genus: *Curcuma*
 Family: Zingiberaceae
 Species: *Curcuma longa*.
 Coriander plant classification:
 Kingdom: Plantae
 Division: Magnoliophyta
 Class: Magnoliopsida
 Family: Apiaceae
 Genus: *Coriandrum*
 Species: *C. sativum*
 Classification of cumin plants:
 Kingdom: Plantae
 Division: Magnoliophyta
 Class: Magnoliopsida
 Family: Apiaceae
 Genus: *Cuminum*
 Species: *C. cyminum*
 Misoyi plant classification:
 Kingdom: Plantae
 Division: Magnoliophyta
 Class: Magnoliopsida
 Family: Lauraceae
 Genus: *Cryptocarya*
 Species: *C. massoia*

Table salt with the chemical formula NaCl is the result of an acid and base reaction which has neutral properties because it has a pH of around 7.

Granulated sugar or cane sugar is sugar made from sugar cane juice (*Saccharum officinarum*), the obtained sap is purified and then evaporated to remove water content which is further crystallized and dried with the chemical formula C₆H₁₂O₆.

Soy sauce is a food flavoring in the form of a black liquid which is generally made from soybeans or black soybeans.

Flavoring is a food additive that gives a certain taste. The most commonly used flavoring agent is monosodium glutamate.

Science concepts: classification of plants, additives, colloids, the nomenclature of compounds.

What is the process of making *Kelopo diparut, banjur diperes karo banyu* coconut milk?

In English
 Grated coconut then
 squeezed with water

Coconut meat (*Cocos nucifera*) is grated to expand the surface of the coconut to speed up the reaction rate in the coconut milk extraction process

Coconut milk is obtained by the extraction process by squeezing grated coconut with water. Coconut milk is an example of a colloid where the dispersed phase is oil (liquid) and the dispersion medium is water (liquid). This colloid is called a liquid emulsion. Coconut milk emulsion is stabilized by coconut

<p>How is the process of making <i>lontong tuyuhan</i> sauce?</p>	<p><i>Bumbu halus digongso sampe mateng, banjur disaring karo santene, terus dimasak ditambahi kecap, gulo, uyah, moto sampe mateng.</i></p>	<p>proteins, namely albumins and globulins and the presence of phospholipid emulsifiers.</p>
<p>In English</p>	<p>Ground spices are sauteed until cooked then filtered with coconut milk, then cooked and added soy sauce, sugar, salt, flavoring</p>	<p>Science concept: extraction, reaction rate, colloid</p> <p>The spices for the opor <i>lontong tuyuhan</i> sauce are mashed. The function of refining spices is to widen the surface so that when cooked the spices can absorb to the maximum.</p> <p>The spices are roasted (sautéed) until the aroma of the spices comes out and reduces the water content in the ground spices. The finely stir-fried spices (<i>gongso</i>) are filtered with coconut milk to prevent the residue from the spices from getting into the cooking and a clean opor sauce is produced.</p> <p>In the coconut milk heating process, an exothermic reaction occurs, heat transfer from the system to the environment, heat from the fire to the pan causes the coconut milk to increase in temperature and the coconut milk to boil.</p> <p>The heating process can kill the microbes contained in coconut milk. Microbes can grow at low temperatures (room temperature) causing coconut milk to spoil easily.</p> <p>The process of heating coconut milk with low heat so that the liquid emulsion in coconut cream doesn't coagulate. The coagulation of coconut milk components can be damaged at high-temperature heating.</p> <p>The chicken and <i>tempe</i> are put into the coconut cream sauce while swirling to function so that the <i>lontong tuyuhan</i> spices can seep into the chicken and <i>tempe</i>.</p>
<p>Why in the process of making opor sauce using medium heat and always stirring</p>	<p><i>Santene ora pecah</i></p> <p>In English</p> <p>Coconut milk doesn't break</p>	<p>Science concepts: reaction rate, heat transfer, thermochemistry, colloids, fermentation</p> <p>Coconut milk is a type of colloidal oil-in-water emulsion emanated from coconut meat. The process of heating coconut milk with low heat so that the liquid emulsion in coconut milk does not coagulate. Coagulation components of coconut milk can be damaged at high-temperature heating, so in cooking coconut milk using medium heat and always stirring.</p> <p>Science concept: heating, colloid</p>

Based on Table 2, shows that in the procedure of producing *lontong tuyuhan* there's original community science that can be reconstructed to give birth to scientific science. This scientific science can be restated

into the concept of education in academies both in senior high school, junior high school, and elementary school. Original science concepts that can be integrated into high school competency standards are shown in Table 3.

Table 3. The Relation of *Tuyuhan Lontong* Making Process with High School Competency Standards

Competency standards	Science Concept
<p>3.2 Explain the conception of the enthalpy change of reaction at constant pressure in thermochemical equations.</p>	<p>Understand the concept of energy changes from the system and the environment in the process of boiling rice cake and cooking gravy opor.</p>
<p>3.6 Explaining the factors influencing reaction rate using collision theory.</p>	<p>Understand the factors that affect the reaction rate in the process of making <i>lontong tuyuhan</i> opor sauce.</p>
<p>3.9 Identify reduction and oxidation reactions using the concept of an element's oxidation number. (Oxidation and reduction reactions and nomenclature of compounds).</p>	<p>Operation of the directions for naming plain organic and inorganic composites according to IUPAC rules. Determine the names of several compounds in the ingredients used in the manufacture of <i>lontong tuyuhan</i>.</p>
<p>3.10. Analyzing the properties of solutions based on acid-base theory and/or solution pH.</p>	<p>Understand the acid-base theory and the pH of the solution in the <i>lontong tuyuhan</i> material.</p>
<p>3.14 Analyzing the role of colloids in life-based on their properties.</p>	<p>Identify differences in solutions, colloids, and suspensions in the manufacture of <i>lontong tuyuhan</i> opor sauce. Identify the type of colloid in the manufacture of <i>lontong tuyuhan</i> opor sauce. Connecting the properties of colloids in the process of making <i>lontong tuyuhan</i>.</p>

Table 4. The Relation of *Lontong Tuyuhan* Production Process with Middle School Competency Standards

Competency standards	Science Concept
3.2 Classify living things and objects grounded on the observed characteristics.	Category of organisms (crops) belongs kingdom, division, genus, class, family, and species by observing the ingredients for making <i>lontong</i> and <i>lontong tuyuhan</i> opor sauce.
3.3 Describe the theory of blends and single substances, properties and physical and chemical changes in life.	Observe the process of making <i>lontong tuyuhan</i> to investigate the properties of matter (liquid, solid, and gas) and gather data about compounds, elements, and blends.
3.4 Analyze the concepts of <i>temperature</i> , expansion, heat transfer, and their role in body temperature and heat transfer in life including mechanisms to maintain convection, conduction, and radiation through the stability of animal body and human temperatures	Investigating the effect of heat on changes that occur in the process of making <i>lontong tuyuhan</i> .
3.6 Delineate type additives and addictive substances in food and beverages, and their effects on health	Identify additional ingredients in the manufacture of <i>lontong tuyuhan</i> and their effect on the taste of food and their effect on soundness

Table 5. The Relation of *Lontong Tuyuhan* Making Process with SD Competency Standards

Competency standards	Science Concept
3.6 Applying the theory of thermal transfer in life. (Heat and displacement)	Applying the theory of thermal transfer in the process of making <i>lontong tuyuhan</i> .
3.7 Understand the influence of thermal on transformations in temperature and the appearance of objects in existence.	Understand the influence of thermal on temperature changes in the rice cake cooking process
3.9 Understand the classification of matter in life-based on its constituent components (single and mixed substances)	Observing and grouping materials into mixtures or single substances in the surroundings in the process of producing porridge <i>lontong tuyuhan</i> to gain data about the nature of single and mixtures substances

In Table 3, data is attained that respondents' science of the procedur of producing *lontong tuyuhan* can be integrated into high school chemistry learning at basic competency standards points 3.2, 3.4, 3.9, 3.10, and 3.14. If integrated into science education in junior high school, the process of making *lontong tuyuhan* will be related to several competency standards as shown in Table 4.

Table 4 shows that the science of respondents in the procedure of producing *lontong tuyuhan* can be integrated into science education in junior high schools. The content and environment of education can be linked to the material in the basic competency standards 3.2 and 4.2, 3.3, 3.4, and 3.6. If it is related to science learning in elementary schools, it can be seen in the competency standards in Table 5.

Based on Table 5 indicates information that the knowledge of respondents in the process of making *lontong tuyuhan* can be associated with learning science in elementary school students. The content and concepts of knowledge can be linked to materials with basic competency standards 3.6, 3.7, and 3.9.

The results of the analysis of native science in the process of making *lontong tuyuhan* in Jeruk Village, Pancur District, revealed that the process can be integrated into original culture grounded on science education as written in Tables 3, 4, and 5. The application of local culture in learning is seen as a source of knowledge. appropriate learning methods to improve students' conceptual understanding by using the natural

and socio-artistic terrain (Ninawati, 2020). This culture is the original heritage of the ancestors and has not been influenced by other cultures (Sumarni et al., 2016). Integrating local wisdom into chemistry can be done by providing examples of chemical concepts integrated into cultural products or by using cultural products as natural laboratories (Wahyudiati et al., 2020). The application of chemical concepts in people's lives, reflected in cultural traditions, cultural symbols, social systems, value systems, & cultural products that are found relevant to chemical concepts or practices is defined as (Norolayn et al., 2017). Chemistry material that is integrated with ethnochemistry can make students better understand new knowledge in scientific concepts (Singh et al., 2016). A similar opinion was expressed by (Dewi et al., 2018) that learning by linking traditional knowledge (original science) makes students understand the meaning, nature, and benefits of what they learn.

Many studies linking local wisdom have been carried out, such as (Arif et al., 2020) conducting research on the application of an ethnochemical-integrated culturally responsive teaching approach to hydrolysis material to develop 21st century skills. Problem Based Learning by integrating West Sumatran local wisdom has validity, practical, and effective in improving critical thinking skills (Oktavia et al., 2018). Local culture-based chemistry learning can improve critical thinking skills (Suardana et al., 2018).

The concept of science in the local wisdom of the process of making *dumbeg* can be used as a source of science learning at the elementary, middle and high school levels (Lestari et al., 2022). The concept of science in the production of traditional herbal medicine can be used as a source of learning science (Sudarmin et al., 2012). The results of the existing reforms are intended to give birth to alternative learning resources that help students learn science without having to leave their culture.

Conclusion

This research concludes of is that in the process of making *lontong tuyuhan* in Jeruk Village, Pancur District, Rembang Regency, it is a hereditary convention that can be applied as a cultural-based science education resource for senior high school, junior high school, and elementary school. With this exploration, it's hoped that preceptors will pay concentration to the original culture that develops in the community and link it to the learning process, so that later learning will be more meaningful.

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