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The Reconstruction of Society Indigenous Science into Scientific Knowledge in the Production Process of Palm Sugar

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ABSTRACT

This research was aimed to reconstruct society indigenous science into scientific knowledge in the production process of palm sugar that was conducted on the people of Lendoh Hamlet, Leban Village, Boja Subdistrict, Kendal Regency, Central Java, Indonesia. The outform of this research were numbers of scientific knowledge from the result of society indigenous science reconstruction that was based on Javanese Culture about the production of palm sugar. The expected benefit of this research was to be the contextual educational resource for teacher of science on the school. The method of this research was qualitative descriptive through visceral interview, direct observation and document study about traditional production of palm sugar, and also scientific literature about nira and palm sugar. The research focus was the tradition of palm sugar production especially on knowledge of traditional sugar craftsman related to the raw materials palm nira and palm sugar production process. The obtained data were analyzed, verified, and constructed into scientific knowledge and were interpreted to get meaningful information. The conclusion was that there were five ten indigenous science from the palm sugar production which could be reconstructed into scientific knowledge.

Keywords: Palm sugar, palm nira, contextual learning, society knowledge, scientific knowledge.

INTRODUCTION

The rapid development of knowledge and technology have pushed the development of science education that produce specific formal science or what usually called as Western Modern Science (WMS) which is taught in school. While in traditional society environment, original science (indigenous science) is built in the form of symbolic message, custom and social culture. Indigenous science or traditional knowledge is a heritage knowledge from ancestors. This kind of traditional knowledge is a holistic or comprehensive understanding towards traditional society in daily practice according to their nature interaction live experience during centuries. According to (Duit, 2007), if it is inspected and studied accurately, that original science often contains of various concept, principle or scientific knowledge that have not been formalized. However, most of these traditional knowledge

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have been forgotten and gone because the lack of understanding of conservation and preservation importance of that various traditional knowledge (Halim, Jawan, Ismail, Othman, & Masnin, 2013).

Result of semi-structured interviews collected by (Yavuz Topaloğlu & Balkan Kıyıcı, 2015), from 36 science and technology teachers in the Gölcük district of Kocaeli province in 2011-2012 academic year revealed that the teachers stated that out-of-school learning environments have a positive effect on students' cognitive and affective development. Science learning need to be attempted so that there are balance or harmony between science knowledge itself by investing scientific attitude, also existed and developed local wise values in the society. Science teachers ought to provide students with opportunities to develop their own understanding of nature of science in order to enable them to critically analyze the intertwined relationship between science, technology and society, which is the basic requirement for scientific literacy (İrez & Çakır, 2006). The students not only learn about western (modern) science that has objective, universal, and value-free process characteristic as culture that come from West (Chaudhuri, 2015), but also learn about their own indigenous science that has contextual, ethics and wisdom characteristic which is their cultural heritage from Eastern people (Irzik, 2001) . And if science learning in school does not pay attention to students' culture, the consequence is that students will deny or accept only most of the science concepts developed in the learning. So, the students' social-culture environment seriously need to be paid attention to in developing science knowledge in the school because inside it there is an original science that is useful in their lives.

Science knowledge curriculum is develop from local culture and grows strong nationalism attitude (Michell, Vizina, Augustus, & Sawyer, 2008). In addition (Jegede & Okebukola, 1989) say that the combination of indigenous science with science knowledge in the school actually can increase students' achievement. Local culture exploration is important to understand local knowledge that is integrated in the school, so cross culture approaching is used if science knowledge in the school can be balanced between western science (modern science) and traditional science (indigenous science) ((McKinley & Stewart, 2012) (Mercer, Kelman, Suchet-Pearson, & Lloyd, 2009) . Similar opinion is also stated by (Aikenhead & Elliott, 2010), they state that if modern science harmonically taught in the school along with students' daily life, science learning leanly will strengthen students' perspective about universe and the result is enculturation. If enculturation occurred, students' scientifically way of thinking about daily live will increase. In other word, the success of science learning process in the school highly influenced by the cultural background that students have or the society where the school is placed (Sudarmin, 2014).

Indigenous science as ethno science, that is explained as educational knowledge system which is developed from the local cultural perspective related to the objects classification and activities of natural phenomenon (Rist & Dahdouh-Guebas, 2006). Indigenous Science only explains science and culture that come from cultural traditional supreme values, used to organize the social order of society in order to reach the community advancement both peace creating and people prosperity increasing (Suastra I. , 2005) (Aikenhead & Elliott, 2010) (Cajete, 2000). That culture is still an indigenous ancestors' heritage and has not been influenced by other culture and can be in form of local knowledge, local skill, local aptness, local resources, local social process, local norms and ethics and local customs.

Indigenous science often called as folk knowledge, traditional knowledge, western science or traditional ecological knowledge ((Battiste, 2005) (Duit, 2007). Indigenous science is still in the form of concrete experience knowledge, while scientific knowledge has already in the form of concept, principle, theory or reproducible laws (experimentally tested in laboratory) based on scientific work, has been avowed by scientific community, objective,

universal, value-free process and can be responsible (Suastra I. , 2005). The range of indigenous science knowledge includes chemistry, biology, physics, agriculture, ecology, and medical (Battiste, 2005). For medical and medicines, society indigenous science knowledge can be seen in the use of traditional medicine and simplicia production from plants to cure specific disease, Joglo House Philosophy and tobacco planting culture (Sudarmin; Sumarni, W.; Hartono, 2009), traditional therapy system (Winkelman, 2009) (Hollenburg, Zakus, Cook, & Xu, 2008) (Robbins, 2011) for agriculture can be seen on the Sundanesse people's understanding about photosynthesis cycle and plant respiration (Djulia, 2005).

The knowledge of palm nira production into palm sugar is one of the culture that is owned by people of Lendoh, Kendal Subdistrict, Central Java. That production of palm sugar indigenous science contains of values that is full of wisdom and professed by local people all this time have been forgotten in many learning, including science learning. This statement is appropriate to (Suastra I. , 2005) which say that the values full of local genius and profess by original society has been ignored in the learning especially in science learning in the school. In conclusion, science learning become "arid" and lack of meaning for students.

The encountered obstacles, until now there have not been much efforts to discover the production of palm sugar original science potential both content or context of its pedagogic. Indigenous Science usually is only stated orally, according to experience and symbolic, the consequence is the limitation of knowledge delivery through modern model. If this kind of living knowledge in society has not been formalized and reconstructed and become scientific knowledge, it can be used in the learning process as alternative learning resource (Sudarmin; Asyhar, R., 2012). According to thinking framework and background above, the problem inspected is how palm sugar production process doing by people of Lendoh until now has the relation to scientific knowledge concepts?

The purposes of this study are to identify and describe the original science of palm sugar production process which is believed the existence and practiced by people of Lendoh, and to identify scientific knowledge concepts related to palm sugar production process. If the indigenous science of palm sugar production process which live in people of Lendoh and has not been formalized, reconstructed and become scientific knowledge, it can be used in the learning process as contextually alternative learning resource.

It is hoped in the future that by including the local culture aspects into the science learning process, so science learning will drive students to attentively develop their local potential and can get profit for their own life and for their surrounding people's prosperity. The learning process can be started from the learning material that is adapted to local culture, learning method that demands students to be able to combine local culture with learning concept they learn, and various learning media which indirectly can combine local cultural science with the material given in the school.

METHODS

This research was conducted in Lendoh Hamlet, Leban Village, Boja Subdistrict, Kendal Regency by including three traditional palm sugar maker (M_1, M_2, M_3). This location was chosen because this village is occupied only by among 150 families which are categorized as poor family, most livelihood at this village rely on the crop of fields, gardens and forests. One of the occupation that become an old tradition is palm sugar maker. This kind of occupation going so well because there are lots of palm growing wildly both in the gardens or forests. People of Lendoh are used to make palm sugar beside the main occupation as farmers or breeders.

This research used the qualitative research approach through ethno science, a study about knowledge system which organized from culture that is exist in society (Battiste,

2005). In this reconstruction, it focused on the culture of Lendoh's people which were already been organized in their knowledge system and were believed by local society in the long specific time where that knowledge was built according to the geography condition of that place. During the time of collecting the data, researcher directly influenced in many life activities of the palm sugar maker which were observed. Primer data collection technic was through observation, visceral interview, discussion, and direct observation on the field. While, secondary data were achieved by cultural documents study about palm sugar production. In this research, researcher become the main instrument in order to collect data of society original science as many as possible, doing verification, reconstruction, formulation, and conceptualization to become a scientific knowledge. To ensure the criteria of confidence in the data obtained, the researchers made several efforts, among others, (1) conduct research in the field with intensive observations, (2) triangulate the data and methods, (3) provide adequacy of reference, and (4) conduct a study case negative. To increase levels of dependence and the certainty of the results of research conducted by the efforts of a review of all traces of activity of Research and informant review (Suastra I. W., 2010). Data analysis process was conducted continuously and intensively investigated, categorized and then constructed into scientific knowledge. Interpretation of the data is done through discussions with experts who are competent in local culture. After analyzing the data, the study continued to reconstruct the original findings in the form of science in order to develop local culture-based science education in schools.

RESULT AND DISCUSSION

From the observation result and visceral interview towards palm sugar maker, it was obtained an information that the people's knowledge in daily life is a knowledge that came from their own experience and had not been influenced western knowledge or science. Responders' knowledge about the way and system of traditional palm sugar production is a hereditary knowledge from their ancestors.

Figure 1. One of the responder is Mr. Kemadi and his family.

Figure 2. Palm Trees which grow much in Leban Village

Figure 3. Nira Heating Process,

Figure 4. Molding Process

Figure 5. Produced molded-sugar

The result of society original science exploration about palm sugar production that has been reconstructed into scientific knowledge can be seen on Table. 1

Table 1. *Indigenous Science and Scientific knowledge about Palm Sugar Production*

No	Research Question Contains of Scientific Concepts	Indigenous Science	Scientific knowledge
1	What is palm tree?	M_1 , M_2 , M_3 : A tree that can produce KOLING and BADHEG	Aren (*arenga pinnata*) is categorized in family *Arecaceae* (pinang-pinangan), is a **Closed-Seed Plants** (*Angiospermae*). . The Aren Taxonomy as follows: Kingdom : *Plantae* Division : *Magnoliophyta* Class : *Liliopsida* Ordo : *Arecales* Family : *Arecaceae* Genus : *Arenga* Species : *arenga pinnata* (Heyne, 1987) Science concept: types, plants taxonomy
2	What is NIRA (palm juice)?	M_1 , M_2 : Liquid that comes from Palm flower stem, usually called as BADHEG which is the raw material of palm sugar production. M_3 : called as LEGEN	Nira (palm juice) is a transparent **solution/** liquid that is obtained by tapping the aren flower stem. Nira is sugar as the result of **photosynthesis reaction**. In fresh condition, nira has good aroma, sweet taste, relatively transparent to clearly yellow, and the **acidity level (pH)** is almost neutral. Nira liquid is usually tapped from the **masculine flower**, even though the **feminine flower** can also be tapped, but the amount and the quality tapped result of the masculine flower are more satisfying than the female one. Generally, Nira contains high level of sugar, approximately 7,5% until 15%. Main sugar that compose nira is **sucrose,** around 13-17%. Nira also contains of **glucose and fructose**, but in a very little amount. Nira (palm juice) has composition of 88,5% **water** degree, 10,2% sugar degree, 0,23% **Protein**, 0,02% **Fat**, and

			0,03% **ash** content. Source : *www.kebunaren.com/* Science concept : mixture, solution, physical properties, chemical properties, compounds, levels of substance, the male flowers, female flowers
3	What will be done to nira after it is tapped?	M_1 , M_2 , M_3 : It is immediately processed into sugar, because it will be sour if it is left for a long time. M_2, M_3 : if the amount is not sufficient, it can be preserved by way heated to boiling. Once heated, the badheg can hold up to 1 day at room temperature.	This nira liquid which is the raw material of palm sugar must be processed quickly because if it is not quickly processed into sugar, nira liquid will change into tuak beverage or *saguer* that has **ethanol** degree of 4%, it can be seen by the **colour** of nira that changes into turbid yellowish, sour **taste** and stingy **scent** (physic characteristic) Nira detriment process is started by sucrose **inversion process**, the **fermentation process** and it is ended by **oxidation process** that produce **Acetate acid (chemistry process)**. The reaction occurred as follows $C_{12}H_{22}O_{11(aq)} + H_2O_{(l)} \rightarrow C_6H_{12}O_{6(aq)} + C_6H_{12}O_{6(aq)}$ Sucrose glucose fructose In this reaction, it is occurred inversion if nira is less sour or there is **enzyme** β- fructofuranosidasion. $2C_6H_{12}O_{6(aq)} \rightarrow 4CO_{2(g)} + 4C_2H_5OH_{(l)}$ Glucose/fructose ethanol There is fermentation process in this reaction. $4C_2H_5OH_{(aq)} + 4O_{2(g)} \rightarrow 4CH_3COOH_{(aq)} + 4H_2O_{(l)}$ Ethanol acetate acid There is oxidation process in this reaction. Science concepts: acid, fermentation, oxidation, inversion, enzyme, leaven, sugar reduction, monosaccharide, disaccharide, alcohol, acetate acid
4	Why does the sweet nira can turn into sour?	M_1 , M_2 , M_3 : No idea	Fresh nira if it is left will through **fermentation** process because there is **yeast** cells *Saccharomyces tuac*. If that fermentation process is being left continuously, there will be vinegar acid that tastes very sour. **Vinegar acid fermentation or acetate acid** is basically an advanced fermentation product of **alcohol fermentation**. The reaction occurred is **aerob** reaction as follows: $CH_3CH_2OH_{(aq)} + O_{2(g)} \rightarrow CH_3CHO_{(aq)} + H_2O_{(l)}$ Ethanol acetaldehyde $CH_3CHO_{(aq)} + O_{2(g)} \rightarrow CH_3COOH_{(aq)}$ acetaldehyde acetat acid Science concept: aerob bacteria, fermentation, alcohol, vinegar.
5	Is there any chemicals that can be used as preservative to maintain nira quality?	M_1 , M_2 , M_3 : There is a preservative chemicals, but it has not been used yet. .	According to the rule that is attached in the attachment of Agriculture Ministry Regulation Number 133/Permentan/OT.140/12/2013 about a good Palm Cultivation Orientation (*Arengapinnata Merr*) that it should be put some **additive material** before tapping into the saving container, which are the mangosteen stalk peel or coconut husk fiber as much as 10g per saving container to maintain the nira quality (pH of nira is not quickly down), ideal pH is 5,6 – 6,8;. In many places, the farmers add "laru" to prevent fermentation/ as **natural preservative** which is lime, pith pieces of jackfruit wood, young mangosteen or its leaf. The function of this "laru" is not only for preventing nira to be sour, but also for helping sugar **agglomeration process** right after nira is boiled. Science concept: additive material, preservative, sugar

			agglomeration.
6.	What is the effect if broken nira is made into sugar?	M_1 , M_2 , M_3 : Palm sugar cannot be formed in the mold	If broken nira is produced, it will become a brown sugar that cannot be formed or taffy like, although nira can be formed into brown sugar but the result cannot harden on for too long and it will be low quality of brown sugar in the form of soft texture sugar. Sucrose inversion occurs because of high **temperature** and highly alkaline pH (Estiasih, 2009); (Dewi, et al., 2014) Science concept : alkaline, brown sugar
7	Why does nira can be damaged so it cannot be formed into sugar ?	M_1 , M_2 , M_3 : Because it is stated	Nira is broken because the microbe fertilization. Microbe which takes part in sucrose **hydrolysis** process into reducing sugar is the **leaven** group and **bacteria**. This kind of leaven that dominantly desecrate nira are *Saccharomyces cereviceae* and *Monillia* **yeast**. While the kind of bacteria that is dominant are *Enterobacter aerogenes*, *Leuconostoc mesenteroides* and *Lactobacillus plantarum* (they cause essence like line on nira), *Pseudomonas flourescens*, *Alcaligenes* and *Flavobacterium* (they cause turbid, hazy and greenish colour), *Micrococeus*, *Escherichia* and *Acetobacter sp.* (they cause acid). Science concept: leaven, bacteria.
8	How to make the cooking process to be efficient?	M_1 , M_2 , M_3 : Cooking process should use solid firewood/ hardly so it become ashes .	To get efficient cooking process, it must use **high** temperature and stable **heat**. Solid/ hardly firewood is choosen because it become ashes slowly in nira cooking so that there will be high heat and it does not take so much time in cooking. The traditional production of brown sugar has not been accompanied with cooking temperature control, so it can cause over **caramelization** that make the brown sugar has too much dark color. Uncontrolled cooking temperature can damage the sucrose. Science concept: caramelization, temperature, heat.
9	Why in the cooking process of palm sugar sometimes liquid/ forth overflow during boiling?	M_1 , M_2 , M_3 : No idea	When cooking nira, both frying pan and nira water will **expand**. The effect is the frying pan or nira water **volume** will be bigger. However, because the water volume increasing is bigger than the frying pan volume increasing, and liquid essence volume expanding related to **pressure** expanding because of temperature increasing, so the nira liquid still overflow in **boiling**. That process shows that expanding on **liquid essence** is bigger than **solid essence** expanding. Science concepts: essence expanding, essence form.
10	How to solve the overflowing foam/nira water when cooking?	M_1 : By adding coconut oil M_2 , M_3 : By adding coconut oil or scraped coconut, stirring, or by leaving long-handled spoon in the frying pan.	Nira solution is the same as water, when **boiled** the liquid will **overflow**. But the left sugar concentrate and **protein** cause the appearance of thick layer and make the ascended water steam cannot be emerged and stuck. Water steam finally gathered and try to emerge by giving stronger urges so the **foam** sprayed out from the frying pan (**irregular boiling**). Oil addition can be used to get rid of that **irregular boiling**. This is possible by adding oil, the molecule movement will be slower, the pulling energy between the **molecules** will be stronger and the gap between the molecules will be tighter. The consequence is the tinnier essence volume, in other word that essence is decreasing and the previous nira which through the irregular boiling will back to the regular ones. By letting a long-handled spoon in the frying pan, the spoon handle will provide a tunnel that make the steam out to the air

			so it prevent nira foam to spray out of the frying pan. Science concept: foam (koloid), boiling, expanding, steaming.
11	What chemical is added in the nira cooking process?	M_1 , M_2 , M_3 : Only a little amount of oil and scraped coconut when the foam is getting overflowed.	According to literature, there are two kinds of nira cooking which are with the lime addition and without lime addition. Lime addition is used to purify the nira (to omit **organic essence** and **inorganic essence** which is not sugar so it can be obtained maximum and clear degree of sucrose), to obstruct the microbe activity and growing, to arrange nira pH in the level of 6-7 pH. Science concept: organic essence, inorganic essence, oil.
12	Why are there solid and soft kind of brown sugar in the market?	M_1 , M_2 , M_3 : The quality of the sugar is decided by the quality of nira, whether is there any usage of mixture/filler or not.	Sugar quality is decided by sucrose degree that is contained in it. The higher sucrose, the better sugar quality. Non-sucrose components like **fat**, **protein**, sugar reduction, water and **organic material which cannot be fused in the water** that is contained in some kind of formed-sugar will influence the kind of formed-sugar produced, so the formed-sugar can be divided into three types: solid, medium and soft texture. This non-sucrose component will increase the softness of formed-sugar. Fat is estimated takes a crucial part in deciding the sugar softness, because fat molecules that cannot fuse in water form fat globules that were spread between sugar **crystals**. Science concept: essence form, biomolecule.
13	What should be done to prevent the sugar not to fail in the production process?	M_1 , M_2 , M_3 : By adding some sugar in the cooking process.	To fasten the **crystal** form in sugar solution production and to increase the ability that can be **granulated**, it is needed some smooth sugar as **germ/starter**. This crystal core addition usually implement on **Saturated Past Coefficient (SPC)** reaching 1,0 – 1,2. To reach the same level of saturation in all parts, it is needed to stir when the **crystallization** occurred that can be seen from the appearance of white color in the surface of the cook. Or by taking that dense mass example then put it in the water, if it is hardened so that dense is already cooked, and the cooking can be finished. Science concept: crystallization, granulated, starter.
14	What is the characteristic of good palm sugar?	M_1 , M_2 , M_3 : Solid, smooth texture, dry, moldy-free, does not make any impurity when it is disolved.	A good original palm sugar, **organoleptically** can be known with not so soft nor hard characteristic, inner side is not very dry, has bright brown color (evenly spread), has quality according to SNI standardization, does not been mixed white sugar (whitish in the middle part), there is one that is soft and easily broken because it mixed with cassava, there is one with hard texture because it is mixed with coconut dregs. Science concept: organoleptic test, Indonesian National Standardization (INS)
15	Why does palm sugar has a browncolour?	M_1 , M_2 , M_3 : No idea M_1 : because of high heat	Palm sugar has brown reddish color because there is **browning reaction** during the production, both from **Maillard reaction** or **Caramelization**. Caramelization on sugar occur when sucrose solution is heated until the temperature is reached its melted point (> 160^{o}C) so there will be sucrose caramelization that produce brown color. There are three types of caramel, they are **karamelan ($C_{24}H_{36}O_{18}$),, karamelen ($C_{38}H_{50}O_{25}$), dan karamelin ($C_{125}H_{188}O_{80}$)** (De Man, 1998) and each of it has different weight molecule . Maillard reaction occur between amine groups (amino acid) and reducing sugar (**ketones** or its **aldehydes**) form glucosamine. The rate of browning increase fast because temperature increasing and pH is above 6,8. (Damasceno, Fernandes, Magalhães, & Brito, 2008)

			Science concept: browning reaction, Maillard reaction, caramelization, weight molecule, pH, amine, ketone, aldehyde
16	How does the steps to make sugar is durable in storage?	M_1 , M_2 , M_3 : It should keep it in the dry place.	Brown sugar has characteristic that attract water (**hygroscopic**) because contains of high sugar reduction (± 10%) so that cause brown sugar relatively cannot be durable. The damage of brown sugar can occur because the water steam absorption from its environment. Science concept: Hygroscopic, compound, absorption.

From Table 1, it can be seen that palm sugar indigenous science could be reconstructed into scientific knowledge. It was found there were 16 indigenous science that could be explained by scientific knowledge which were divided into 48 science concepts. If this indigenous science will be integrated for example on junior high school's science learning, this traditional palm sugar production culture will at least can be related to 4 Standard Competence that are relevant as it is written on Table 2.

Table 2. *The relation of Palm Sugar Production Culture with Junior High School Science Standard Competence*

No	Standard Competence	Science Concepts of Palm Sugar Production
1	Comprehending essence characteristic, and physical and chemical change on the compound that can be used in daily life (e.g mixture separation)	Name of compound and element Character's difference of element, compound and mixture Physical character and chemicals character Separation based on physical character
2	Comprehending concept of temperature, expanding of heat, heat movement, and its appliance on maintaining the stability of body temperature mechanism on human and animals and also in daily life.	Heat and temperature concept on expanding process of solid and liquid compound Heat and temperature concept on solvent evaporation process.
3	Comprehending the use of chemicals in daily life.	Additive materials in palm sugar production
4.	Knowing energy concept, various energy resources, food energy, energy transformation, respiration, food digestion system and photosynthesis.	Sugar synthesis on aren tree through photosynthesis reaction

If it will be integrated on senior high school's chemistry learning, this traditional palm sugar production culture will be related to some Standard Competence on Table 3.

Table 3. *The relation of Palm Sugar Production Culture with Junior High School Chemistry Core Competence*

No	Standard Competence	Science Concepts of Palm Sugar Production
1	3.10 Applying the rule of IUPAC for name giving of simple organic and inorganic compound.	The name of inorganic and organic compound
2	3.11 Applying the concept of relative mass atom and relative mass molecule, reaction equation, chemistry basic laws, and mole concept to solve chemistry calculation.	Essence level Reaction equation
3	3.1 Analyzing structure and character of hydrocarbon compound based on the	Isomer Hydrocarbon compound classification

	understanding of atom carbon characteristic and compound classification.	
4	3.10 Analyzing the character of solution based on alkali acid concept and/or pH solution.	Alkali acid concept pH solution
5	3.14 Analyzing the use of colloid in life according to its characters.	Dispersion phase and dispersant medium of colloid system The character of colloid solution
6	3.1 Analyzing the cause of solution colligative character phenomenon on steam tension, boiling point increasing, forzen point decreasing and osmosis tension.	Solution colligative character Boiling point increasing
8	3.9 Analyzing structre, names, character and macromolecule classification (polymer, carbohydrate, and protein)	Structure, names, character and macromolecule classification The use of protein, fat, carbohydrate

The analysis result of indigenous science that had been found on traditional palm sugar production in Lendoh village, it was found that Lendoh society indigenous science has still been preserved and it is believed the existence is appropriate if it will be integrated into science learning. This statement is an indicator that indigenous science still being preserve by people then it will be a learning source if it is discovered and have the relation to scientific knowledge. The research result of (Suastra I. W., 2010) state that an appropriate learning source in science learning for students' ability of creative thinking development is natural environment and social culture beside text book/ lesson book, audio visual and internet. .

Why does the people still preserve it? It is because they have seen and experienced the truth by themselves according to life experience (scientific experiment) for years from one generation to the next generation through trial and error process. This indigenous science knowledge was transformed through oral tradition from their parents for the next generation and concrete experience in their environment interacting. During the process of time, it is possible that the new culture come according to the development of technology and science, but the way of thinking (belief) that is a heritage from the previous generation is still preserved.

This invention like was stated by (Suastra I. W., 2010) can be the base of science curriculum reformation based on traditional knowledge (indigenous science) and beliefs that is disseminated in the society. It is expected from the reformation result that it can produce a good quality of syllabus and learning material and care about surrounding culture, which can help student in comprehending science without leaving their source culture in the end.

Natural and social environment are learning source that are exist around the students and can be used by teachers in arranging learning according to learning material given. From natural learning source and social culture, it will be easier for students to relate the material they are learning to their daily life. On the contrary, the better understanding of students about a science concept or principle in the school, the better students' way of thinking about daily life. And vice versa if the students 'understanding of a concept or principle of science at school is better, then the students' ability to think about their daily life will be better anyway. Therefore, the upcoming science learning should be pursued in order to obtain a balance between knowledge of science itself to the cultivation of scientific attitudes, and values of local wisdom and develop in society. Socio-cultural environment of students need to be given serious attention in developing science education in schools because it is integrated pent scientific knowledge that can be useful for life and for the wider community (Suardana, 2010).

CONCLUSIONS

Based on the result of research, it can be concluded that from process of the palm sugar production which is a heritage knowledge from ancestors, there are lots of society science knowledge that can be reconstructed into scientific knowledge which can be the science learning source for students. Thus, in the process of science learning, teachers are expected to pay attention to local culture spread in society and to relate between concepts, process and contexts so science understanding of student about natural phenomenon will be more meaningful and contextual. The process of making palm sugar in Lendoh village, Kendal regency, Central Java, which is the ancestral knowledge can be reconstructed into a science that can be used as a source of science learning for students. Recommended further research on the development of student activity sheet and science teaching materials based on local wisdom in an effort to make science learning resource for students.

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