

# Violent Reconstruction of Science Learning Based on Indonesian Local Wisdom: A Critical Review

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## ABSTRACT

Every society must have a culture that is passed down from generation to generation, wherein in that culture there is indigenous knowledge, or what is called local wisdom. Integrating local wisdom in science learning can provide benefits to students about learning how to preserve culture because it contains traditional knowledge, products, and technologies that are passed down from generation to generation. The purpose of writing this article is to provide a solution on how to integrate local wisdom in science learning in schools. Based on data analysis, there are three types of local wisdom (health, nature conservation, and disaster mitigation) that teachers can use to integrate with science learning. Science learning in the future must prioritize local wisdom in all learning, to show the identity of the Indonesian nation.

**Keywords:** *Local wisdom, Indigenous science, Science learning.*

## 1. INTRODUCTION

The current trend of world development is very fast, starting with the industrial revolution era which has reached 4.0, and Society 5.0 which requires skills in mastering technology. Thus, education is a very important sector to prepare quality resources that have the ability and competitiveness in the era of globalization. And to improve these abilities, learning science is the main key.

Science is a human intellectual heritage in uncovering natural phenomena by using scientific methods to obtain scientific knowledge used to solve everyday life problems [1] [2] [3]. Science is not just knowing about facts, concepts, and laws about nature, but more emphasis on processes. Science learning aims to change and help humans live a better life with new approaches and ways of thinking to solve problems [4]. Science learning can train students' thinking based on scientific rules and ethics logically without prejudice and not accepting any information without authentic evidence [5]. With the characteristics of science consisting of scientific products, scientific attitudes, and scientific skills, the

source of learning in science learning is a culture that is close to the student's learning environment.

Learning science can be sourced from culture. Every society must have a culture that is passed down from generation to generation, wherein that culture there is indigenous knowledge, or what is called local wisdom. Local wisdom is a culture or tradition that develops in society as an effort and response to adapting to nature as a place to live by using knowledge to act and behave [6] [7]. The main element of local wisdom is the original knowledge possessed by the community. This knowledge is obtained from community experience and tested directly with nature which has been passed down from generation to generation.

Local wisdom has a very important role in science learning because there are philosophical values, especially the relationship between humans and nature, and using local wisdom is a form of contextual learning strategy [8]. Indonesia has many tribes that occupy certain areas and have various forms of local wisdom. Local wisdom that can be applied in science learning is a tradition in society that can be tested scientifically so that

it can be used as teaching material [9]. Several research results show that integrating local wisdom in science learning can improve students' knowledge and thinking skills in understanding natural phenomena [2] [7] [10-21]. Integrating local wisdom in science learning can provide benefits to students about learning how to preserve culture because it contains traditional knowledge, products, and technologies that are passed down from generation to generation.

The current science learning paradigm is how to use scientific knowledge to understand nature by identifying, analyzing, and drawing conclusions based on scientific evidence or known as scientific literacy. Teachers play a role in developing students' scientific literacy, by providing problems that are in the environment the students are in (contextual problems). Science learning in schools needs to be developed balance/harmony between scientific knowledge, development of scientific attitudes, and the values of local wisdom (containing indigenous knowledge that can be useful for life) [6].

But in fact, the results of the OECD survey found that Indonesian students ranked 74th in mathematics, 74th in reading, and 71st in science [22]. The results of this survey indicate that there are problems in learning in schools, especially in learning science. This is very contrary to the results of empirical research on the use of local wisdom in science learning, where in the field teachers are very difficult in choosing and integrating local wisdom in learning. The purpose of writing this article is to provide a solution on how to integrate local wisdom in science learning at school.

## 2. METHODS

This research is qualitative research with a qualitative meta-analysis method. Qualitative meta-analytic methods are methods used by researchers to collect, synthesize and analyze findings from primary qualitative studies [23] [24]. Qualitative meta-synthesis is a systematic approach to combining qualitative data to reproduce and explore research results to better understand research topics and new knowledge and synthesis is made to generate themes, ideas, and patterns that emerge from the combined synthesis of the main research results [25].

The data in this study are articles of research results published in indexed international journals. The article data was searched using the Google Scholar search engine with the keywords " local wisdom in Indonesia" with a total of 192.000 articles. From the search results, articles were then selected and analyzed based on themes related to science learning based on local wisdom into 20 articles.

Data analysis uses theme analysis to look for patterns by comparing the results of the main research to make implications and recommendations for local wisdom in science learning. From the 20 articles analyzed, 3 main themes were found, namely: health, environmental conservation, and disaster mitigation.

## 3. RESULTS AND DISCUSSION

From the results of data analysis, it was found that three (3) themes regarding the function of local wisdom have similarities in each region, namely: 1) health in which there are sub-themes about; food, food security, and traditional medicine: 2) environmental conservation and 3) disaster mitigation. This can happen because Indonesia is located on the equator which has two (2) seasons, namely: dry and rainy. In addition, geographically, Indonesia is located at the confluence of tectonic plates which results in a high level of natural disasters. Under these conditions, the community automatically adapts to nature in the form of local wisdom.

Local wisdom is formed from the original knowledge of the community, if we analyze more deeply there are elements of original science or what is called indigenous science. Indigenous science is the original knowledge of local communities in studying natural phenomena in the form of products, attitudes, and scientific processes that are in accordance with the culture and location of the community [8]. Indigenous science in its expression as traditional ecological knowledge integrated with appropriate insights and models from the ever-evolving field of sustainability provides creative model possibilities for indigenous peoples to defend themselves and their way of life [45]. Indigenous science contained in local wisdom can be used as a source of science learning.

Local wisdom is one form of culture that can be integrated into science learning. Why should it be integrated? Because each region has different local wisdom, it is necessary to integrate it according to scientific competence in the area where the student is located. Integrating local wisdom in science learning can improve students' scientific competence in knowledge and attitudes [2] [6] [21] [32] [46]. Integrating local wisdom in science learning, of course, is not like turning the palms (easy), it needs reconstruction in science learning using local wisdom. This reconstruction needs to be done so that students in learning science are able to develop cultural-based scientific literacy skills (local wisdom). The role of the teacher is very important, especially in the learning process in the classroom.

The reconstruction is meant to use three types of local wisdom (health, nature conservation, and disaster mitigation) that can be used by teachers to be integrated

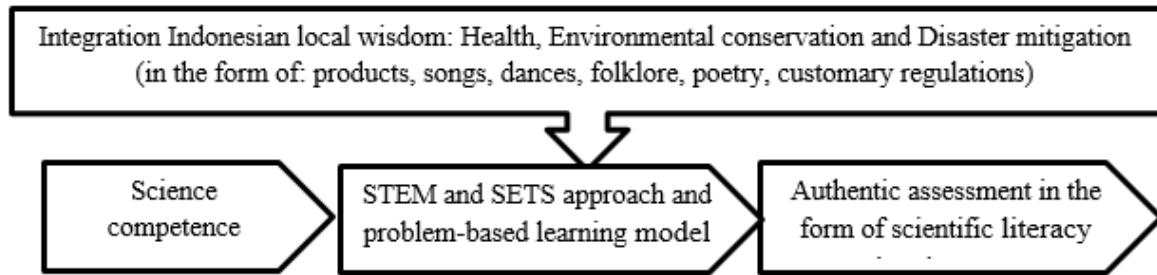
**Table 1.** Types of local wisdom for science learning

Themes	Local wisdom	Science learning proses
Health	<p>a. Traditional food: The staple food of the Indonesian people is rice and in some areas such as East Nusa Tenggara, Maluku and Papua the staple food is corn, cassava, and sago (<i>papeda</i>) and is equipped with a processed menu in the form of vegetables, fish, and meat which are processed using various spices (<i>bumbu</i>) [26]. The production process of palm sugar [27] and making salt [28].</p> <p>b. Food security: Forms of local wisdom in food security, are: <i>Mabbaca Doang</i> and <i>mappatala</i> the coastal community of Panyula village, North Sulawesi [29]; <i>Jineng</i> food management system strategy in Bali [30]; <i>Mondosiyo</i> and <i>Dhukutan</i> traditional ceremonies, procedures for making food made from corn, procedures for making offerings, non-rice farming systems, systems protect the environment, and medicinal plants in Tawangmangu, Central Java [7]; Selaru Island community has performed what so-called <i>Tnyafar</i> is an expression of local wisdom in meeting food necessity [31]; and various forms of food preservation such as salted fish, <i>tempoyak</i> and <i>tempe</i>.</p> <p>c. Traditonal medicine: Treatment and body care using parts of plants [32] [33] [34] [35] and traditional healing techniques by spraying (<i>sembur</i>) on the affected part [36].</p>	<p>a. Scientific products: Understanding scientific facts through identification of types of food ingredients which can then be classified into plants and animals, functions of plant and animal parts, to the relationship between plants and animals. For example, rice that comes from the rice plant, the body parts, and functions of the rice plant can be identified. In addition, also understand the scientific concept of the process of making traditional food. For example changes in the shape of objects can be proven in the process of cooking rice, until the occurrence of rice ripening into rice by evaporation and many more scientific concepts that can be taught in the process of making traditional food and medicine.</p> <p>b. Scientific attitude and scientific process skills: Practicing these two skills can be done when students are invited to observe or practice making traditional foods, traditional medicines, and food preservation.</p>
Environmental conservation	<p><i>Subak</i> farming system in Bali [8]; <i>Ngata Toro</i> local community manage forest by dividing the forest into several zones, those <i>arewana ngkiki</i>, <i>wana</i>, <i>pangale</i>, <i>pahawa pongko</i>, <i>oma</i>, and <i>balingkea</i> accompanied by rules in the management of result-based forest conservation and sustainable utilization [11]; Local Wisdom of South Borneo society, such as their agriculture system, irrigation system, river society, traditional house [37]; <i>Rokat tasik</i> in Madura [38]; and agricultural system (<i>massimatan</i>, <i>mabanne-banne</i>, <i>majappi</i>, <i>menongankumande</i>) in Enrekeng, South Sulawesi [39].</p>	<p>Local wisdom in nature conservation provides students with an understanding of the form of ecosystems (interdependence between living things and the environment) besides that there are also traditional astronomical concepts and concepts about natural resources.</p>
Disaster mitigation	<p>Traditional house construction [40], <i>Maeana</i> dance in South Nias Regency in Nias Island, <i>Uma</i> and <i>Tuddukat</i> in Mentawai Islands [41] , <i>Smong</i> disaster mitigation based on local wisdom of the Simeuluean people, Aceh [42] [43], <i>Pranata Mangsa</i> the climate change mitigation in Java [44].</p>	<p>Local wisdom in disaster mitigation can teach students about the application of the concepts, principles, and laws of science. Students can explore the relationship between science concepts and local technology applied in disaster mitigation, such as building materials used in traditional houses, the application of sound concepts in disaster early warning systems.</p>

with science learning. The three types of local wisdom were identified which contained elements of science. In addition, the teacher's role is very important to continue

to develop science learning with STEM and SETS approaches with problem-based learning models. This

process continues to be carried out to familiarize students in developing their thinking skills.



**Figure 1** The reconstruction Indonesian local wisdom science learning.

The application of local culture in education is widely applied by several countries. One of them is Japan which still maintains its culture in learning, namely the *Kikigaki* method. The *Kikigaki* method in Japan is to create communication between the younger generation and the older generation to obtain information about the local wisdom of the older generation and society [47]. This method is used to analyze information and verify the validity of the information by means of an investigation. Local wisdom in which there is indigenous science can be integrated into science learning can train students in scientific inquiry skills by comparing native science with western science but it can also shape students' character in learning. In the future, science education learning should be integrated into culture-based learning (CBL) and ethno-science in most classroom activities [48].

#### 4. CONCLUSION

Local wisdom can be integrated into learning. The form of local wisdom that is almost similar in Indonesia is wisdom for health, nature conservation, and disaster mitigation. These three functions are formed due to Indonesia's geographical conditions. Science learning in the future must prioritize local wisdom in all learning, to show the identity of the Indonesian nation. Using local wisdom in learning will shape the character of Indonesian students who think locally and act globally.

#### AUTHORS' CONTRIBUTION

All authors conceived and designed this study. All authors contributed to the process of revising the manuscript, and at the end all authors have approved the final version of this manuscript.

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