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Local Wısdom-Based Scıence Learnıng Model through Reconstructıon of Indıgenous Scıence to Improve Student's Conservatıonıst Character

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ABSTRACT

The implementation of local wisdom-based science learning model through reconstruction of indigenous science is hoped to improve student's conservationist character. Through this model, student will be familiarized with science and local wisdom to improve their existing conservationist characters. Characters measured in this study were religiousness, tolerance, politeness, responsibility, and patriotism. Purpose of this study was to know the result of indigenous science reconstruction through implementation of local wisdom-based science learning model, and the effect on student's conservationist character. This is a descriptive research. Result of the study is reconstructed indigenous science of Samin tribe who has high respect toward conservation value, especially land conservation. The use of local wisdom-based science learning model through reconstruction of indigenous science is proved to improve student's conservationist character from low to good visibility.

Keywords: Local Wisdom, Science Learning, Indigenous Science, Conservation

INTRODUCTION

Natural science is a "knowledge which acquirement requires learning and proving" and "overarching knowledge and truth about law of nature which can be proved through scientific method". In this regard, science refers to a systematic ways to acquire knowledge by the means of observation and experimentation in order to understand nature's phenomena (Yulvianto, 2011).

According to the stated definition, science subject mastered should be able to internalize the value of the science and incorporate it into their everyday life. One indicator of this being happened in the love and preservation of biodiversity and environment as well as characterizing the science's value. However, preliminary observation showed a disheartening result as none of that has happened yet.

Science concept has not been implemented completely by the students, indicated by non-Characterized of the beneficial scientific attitude. Myriad of environmental problems ranging from floods, droughts, flash floods, forest fire air pollution, and water pollution are

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manifestation of those problems. These made catastrophes bring suffering to the people and hinder the country development (Suastra, 2010).

Universitas Negeri Semarang (Unnes) as a part of higher education sector plays an important role in the development of character building into the students. Character building education developed in the Unnes is based on environmental conservation (Handoyo & Tijan, 2010). There are 8 conservationist characters taught in Unnes i. e. religiousness, honesty, concern, tolerance, democracy, persistence, and politeness. The eight prime characters taught here is hoped to develop other superior characters such as fairness, responsibility, and patriotism.

In science learning, character development comes from good understanding about the subject material, and observation is a solid ground for science learning process. In practice, a learning model is required to ensure the implementation of observation. A meaningful and contextual observation should be done and arise from student's immediate environment, especially the ones with cultural and local wisdom content. Experiential learning is considered as an effective way of educational approach (Alkan, 2016).

Local wisdom is a human effort to use the moral and cognition to act and behave regarding issues or phenomena in certain scope. The etymological definition derived from the word wisdom which means the capability of using one mind and moral to act and behave regarding certain object and issue (Ridwan, 2007).

Local word here specifically refers to limited interaction space with particular value and system. Within this space exist patterns human interaction, among themselves and with the physical environment. A real life setting is an interaction space with patterns of relationship which ultimately invokes the birth of values. In times, the value becomes the reason and moral guidance to which the society adhere (Ridwan, 2007).

Sibarani (2013) stated that local wisdom is indigenous knowledge and value which has served as a traditional guiding code of conduct in the society. The local wisdom is the community's wisdom or local genius deriving from the lofty value of cultural tradition in order to manage the community's social order or social life. Also, local wisdom is the value of local culture that has been applied to wisely manage the community's social order and social life.

Sibarani (2013) concluded that local wisdom are indigenous knowledge and local genius which stems from the honorable culture and tradition that has been long served as a social guidance in order to advance the society. Local wisdom might come in the form of indigenous knowledge, indigenous crafts, local genius, local resource, local social-process, local norm, and local culture.

Local wisdoms became inseparable constituent in ethnoscience course. In science major curriculum, ethnoscience course discuss about the nature and scope of ethnoscience, importance of ethnoscience, development of ethnoscience content, ethnoscience learning concept, ethnoscience perspective as research focus in education, reconstruction of Javanese indigenous science, as well as conservation on the perspective of local wisdom.

In ethnoscience learning, local wisdom-based science learning model is conducted through reconstruction of indigenous science existed in society. Indigenous science is a part of social construct in society which has and still believed to be true. Indigenous sciences endure the test of time through generations, while the society witnessed and experienced the truth and adaptations (Suastra, 2005).

Reconstruction of indigenous science is a rearranging of concepts found in indigenous science transcribed into contemporary science. Suastra (2005) stated that indigenous science differs from contemporary science in which indigenous science exist in the form of concrete knowledge, while contemporary science has transcended in to theories, principles, concepts, and peer reviewed reproducible laws which has stand the test of scientific community.

Implementation of local wisdom based scientific learning model through reconstruction of indigenous science is hoped to improve student's conservationist character. The use of the model will familiarize the student with the science content emerged from local culture. The characters being measured are religiousness, tolerance, politeness, responsibility, and patriotism.

Purpose of this study is to describe the result from reconstruction of indigenous science by using local wisdom-based science learning model, as well as knowing the effect of the implementation of the said learning model on improving student's conservationist character.

METHODS

This is a descriptive study. Object of the study is the reconstruction process of indigenous science performed by student in the ethnoscience course, along with the improvement of conservationist character. This study takes place in Science Department, FMIPA Unnes, for four months.

This study design comprises of four phases, i.e. planning, execution, observation, and reflection. Data collection was as follows: 1). Indigenous science was reconstructed from the result of student's observation on local culture which then transformed from indigenous science into contemporary science. 2). Conservationist character data was gathered by using conservationist character questionnaire. The questionnaire has been validated before data collection. According to Hadi (2001) a non-test instrument should be validated to check its construction validity.

Data collected were then analyzed. Student's ability in reconstructing indigenous science was score with range 10-100. Conservationist character measured at the start and at the end of the program were analyzed and confronted with the categorization on Table 1.

Table 1. *Categorization of student's character measurement*

Percentage	Criterion
25-43	Not visible
44-62	Low visibility
63-81	Good visibility
82-100	Strong visibility

FINDINGS

In ethnoscience course students were asked to carry out observation on certain community. Information or materials often used in everyday life are easier to comprehend (Cimer, 2007; Schonborn and Bogeholz, 2009). Students then asked to reconstruct indigenous science material observed, to be transformed into contemporary science. There are several observation theme analyzed, i. e. Indigenous science of Samin Tribe from Pati, Central Java, salt making process in Rembang, and batik painting in Pekalongan. Student's performance in reconstructing the indigenous sciences were then scored, with mean result of 86. Minimum requirement was stated that 70% of the students should score 75 at science reconstruction.

One example of reconstruction result on indigenous science of Samin Tribe from Sukolilo Pati, Central Java. Reconstruction result is described on Table 2.

Table 2. *Indigenous Science Reconstruction Result of Samin Tribe*

No	Questions	Interview result	Reconstruction
1.	Why does people of Samin Tribe loved soil so much?	*I love the soil and land for it is like my mother. It provides me.*	Importance of soil as substrate/ Land conservation
2.	Why does most of Samin people works as farmer?	*Because farmers are their own boss. Who grows and reap their owns, not disturbing other's properties.*	Keeping the balance of the ecosystem
3.	What fertilizer does Samin Tribe people used most?	*We use our own compost which we made*	Soil conservation and environmental preservation
4.	Why do Samin people choose to use compost as fertilizer?	*Because it is more economic and yield as good result as industrial fertilizer*	Content and advantages of organic fertilizer
5.	Do you use stove or fireplace for cooking?	*We use stove with biogas fuel*	Renewable bio-energy
6.	We all know the Semen Vs Samin movie, in which we understand that Samin Tribe loved the environment. What does Samin Tribe think about the development of cement factory?	*We opposed the development of cement factory, because it will pollute the land.*	Discussion about limestone and its function
7.	What is the norms and taboo in Samin Tribe daily life?	*Envy, jealousy, defamation, stealing*	It is prohibited to do badly, taking other party's properties is a sign of conservationist character.

Table 3 below describes the improvement of conservationist character on certain aspects. Data was gathered at the beginning of the semester and at the end of the semester after they observed and reconstructed the indigenous science of several societies.

Table 3. *Improvement of student's character*

Characters	Before (%)		After (%)	
Religiousness	64	Good visibility	71	Good visibility
Tolerance	50	Low visibility	70	Good visibility
Politeness	54	Low visibility	64	Good visibility
Responsibility	59	Low visibility	68	Good visibility
Patriotism	61	Low visibility	84	Strong visibility
Mean	58	Low visibility	71	Good visibility

DISCUSSION and CONCLUSION

Reconstruction result based on Table 2 can be elaborated further. First, loving the soil implicitly means the tendency toward soil conservation. Arsyad (1989) stated that one purpose of land conservation is to minimize land erosion. Land conservation can also means the customization of land use to the land type so it can retain its everlasting use. Young (1989) defined land conservation broadly, consisting of erosion control and maintaining fertility. Land conservation is management strategies to prevent soil erosion from the land surface caused by physical, chemical and biological changes in the form of overuse, salinity, acidification, or other contaminants.

Common strategy usually comprises of: selection of land covering vegetation, erosion prevention, salinity regulation, acidity control, and enhancing soil organism diversity, soil remediation and mineralization. Other strategy specialized in agriculture are: farming without land cultivation, cultivation of contoured land, windbreak barrier formation, plants rotation, and use of natural fertilizer.

Strategies above suits the daily live of Samin People who are capable traditional farmer. In this regard their naturalistic view extends to their refusal of the cement factory development on their land. They feared activity of cement factory will pollute the neighboring Kendeng Mountains.

Second, farmers are their own bosses, reaping what they sowed, never take anyone else's properties. This implicitly means keeping the balance to the ecosystem. They have adopted pacifist stance and chose to be a farmer in order to live a quiet and simple life. However they take a pride on their way of life, stating that farmers need not to bow to anyone. They are their own bosses. They thought that other jobs and profession requires servicing other people, in which farming does not requires it. Samin people also observed Nandur culture in which people grow plants which explicitly a conservation effort.

Third, using self-made compost fertilizer. Explicitly correlates with land conservation and environmental care in accordance with strategies discussed on the previous point. Samin farmer chose natural compost fertilizer over chemical fertilizer. This fact is beneficial for the soil, while natural compost contains fair amount of nutrients compared to chemical fertilizer, it possess remedial properties for the soil. Compost improves physical properties of the soil such as its permeability, porosity, structures, and ion retaining capability. Compost consists of decaying organic material produce by decomposing leaves and organic waste. Decomposition could be accelerated by introduction of decomposer.

Fourth, economic and yield the same amount of produce as chemical fertilizer. This particular indigenous science highlights the understanding of Samin Tribe on the quality and economy of compost fertilizer. To the farmers, compost fertilizer comes with several advantages: a) Preserving the soil by avoiding chemical fertilizer and pesticide; b) Avoiding the entrance of the said chemical agents into human's food; c) Promoting green lifestyle in the food and nutritional product, making people aware of the value of organic food; d) Abstinence from fertilizer and pesticide reduced the production cost of the crops (Roidah, 2013).

Fifth, using stove with biogas fuel. It shows the implementation of renewable bio-energy principle. The use of cow waste processed to produce biogas is a win-win solution as the process removes waste and greenhouse gas and turns it into energy source. Another use of bovine waste is as a material to make compost fertilizer. This means less chemical fertilizer being introduced to the environment. Again this is beneficial to the ecosystem as well as to the human.

Biogas is a product of anaerobic bacteria metabolism. During the cooking process of compost fertilizer, the bacteria undergo fermentation reaction. Gas produced consists of CH_4 and CO_2. If the composition of CH_4 exceeds 50% then the gas is highly flammable.

Cow sewage biogas naturally consists of 60% CH_4. Ideal temperature for fermentation is around 30^oC (Junaedi, 2002).

Sixth, refuse cement factory due to fear of environmental damage. In this point we will have to discuss the properties of the karst and limestone which is the raw material of cement. Karst is a German terminology with Slavic root which means barren rocky land (Adji, 2006). This is common name for rocky lands with soluble carbonate constituent. Ford and Williams (1992) specifically defined karst as land patch with certain hydrology characteristics and formed and fashioned by the combination of soluble rocks with well developed secondary porosity. Karst mountains in Sukolilo are the source of water in hydrology cycle which provides water for Samin tribe's rice farm.

Seventh, Tabooed are envy, jealousy, defamation, and stealing. Samin tribe prohibited its members to do evil or bad mouth the tribesmen. This is a characteristic of a conservationist. Through reconstruction process proposed by Sudarmin (2014), it implied that people of Samin understand the importance of conservation in their daily life.

Based on discussion above, there are several scientific concepts that can be learned from local wisdom of the Samin Tribe from Pati. Samin tribe actually stereotyped as a tribe with negative image, refusing the modernization, and talks out their heart without much filtering (Sunadi, 2013). After the reconstruction process, it is revealed that Samin tribe is actually more advanced than the stereotypes given to them. One blazing example of this is the use of biogas as fuel. Whereas the rest of the nation has not even known yet about biogas, Samin tribesmen are already processing the sewage of their cattle as fuel. Other manifestation of this is the soil quality which is untainted by chemical fertilizer and pesticide.

Observation of indigenous science was carried out by groups of students, as learning society. The concept caters to belief that learning in group is better than invidual learning. Khusniati (2012) stated that implementation of learning society develops certain characters such as teamwork, tolerance, politeness, democracy, adherence to social norm, and responsibility. Fitriani et.al. (2016) stated that student's direct involvement in learning process makes a more meaningful learning experience which will yield better result in student. Meaningful learning is very important for student (Gunes, et al., 2015; Bezen, et al., 2016). The students will achieve meaningful learning by forming a link between the new information and the existing information (Hakim, et al., 2016).

According to Table 3, there are significant improvements on student's characters before and after taking the ethnoscience course. It is safe to assume that this improvement is due to the observation and science reconstruction activity the student underwent during the course. All religiousness characters shows significant improvement. We hypothesized that developing religiousness took longer time and are embedded stronger inside the students.

Tolerance, politeness and responsibility character improved one level from *low* to *good visibility*. This is the direct effect of science reconstruction activity underwent by the students which familiarized the student with local wisdom and environment. Sibarani (2013) stated that local wisdom are indigenous knowledge and local genius which stems from the honorable culture and tradition that has been long served as a social guidance in order to advance the society.

Local wisdom based learning model requires the student to observe the local wisdom on exotic groups of people. Some of the selected subjects are indigenous science of Samin Tribe from Pati, Central Java, salt making process in Rembang, and batik painting in Pekalongan. Observation process followed by reconstruction is proved to be effective in enhancing student's characters. Result from this activities shed light into student's understandings about local wisdoms starting from conservation effort, to social norm and code of conduct. Samin

tribe whom were stereotyped to be out of date and rude actually is advanced and teaches an honorable moral code.

This finding is in accordance with Suastra (2005) who found that knowledge, believes and experience of traditional community are potential assets as learning material and development of science curriculum. In traditional society, children explore and immersed in indigenous science way before they are introduced to contemporary science. Sibarani (2013) found that local wisdom can improve student's characters.

The use of this learning model is hoped to help ever last local wisdom as Indonesian heritage. This is in tone with Parmin et. al. (2016) whom found that modernization could erode the local wisdom among the rampage of foreign culture, unless certain learning models are developed and implemented to counter this trend, and to bring back Indonesian students to their root.

Conclusion

According to the discussion above, some conclusion arise: 1) result of indigenous science reconstruction were obtained, notable example is the local wisdom of samin tribe which held a nobel value of soil conservation. 2). By using local wisdom-based science learning model which involves reconstruction process, student's conservationist character is improved significantly from *low* to *good visibility*.

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