Dumbeg Production Scientification in Rembang, Central Java, Indonesia: Local Culture Integration Efforts in Science Learning

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Abstract
The purpose of this study was to reconstruct community science into scientific science in dumbeg production in Polandak village, Pancur District, Rembang Regency. The expected benefits in this study are to be used as an alternative source of contextual learning in schools, within the scope of science. The method used is descriptive qualitative through in-depth interviews, direct observation, and study of dumbeg production documentation. The focus of the research is the dumbeg production process from the preparation stage of the material to the processing of materials. Data processing techniques in this study include analysis, verification, and the process of reconstructing community science into scientific science. The results of the study show that the scientific concepts contained in dumbeg production can be used as learning resources for science learning both at the elementary, middle, and high school levels.

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p-ISSN 2252-6412
e-ISSN 2502-4523
INTRODUCTION

The rapid development of science and technology in western countries encourages the development of science that is taught in Indonesian and other developing countries schools that refer to material that promotes western knowledge, or which is often called Western Modern Science (WMS). This western knowledge contains a set of facts, concepts, principles and scientific knowledge that are abstract and tiered from simple to complex, so that most students find it difficult to learn and understand them. To be able to understand WMS students spend time with books and increase hours of study outside of school, so they do not have enough time to realize that the western science concepts taught in school have actually been applied in the community in the form of public knowledge.

Community knowledge is built in the form of symbolic, customary and socio-cultural messages. This knowledge is a hereditary inheritance from ancestors which contained a holistic understanding of traditional societies in daily practice in accordance with their interactions with nature for centuries. Knowledge of the community often contains concepts, principles, or scientific knowledge that have not been formalized (Duit, 2007). Unfortunately, public knowledge is gradually forgotten as a result of a lack of understanding of the importance of preserving traditional knowledge (Halim et al., 2013).

Learning by linking what is in the environment has a positive impact on students. The positive impact can be in the form of cognitive and affective development (Yavuz Topaloglu & Balkan Kiyici, 2015). In learning science, learning from the environment needs to be applied to build harmony between knowledge itself with a scientific attitude, which will later develop the values of local wisdom in the community. This is supported by the contents of the 2013 curriculum which is being implemented in Indonesia which states that learning can take advantage of culture (Kemendikbud, 2013).

This was confirmed by Irez & cakir (2006) stating that educators can provide opportunities for students to develop their own understanding so that it allows them to critically analyze the relationship between science, technology and society as scientific literacy. By learning through local culture, students not only learn about science that comes from the universal west (Chaudhuri, 2015), but also learn about their own original knowledge that is contextual in nature, and has characteristics as their cultural heritage as easterners (Irzik, 2001).

Learning science by developing local culture will foster a strong attitude of nationalism (Michell, et al., 2008), can improve student achievement (Jegede & Okebukola, 1989), strengthen students’ perspectives on the universe, and produce inculturation (Aikenhead & Elliott, 2010) which make students think ability will increase. In other words, the success of the science learning process in schools is strongly influenced by the cultural background that students have, or the community in which the school is placed (Sudarmin et al., 2009). Some examples of Javanese knowledge can be used as an alternative to contextual learning in learning chemical science, as shown in Table 1.

| Table 1. Research Areas (Etnosains) and Scientific Science in Chemical Science Learning |
|---------------------------------------------|-------------------------------------------------------------------------------------------------|
| NO  | Community Knowledge                          | Content and Context on Chemical Science Learning                                             |
| 1   | Production of traditional herbal medicine    | Chemical solution: Separation and purification of substances / solutions, evaporation, filtration, catalysis reactions, and substance activity |
| 2   | Traditional salt production in the pantura region of Java (Pati and Rembang) | Chemical solutions and mixtures: Evaporation, filtration and recrystallization             |
| 3   | Grow tobacco in Temanggung                  | Environmental pollution, chemical solutions, and chemical bonds                              |
Rembang is a district in Central Java Province, Indonesia which has a strong local wisdom, both in terms of language arts, religion, traditional ceremonies, natural potential and special foods that can provide economic contributions to the community in succession. One of the local wisdom of Rembang Regency is dumbeg. Dumbeg is a typical food of the developing district which contains cultural values in each of its existence. Dumbeg is always available in earth charity and wedding ceremonies. Dumbeg is believed to be a symbol of fertility. According to Edi Winarno, a cultural observer from Rembang on tribunwisata.com (11/05/2018) dumbeg is a male symbol called linga. In the Old Javanese tradition, the dumbeg pair was jadah or sticky rice which became a symbol of women. So that, dumbeg and jadah symbolize fertility, as a pillar of human civilization.

Dumbeg is made from rice flour, tapioca and Javanese sugar which has a legitimate taste. Dumbeg is often found in Lasem, one of which is in the village of Polanda, Pancur District. In the past, there were a lot of dumbeg producers in this village, but along with the progress of the dumbeg producer era, only 6-7 families were still running dumbeg production. This happened because the next generation could not master the business which had been downgraded by their ancestors, starting from the stage of making the esophagus to the processing stage.

Referring to the background, the researcher wanted to preserve the culture of dumbeg making by bringing it into the classroom through science learning, so the purpose of this study was to identify the knowledge of the community that had not been formalized in making dumbeg and santifikasi community knowledge so that it could be used as a contextual learning resource.

METHOD

This research is a qualitative research about a system of knowledge organized from the culture that exists in society (Battiste, 2005). The community culture organized in this study is the culture of dumbeg making in Rembang Regency. In this study the respondents used by the researchers were 2 people (W1, and W2) residents of the Village of Polandak, Pancur District. In the past, there were a lot of dumbeg producers in this village, but along with the progress of the dumbeg producer era, only 6-7 families were still running dumbeg production. This happened because the next generation could not master the business which had been downgraded by their ancestors, starting from the stage of making the esophagus to the processing stage.

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The data collection technique in this study adopted from the research conducted by Sumarmi (2017). During the data collection the researchers directly observed the activity of dumbeg production. Primary data collection using observation, in-depth interviews, and discussions in the field. While secondary data was collected through literature studies related to dumbeg production culture. In this study, researchers became the main actors in collecting data, in carrying out verification, reconstruction, formulation, and conceptualization of dumbeg production processes to become scientific knowledge.

RESULTS AND DISCUSSION

From observations and in-depth interviews with 2 respondents (W1 and W2) traditional dumbeg makers in Polandak Village RT 03 RW 01, Pancur Subdistrict, Rembang district, Central Java, Indonesia obtained information that respondents' knowledge of making dumbeg was obtained from knowledge that was taught for generations by their ancestors.

Activities carried out during the observation of the dumbeg making process can be seen in Figure 2 to 5 below:

Figure 2. Dumbeg and one of the respondents is Tutik's mother

Figure 3. The process of making dumbeg esophagus

Figure 4. The process of stirring and filtering dumbeg dough
Figure 5. The process of filling dumbek dough into the vacuum and steaming process.

The results of indigenous people's exploration of science about dumbeg production are then reconstructed into scientific knowledge as shown in Table 2.

Table 2. Original Community Science Reconstruction to Scientific Science in the Dumbeg Production Process

<table>
<thead>
<tr>
<th>NO</th>
<th>QUESTION</th>
<th>SCIENCE ORIGINAL COMMUNITY (SCIENCE)</th>
<th>SCIENTIFIC SCIENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>What does dumbeg mean?</td>
<td>Pakanan khas rembang, sing biasane dingo sarat nalika sedekah bumi.</td>
<td>Alms earth or clean village is a cultural ritual inherited from ancestors since hundreds of years ago. During the Hindu ritual it is called the earth offering. During Islam, during the Walisongo rituals of the earth offerings were not removed, but were used as a means to broadcast Islamic teachings about faith and piety. To broadcast the teachings the guardians boarded the rituals of the earth offerings by replacing Hindu prayers with Arabic readings listed in the Qur’an. Then as a form of gratitude in the ritual food is distributed to the poor, regardless of religion, ethnicity, race, or class. And as a symbol of fertility, dumbeg is provided.</td>
</tr>
<tr>
<td></td>
<td>Dumbeg kuwi nyamikan kas Rembang, Biasane paling akeh ono Lasem lan sakupenge. Dumbeg digawe soko gelepong beras, tepung kanji, lan gula jawa (biasane ditambahi irisan kelopo cikalan utawa irisan nangka). Panganan iki biasane kanggo nyamikan nalika ana sedekah bumi.</td>
<td>In English: Dumbeg is the most typical food of the city of Rembang in the Lasem area and its surroundings. Dumbeg is made from rice flour, starch and Java sugar (usually added with sliced coconut or sliced jackfruit). This food is usually used as a snack in the earth charity event)</td>
<td>In English: The typical Rembang food used as a condition when giving alms to the earth</td>
</tr>
</tbody>
</table>

Cikalan = Coconut
Classification of Coconut plants:
Kerajaan: Plantae
Devisi: Magnoliophyta
Ordo: Arecales
Famili: Arecaceae
Genus: Cocos
2 What are the tools and ingredients for making dumbeg?

**Alat:**
- Pisau
- Saringan
- Dandang kukus
- Ember gede 2
- Ciduk
- Torong

**Bahan:**
- Tepung beras 1 kg
- Tepung kanji ¾ kg
- 1 kg gulo jowo
- 1 kg gulo pasir
- Banyu 5 liter

**Godong Lontar**

**In English**

**Tools:**
1. Knife
2. Filter
3. Steamed cage
4. Large bucket 2
5. Dipper
6. Funnel

**Material:**
- 1. 1 kg of rice flour
- 2. Starch ¾ kg
- 3.1 kg of Javanese sugar
- 4. 1 kg of sugar
- 5. 5 liters of water
- 6. Lontar leaves

**Spesies:** C. Nucifera

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Palm leaves

Palm leaves are leaves of the siwalan tree (*Borassus flabellifer*).

Classification of siwalan plants as follows:

- Kerajaan: *Plantae*
- Devisio: *Angiospermae*
- Ordo: *Arecales*
- Familia: *Arecaceae*
- Genus: *Borassus*
- Spesies: *Borassus flabellifer*

(Darsatop.lecture.ub.ac.id)

3 How to make dumbeg?

Gawe klongkongan dumbeg sing bentuke koyok terompet, carane godong lontar dibagi dadi loro (sodone diilangi) banjur diplinter mubeng koyok terompet.

**Godong aha**

Gawe adahe dumbeg sing bentuke koyok terompet, carane godong lontar diplinter mubeng koyok terompet.

**Ajer = Solution**

The solution consists of solutes and solvents. The solution here consists of sugar (solute) and water (solvent). There are 2 mixtures, namely homogeneous mixtures and heterogeneous mixtures. Homogeneous mixture is a
In English
For a dumbeg skin that is shaped like a trumpet, the way the palm leaves are divided into two (the bones of the leaves are removed) and then twisted to rotate like a trumpet

Gawe ulenan dumbeg. Sing pertama gulo jowo gulo pasir digodog sampek mateng lan ajer, ojolali tambahano uyah sitik ben gureh. Banjur didemno nganti manget-manget.

In English
Make a dumbeg mixture. Javanese sugar, sugar is boiled until cooked and becomes a solution, then don't forget to add salt a little so it is tasty. Then left to not so hot)

Ngenteni manget-manget campurno gelepung beras sing bubar ditumbuk mau kiro-kiro 1 kg lan tepung kanji ¾ kg ono ember gede sing wis dicepakno.

In English
Waiting for the sugar solution not so hot, the 1 mixture of two or more substances where all substances have a uniform arrangement so that, it is difficult to separate. While heterogeneous mixtures are a mixture of two or more substances where all substances do not have a uniform arrangement, so they can still be separated between constituent particles. In this case, Java sugar and water are samples of a homogeneous mixture.

Heating and Stirring Function in Coconut Milk
Coconut milk is an oil emulsion system in water, and the second system of the liquid does not dissolve each other. Basically the coconut emulsion is unstable because if left for a while the separation between the dispersed phase and the dispersing medium. Especially when subjected to heating above 80°C, the coconut milk will coagulated/lumpy (Sembiring, 1990). So that in heating coconut milk is expected to use medium heat and always stirring.

Salt Addition To Be Tasty
The process of adding salt (natural food ingredients) to enhance the taste of the cuisine. Manget-manget = Not too hot

The cooling function of sugar before it is put into a mixture of rice flour and starch
Starch starch has functional properties that can be gelatinized. Glatinization is the process of swelling starch glutinous when heated in aqueous media. Starch granules do not dissolve in cold
kg of rice flour that had been ground before was mixed with 3/4 kg starch on one large bucket

Naliko gulane wis manget-manget sokno alon-alon ono ember sing isine campuan gelepong karo kanji mau. Ulenano nganti kalis lan pisan pindo di geblok-geblok supoyo kenyal

**In English**
Waiting for the sugar solution to not be so hot, prepare rice flour in a large bucket

Naliko gulane wis manget-manget sokno alon-alon ono ember sing isine gelepong beras. Ulenano nganti kalis lan pisan pindo di geblok-geblok supoyo kenyal lan menowo uwis roto lebokno banyu njet mau sitik-stik lan ratakno.

**In English**
When the mixture has become smooth, the water media, but starch glanules can expand in hot water. (Nur, 2013)

**Geblok-geblok = beating on the dough.**

That is for the process of homogenizing particles (avoiding the presence of clumps of starch and rice flour in the dough)

**Saringo = Filtration Process**
The process of separating the mixture from impurities from java sugar or rice flour and starch

**The steam opening process every 10 minutes**
The point here is to reduce the pressure in the steam due to the increase in temperature from the heating process. The strong pressure in the steamer can make the dumbeg mixture in the steamer expand, if it is filled too full and does not do pressure pressure by opening the steam lid then the mixture will overflow or spill.

**Cooling poses by opening the lid of dumbeg steaming and using cloth in the process of draining it.**
The process of opening the dumbeg steamer lid is intended so that the heat in the system (steam) can be reduced or released into the environment so that dumbeg can be drained.

The process of wetting hands with water before draining dumbeg means, so that the hands do not overheat when holding the dumbeg to drain. The next process in draining the dumbeg using a cloth is intended, so that the hands do not feel hot and to remove moisture from the dumbeg wall as a result of the
When the mixture is smooth then filtered so that the mixture is smooth in texture, there is no dirt and no dough is still clumping. After filtering, the dough is put into the dumbeg skin using a funnel so that it does not spill, but when it is smooth it can be directly loaded into the dumbeg skin without using a funnel. After ready steam dumbeg up to 45 minutes. Every 10 minutes the steamer lid is opened so that the expanding mixture does not spill or come out of the dumbeg skin. After the mature dumbeg leave it for a moment. Then the dumbeg is drained in a way, before draining dumbeg, the hands are dipped in water, meaning that the hands exposed to water can reduce the heat from the dumbeg. Then so water vapor produced in the heating process.

The process of mixing ingredients gradually can be translated into the process of introducing simple elements, compounds, and mixtures.
that the dumbeg is not wet cleaned using a dry cloth

In English
You can also use coconut leaves, but palm leaves are easier to find, stronger leaves, although steamed lontar leaves are not soft the texture is like coconut leaves. it also tastes better using palm leaves

4 Why use palm leaves? Can you use coconut leaves?

Nganggo godong janur yo iso, nanging godong lontar luweh Gampang golekane, Luwih kengkeng godonge, menowo di kukus godonge ora liyut-liyut koyok godong janur menowo di kukus. Rasane yo enak menowo go godong lontar.

In English
You can also use coconut leaves, but palm leaves are easier to find, stronger leaves, although steamed lontar leaves are not soft the texture is like coconut leaves. it also tastes better using palm leaves

In terms of morphology the leaf shape is the same but the texture is different, the leaf is more flexible than the palm leaf. This is because the content of silica in lontar leaves is greater than that of coconut leaves, so that in the process of steaming lontar leaves are stronger and not easily flexible or weak.

6 How long can dumbeg last?

Dumbeg betah nganti 2 dino, amargo ora nganggo santen

In English
Dumbeg lasts up to 2 days because it doesn't use coconut milk

In English
Dumbeg lasted only a day because there was coconut milk

The oil in water emulsion system in coconut milk is not too stable because it easily changes due to the influence of PH, heat, and enzyme activity. (Ansori, 2009)

From Table 2, it can be seen that in the dumbeg production process there is public knowledge that can be reconstructed into scientific knowledge. This scientific knowledge can be translated into the content and context of learning science in schools, both in the content and context of learning in elementary school (SD), junior high school (SMP) and high school (SMA). Content and context of dumbeg production in elementary, junior high and high school science learning which can be seen in Table 3, Table 4, and Table 5.

Table 3. Relationship between Dumbeg Making and SD Competency Standards

<table>
<thead>
<tr>
<th>No</th>
<th>Science Learning Competency Standards</th>
<th>Content and science context</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.6 Applying the concept of heat transfer in everyday life. (Heat and displacement)</td>
<td>1. Demonstrate activities to distinguish temperature and heat through the process of making dumbeg.</td>
</tr>
</tbody>
</table>
2. Conduct experiments on heat transfer by convection, conduction and radiation through the dumbeg steaming process.
3. Discuss the importance of heat transfer and its relation to occupational safety and security in daily life through the process of dumbeg draining.

1. Discuss the resolution of daily problems using heat through the dumbeg process.
2. Conduct an experiment on the effect of heat on changes in temperature and shape of objects through the dumbeg steaming process.

3. Understanding the effects of heat on changes in temperature and the appearance of objects in everyday life.

3.7 Understanding the classification of material in everyday life based on its components of compilation (Single and mixed substances)

Conducting observations and grouping materials into mixtures or single substances in the surrounding environment through the process of making dumbeg dough to obtain information on the properties of a single substance and mixed properties

In Table 3, information is obtained that the knowledge of the 2 respondents (W1 and W2) in the dumbeg making process from the preparation, batter and imitation stages can be related to the content and context of science learning in Indonesia at the elementary school level. The content and context of science learning can be related to the material or competency standards of learning science points 3.6, 3.7, and 3.9

Table 4. Relationship between Dumbeg Making and Middle School Competency Standards

<table>
<thead>
<tr>
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<th>Content and science context</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.2 Classifying living things and objects based on observed characteristics.</td>
<td>Classification of living things&lt;br&gt;Classification of living things (plants) based on the similarity of identifiable characteristics, which includes kingdom, species, species, genus, class, family through observation of materials to make dumbeg clumps.</td>
</tr>
<tr>
<td></td>
<td>4.2 Presenting the results of classifying living things and objects in the surrounding environment based on observed characteristics</td>
<td>Substances and Characteristics&lt;br&gt;Solids, liquids and gases; elements, compounds and mixtures. Observe the dumbeg making process to investigate the characteristics of substances (solid, liquid and gas) and collect information on elements, compounds and mixtures.</td>
</tr>
<tr>
<td>2</td>
<td>3.3 Describe the concepts of mixtures and single substances (elements, and compounds), physical and chemical properties, physical and chemical changes in everyday life.</td>
<td>Substances and Characteristics&lt;br&gt;Perform a process of separating the mixture (filtration) in the process of making dumbeg</td>
</tr>
<tr>
<td>3</td>
<td>4.3 Presents the results of investigations or works about the nature of solutions, changes in physics and chemical changes or mixture separation</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3.4 Analyzing the concept of temperature, expansion, heat heat transfer, and its role in daily life including mechanisms to maintain the stability of human and animal body temperature</td>
<td>1. Investigate the effect of heat on changes in the temperature of objects and heat transfer by convection, conduction and radiation through observation of the dumbeg making process. 2. Gathering information on various efforts to maintain the stability of body temperature of living things in daily life through observing the dumbeg process.</td>
</tr>
<tr>
<td>5</td>
<td>3.6 Describe various additives in food and beverages, addictive substances and their effects on health.</td>
<td>Identify additives in the production of dumbeg making and their impact on food tastes and their impact on health</td>
</tr>
</tbody>
</table>
In Table 4, information is obtained that the knowledge of the 2 respondents (W1 and W2) in the dumbeg making process from the preparation, batter and imitation stages can be related to the content and context of science learning in Indonesia at the junior high school level. The content and context of science learning can be related to the material or competency standards for learning science points 3.2 and 4.2, 3.3, 4.3, 3.4, and 3.6.

Table 5. Relationship between Dumbeg Making and High School Competency Standards

<table>
<thead>
<tr>
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<th>Content and science context</th>
</tr>
</thead>
</table>
| 1  | 3.9 Identify reduction and oxidation reactions using the concept of elemental oxidation numbers. (Oxidation and reduction reactions as well as compound nomenclature). | 1. Discuss the application of the rules for the name of simple organic and inorganic compounds according to IUPAC rules.  
2. Find the names of several compounds in the material used in the dumbeg making process according to IUPAC rules. |
| 2  | 3.14 Group various types of colloidal systems, and explain the usefulness of colloids in life based on their properties | Colloid System  
Identify what is meant by solution, suspension and colloid through observation of dumbeg making.  
Identifying the type of colloid based on the dispersed phase and its dispersing medium through observation of dumbeg making  
Linking the nature of colloids (coagulation) in the process of making dumbeg  
Discuss materials / substances in the form of colloids in the food industry. |

In Table 5, information is obtained that the knowledge of the 2 respondents (W1 and W2) in the dumbeg making process from the preparation, batter and imitation stages can be related to the content and context of science learning in Indonesia at the high school level. The content and context of science learning can be related to the material or competency standards of learning points 3.9 and 3.14.

Based on the results of dumbeg production certifications written in Tables 3, 4, and 5, it shows that in the dumbeg production process as one of the local cultures in the city of Rembang, it has the potential to be integrated into local culture-based science learning. This local culture if applied in learning is considered as the right source of learning in science learning to build students' creative thinking by using the natural and socio-cultural environment in addition to learning books, audio visuals, and the internet (Sussastra, IW, 2010).

CONCLUSION

Based on the results of the study it can be concluded that the sanctification of community knowledge of the dumbeg production process in Desan Polanak, Pancur Subdistrict, Rembang Regency is an ancestral heritage that can be used as a contextual science learning resource, both by elementary, junior high and high school students. With this research, it is expected that educators can utilize the potential of local culture in society to be connected with existing concepts, processes and contexts (western science) so that meaningful learning will be created.

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