



## **Instilling The Conservation Character Through Reconstruction of Scientific Knowledge Based on Local Wisdom**

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### **ABSTRAK**

The purpose of this study is to reconstruct scientific knowledge based on local wisdoms of the Ngargomulyo village people in preserving the environment as a means to instill and enhance the conservation character for prospective science teachers. The research is a qualitative study of ethnosains, which means the study of an organized system of knowledge from the culture and local wisdoms of a community. The research subjects are the residents of Ngargomulyo village. The focus of the research is the value of environmental preservation which is manifested in the behavior patterns of the people of Ngargomulyo village. The data collection is done through interviews and in-depth observation. The data obtained is then verified, reconstructed, formulated, and conceptualized into the scientific knowledge. The results of the study indicate that efforts made by the people to preserve the surrounding environment are manifested in farming, raising livestock, forest activities, and sand and stone mining activities. In addition, the activities to protect the environment for natural conservation are also evident from the efforts to maintain spring water sources. The environmental preservation messages are also found on some boards installed in certain places.

**Key words:** conservation character, local wisdoms, Ngargomulyo village

## **INTRODUCTION**

Ngargomulyo is the top village on the western slope of Mount Merapi and located only 8 km away from the peak of the mountain. Ngargomulyo is included in the Disaster Prone Zone III (KRB III). According to Minister of Energy and Mineral Resources Regulation No. 15 of 2011, disaster-prone area III are the regions that have the potential to be directly affected by hot clouds, lava flows, lava avalanches, throwing incandescent rocks and/or toxic gases.

The people of the Ngargomulyo village have been living side by side with the Mount Merapi and its surrounding forests and nature. This makes the Ngargomulyo village community have unique local wisdoms such as moral and social ethics,

and local knowledge that has become behavior patterns in preserving the environment. Sudarmin, Mastur, & Parmin (2014) stated that the local knowledge of the community which becomes the culture and local wisdoms has not been widely studied and used as a learning resource in fostering the conservation character. Therefore, to maintain the the local wisdoms of the community, it is necessary to cultivate noble values for the students through the learning process.

Kartono, Hairida, & Bujang (2010) explained that the uniqueness and superiority of a region, including its local culture and technology, can be used as a basis for developing the science learning. Thus, the learning process that involves local cultural traditions can form the students to love their regions and nations

The important of local wisdom must also be considered as one of supporting efforts of a decreasingly natural environment (Kasa, 2011). The implication of the statement is the need to incorporate local culture into the lessons at schools. According to Sudarmin (2014), the wise educators should be able to incorporate local cultural values in the process of science and non-science learning subjects. In fact, the science learning at the schools has not emphasized yet on the local culture.

Sudarmin, Mastur, & Parmin (2014) have reconstructed indigenous knowledge of some communities in Karimun Jawa islands into scientific knowledge for growing conservation soft skills. Meanwhile, Khusniati (2014) has utilized local wisdoms as one of the learning models in supporting the conservation character.

Based on the descriptions above, the urgency of the reconstruction of scientific knowledge based on local wisdoms of the Ngargomulyo village community is due to the fact that the people there have implemented a pattern of environmental preservation. Unfortunately, this has not been yet formulated and conceptualized scientifically.

The purpose of the research is to reconstruct the scientific knowledge based on local wisdoms of the Ngargomulyo Village community in preserving the environment. This research is a means to enrich concepts, scientific knowledge, and new patterns of knowledge to instill and enhance the character of conservation for prospective science teachers.

## RESEARCH METHODS

This was a qualitative study of phenomenological ethno-science, which can be defined as the study of the system of organized knowledge of culture and local wisdoms related to phenomena and events in the universe (Battiste, 2005; Creswell, 2009). The focus of the research was the values of environmental preservation that were manifested in the behavior patterns of

the Ngargomulyo Village community and has become the local wisdoms. The research subjects were the residents and officials of the Ngargomulyo village.

The researcher became the main instrument in this study. The aim was to be able to collect as much local science knowledge as possible from the local community. The data obtained were then verified, reconstructed, formulated, and conceptualized to further become a formalized scientific knowledge.

## RESULTS AND DISCUSSIONS

Ngargomulyo village, Dukun Subdistrict of Magelang regency is one of the buffer villages within the National Park Management Section (SPTN) of the Dukun Region I of Dukun Resort of Mount Merapi National Park (TNGM). TNGM is one of the forest areas that is declared as a national park based on the Decree of Minister of Forestry (*menhut*) Number 134 / *Menhut-II* / 2004 dated May 4, 2004. Before being designated as a national park, the forest surrounding the settlement is protected forest under the management of *Perhutani* (Forestry) Corporation (Permana, 2014).

Ngargomulyo is located at an altitude of 740 masl and is included in the traditional zone which is directly adjacent to the jungle zone. The traditional zone is a part of the national park which is established for the benefit of traditional use by the local people because historically the surrounding community is dependent on natural resources within the national park area (Permana, 2014).

The Ngargomulyo Village has the following administrative borders:

North : Keningar village  
 South : Ngargosoka village  
 East : Mount Merapi national park  
 West : Kalibening village  
 (Village Profiles, 2019).

As the top village on the western slope of Mount Merapi, Ngargomulyo village has abundant natural resources such as fertile land, spring water, natural beauty, and sand

and rocks to be mined. Despite having abundant natural wealth, the people of Ngargomulyo village utilize the resources only to fulfill their daily needs. They have an awareness to preserve the environment as one of the local wisdoms of the Indonesian ancestors. The awareness is strongly built so that it can live in harmony with surrounding nature so that the existing natural wealth can be inherited to the future posterity.

Most of the Ngargomulyo people work in the agricultural sector. According to its use, the land in Ngargomulyo Village is consists of rice fields, dry land, and forest land. The rice fields are usually planted with rice, vegetables, chili, and pulses. The dry area in the form of dry land is planted with bamboo, grass, and annual crops such as *segon* wood. In processing the agricultural land, the people use livestock manure as the fertilizer as presented in Figure 1.



Figure 1. a) Manure; b) The Use of Manure as the Fertilizer

The use of fertilizer as an organic fertilizer has a disadvantage that the nutrient content is relatively small so that its use requires a large amount of fertilizer. Nevertheless, the manure has also advantages compared to inorganic fertilizers including more complete nutrients both macro and micro elements, organic acids such as humic acid, fulfilling acid, hormones and enzymes, repairing and maintaining soil structure, as a buffer for pH, keeping the soil moist, no usage limits, and not damaging the land (Prayitno, 2014).

In addition to relying on the agricultural sector, the Ngargomulyo village community is also raising livestock. The livestock that is mostly kept by the residents is cows. Some also raise goats and buffaloes. The livestock are fed by grass, combos, and straw (*damen* in Javanese). They do not burn *damen* on the fields after harvesting the paddy but collect and use it as their livestock feed as shown in Figure 2.

Utilization of the straw as the livestock feed is one of the efforts to preserve the nature. According to Husnain (2010), burning the straw causes some nutrients to be lost, especially the volatile ones so that they are not available for the plants. Burning straw also causes air pollution and health problems for the farmers and surrounding.



Figure 2. The People are Collecting The Straw To Feed Their Livestock

Ngargomulyo village is directly adjacent to Mount Merapi National Park (TNGM). It has been a long time ago that the villagers have been living side by side with the forest area. They only take grass for the livestock feed from the forest. According to research informants, in the forest, the local residents have their own areas for grazing. The areas have limits, so they do not carelessly take grass on others'. The intensity of grass harvesting depends on the number of the livestock owned. In taking the grass, the people uses *kletek* (traditional cart) by carrying it manually or pulling it using the motorbike. The types of grass spent for the livestock feed are *kolonjono*, *teki*, and *kaliandra*.

Only few people spend the forest for *perencekan*, which means collecting firewood for cooking. The firewood is taken from the dead trees and or dry tree branches. In meeting the needs of firewood, they do not cut down trees in the forest. Even so, many of them have realized this kind of activity does not correspond to conservation values. In carrying activities in the forest, local residents still have to pay attention to the ecological preservation and existing natural resources.

The forest area in Ngargomulyo village is included in the National Park Management Section Region I. The topography of the forest area includes mild to moderate one. They generally consist of pine plantations, and some natural mixed forests are lying on steep parts. At the height above, it is natural forest areas mixed with pine, *dadap*, *winang* and *weru* plants. The forest areas are dominated by the plants of *Pinus merkusii*, *Acacia decurens*, and *Albizia falcataria*. There are also some species of *Arenga vinata*, *Anthocarpus sp.*, *Jatropha*, *wilodo*, shrubs, grass, reeds and some typical epiphytes of tropical regions (TNGM Habitat Report, 2008).

Another effort made by the local people to preserve the forests is by not doing farming activities within and not hunting the protected animals. Some mammals found in Mount Merapi National

Park are leopards (*Panthera pardus melas*), deer (*Muntiacus muntjak*), Deer (*Cervus timorensis*), long-tailed monkeys (*Macaca fascicularis*), langur (*Presbytis fredericae*), jungle cats (*Prionailurus bengalensis*), civet (*Paradoxurus hermaphroditus*), wild boar (*Sus scrofa*), and coconut squirrel (*Calosciurus notatus*) (Anonim, 2003 in Gunawan et al., 2013).

Some types of birds found in this area are: javan munia (*Lonchura leucogastroides*), white-flanked sunbird (*Aethopyga eximia*), javan sunbird (*Aethopyga mystacalis*), blood-breasted flowerpecker (*Dicaeum sanguinolentum*), javan kingfisher (*Halcyon cyanoventris*), blue-winged leafbird (*Chloropsis cochinchinensis nigricollis*), common tailorbird (*Orthotomus sutorius*), javan cochoa (*Cochoa azurea*), javan hawk-eagle (*Spezaetus bartelsi*), common buttonquail (*Turnix silvatica*), rufous-tailed fantail (*Rhipidura phoenicura*), sunda forktail (*Enicurus velatus*), rufous-fronted laughingthrush (*Garrulax rufifrons*), brown prinia (*Prinia polychroa*), sunda minivet (*Pericrocotus miniatus*), lame-fronted barbet (*Megalaima armillaris*), brown-throated barbet (*Megalaima corvina*), black-banded barbet (*Megalaima javensis*), crescent-chested babbler (*Stachyris melanothorax*), javan tesia (*Tesia superciliaris*), ruddy cuckoo-dove (*Macropygia emiliana*), pink-headed fruit dove (*Ptilinopus porphyreus*), brown fulvetta (*Alcippe brunneicauda*), javan fulvetta (*Alcippe pyrrhoptera*), and yellow-throated hanging parrot (*Loriculus pusillus*) (Anonim, 2003 in Gunawan et al., 2013).

Wollenberg et al. (2004) stated the function of forests such as protecting water catchment areas, reducing flood damage, stabilizing slopes, and preventing landslides. In dry areas, the forests protect springs and bind water to flow to the rivers that support lower areas. The residents of Ngargomulyo village already have an awareness to preserve the water springs. They realize that water is a source of life that must be maintained so that it can be

passed on to their posterity. In safeguarding water resources, the local community implements cutting and selective logging in the community forests, and does not cut the trees near the water sources.

The results of the data collection of the Chief of Ngargomulyo Village in 2009 showed that there are 101 water springs. From 2011 to 2014, after the eruption of Mount Merapi, the number of springs has decreased to 59. After the eruption of Merapi in 2010, the community members did reforestation on the community forests. The results of the reforestation carried out in the beginning of 2019 showed there were 132 springs found.

The water in Ngargomulyo Village is utilized to meet household needs for clean water and agricultural irrigation. The community gets fulfillment of clean water from the Blongkeng river. The reservoir of clean water from the Blongkeng River is presented in the following Figure 3.



Figure 3. Reservoir of The Clean Water From Blongkeng River

The conservation carried out in both state and community forests do not only preserve the life of the flora and fauna living in them and preserves the availability of springs, but also as a mitigation effort from the eruption of Mount Merapi. Abundant vegetation in the forest will protect the village from throwing materials spewed out by Mount Merapi

Ngargomulyo village is 8 km away from the peak of Mount Merapi. Adjacent to Mount Merapi, it is rich in sand and stone mining materials. The abundance of

sand and stone will undoubtedly encourage the residents to mine them. The sand mining using heavy equipment has long been done in Ngargomulyo village. The natural changes caused by the mining already impacts the residents. The environment that was clean, shady, green, and fresh, has now become dirty and filled with the fumes of trucks and dust (Rukmorini, 2015).

Uncontrolled mining activities ultimately destroy a portion of the forest area which was originally a conservation region. Deep sand and soil dredging give bad affects for the springs. Some of the springs have experienced decreasing water flow and some of them have even stopped producing clean water. As a result, the people often experience water crisis, even though initially there was abundant water. The mining activities do not only have impacts on the environment, but also on the people's behavior. Children and adolescents who had previously undergone school routines and helped their parents start participating in mining activities. Some of them even chose to skip the school and prioritize to work on the sand mining (Rukmorini, 2015).

The local wisdoms about the environment is threatened with degradation because the norms and ethics of the environment inherited from ancestors are disrupted by consumptive materialist-hedonic lifestyles and the pursuit of pleasure. This phenomenon appears to be observed in the community with the existence of profit-oriented activities and less care for nature (Thamrin, 2014).



Figure 4 Ban on sand-loaded trucks passing by

The natural changes due to exploitation of sand and stone have encouraged the residents of Ngargomulyo Village to go back to living the pattern of life as inherited from their ancestors; utilizing the natural environment for their needs wisely. Now, they have denied the existence of sand and stone mining activities in their area using backhoes. The activities of sand and stone mining in Ngargomulyo village are carried out manually in the watershed as shown in Figure 4 and Figure 5. The rock and sand Mining is not carried out in the area of the

farm or near the water springs. They have understood that exploitation of rock and sand will damage the sustainability of the springs. The ban on mining using heavy equipment and managing the springs in Ngargomulyo village has been supported by the Regulation of Ngargomulyo Village number 3 year 2009 concerning Environmental Management. This regulation does not contain criminal sanctions, but the violation of the rule will be given warnings.



Figure 5. (a) stone and sand mining activities in the Lamat River basin; (b) the collected sand and stones

Another local wisdom of Ngargomulyo village as an effort to preserve the environment is not catching fish in the river using stun, explosives, poisons or other materials that can damage the ecosystem. The community law applies to those who

violate it, namely replacing twice the number of fish caught. In addition to the ones mentioned above, some messages containing the character of conservation as shown in Figure 6 are also found in several places in Ngargomulyo village.



Figure 6. Some Boards Containing The Messages About The Value of Conservation Installed in Several Locations in Ngargomulyo Village

## CONCLUSIONS

The results of the research and analysis indicate the existence of local wisdoms in

Ngargomulyo Village in maintaining the environmental sustainability. This awareness is built strongly so that it can live in the harmony with surrounding nature.

Thus, existing natural wealth can be inherited to the posterity. The efforts to preserve nature are manifested in farming, raising livestock, forestry activities, and sand and stone mining activities. The activities of protecting the environment for natural sustainability are also evident from the efforts of local residents to maintain the water springs. Some boards containing the messages on environmental preservation are found in several places of this village. Further research on the development of teaching materials based on the local wisdoms of the Ngargomulyo village community in preserving the natural environment needs to be conducted.

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### REFERENCES

- Battiste, M. (2005). Indigenous knowledge: Foundations for first nations. *World Indigenous Nations Higher Education Consortium-WINHEC Journal*, 1-12.
- Creswell, J. W. (2009). *Research Design Pendekatan Penelitian Kualitatif, Kuantitatif, dan Mixed*. Yogyakarta: Pustaka Pelajar. Penerjemah Achmad Fawaid.
- Balai Taman Nasional Gunung Merapi. (2008). Laporan Habitat TNGM Desa Ngargomulyo dan Desa Tlogolele. Departemen Kehutanan. Yogyakarta.
- Gunawan, H., Sugiarti, W. M., Tata, M. H. L., & Prajadinata, S. (2013). Restorasi Ekosistem Gunung Merapi Pasca Erupsi. *Pusat Penelitian dan Pengembangan Konservasi dan Rehabilitasi Badan Penelitian dan Pengembangan Kehutanan, Kementerian Kehutanan. Bogor*.
- Husnain. (2010). Kehilangan Unsur Hara Akibat Pembakaran Jerami Padi dan Potensi Pencemaran Lingkungan Prosiding Seminar Nasional Sumberdaya Lahan Pertanian. Bogor, 30 November - 1 Desember 2010.
- Kartono, K., Hairida, H., & Bujang, G. Penelusuran Budaya dan Teknologi Lokal dalam Rangka Rekonstruksi dan Pengembangan Sains di Sekolah Dasar (Kajian Etnosains dan Etnoteknologi terhadap Masyarakat Tradisional Lingkungan Pertanian Suku Melayu dan Dayak di Kabupaten Pontianak). *Jurnal Cakrawala Kependidikan*, 9(1).
- Kasa, I. W. (2011). Local wisdom in relation to climate change. *Journal of ISSAAS*, 17(1), 22-27.
- Khusniati, M. (2014). Model pembelajaran sains berbasis kearifan lokal dalam menumbuhkan karakter konservasi. *Indonesian Journal of Conservation*, 3(1).
- Rukmorini, R. (2015, 31 Desember). Yatin Merawat Kehidupan di Gunung Merapi. *Kompas*, pp 16.
- Peraturan Menteri Energi dan Sumber Daya Mineral Nomor 15 Tahun 2011 tentang Pedoman Mitigasi Bencana Gunungapi, Gerakan Tanah, Gempabumi, dan Tsunami
- Permana, E. (2014). Pengaruh Taman Nasional Gunung Merapi terhadap Strategi Nafkah Masyarakat Desa Ngargomulyo. Skripsi. IPB. <https://repository.ipb.ac.id/handle/123456789/72261>
- Prayitno, H. T. (2014). Strategi Pemanfaatan Kotoran Sapi. *Jurnal*

- Litbang: Media Informasi Penelitian, Pengembangan dan IPTEK*, 10(1), 43-51.
- Desa Ngargomulyo. (2019). Profil Desa. Desa Ngargomulyo
- Sudarmin. (2014). Pendidikan karakter etnosains dan kearifan lokal. Semarang: FMIPA Unnes.
- Sudarmin, S., Mastur, Z., & Parmin, P. (2014). Merekonstruksi Pengetahuan Sains Ilmiah Berbasis Budaya Dan Kearifan Lokal Di Kepulauan Karimunjawa Sebagai Wahana Menumbuhkan Soft Skill Konservasi. *Jurnal Penelitian Pendidikan*, 31(1).
- Thamrin, H. (2014). Revitalisasi Kearifan Lokal Melayu dalam Menjaga Harmonisasi Lingkungan Hidup. *Toleransi*, 6(1), 90-106.
- Wollenberg, E., Belcher, B., Sheil, D., Dewi, S., & Moeliono, M. (2004). *Mengapa kawasan hutan penting bagi penanggulangan kemiskinan di Indonesia?* (No. CIFOR Governance Brief no. 4, p. 6p). CIFOR, Bogor, Indonesia.