

## Research Article

# Literature Review: Development of Science Learning Based on Local Wisdom and Indigenous Knowledge for ESD

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**Abstract.**

The problem in science learning that often occurs today is that many students think that science learning is taught in an uninteresting and irrelevant manner. Science learning is irrelevant according to their perception because of the lack of connection and linkage of science learning with everyday life and the socio-cultural background they experience. One alternative solution to overcome the above problems and science learning becomes more relevant is necessary to revitalize the curriculum based on contextual concepts in accordance with the daily lives of students, like the cultural context of local wisdom or indigenous knowledge. This literature review was a scientific study of the analysis of 30 articles on science learning based on local wisdom and indigenous knowledge. This study aimed to analyze and elaborate on the integration of science learning with culture and its impact on education. This research was qualitative research using the descriptive analysis method of Miles and Huberman, which consisted of several steps: data collection, data reduction, data display, and conclusion. The articles analyzed were sourced from national articles indexed by SINTA and internationally reputable articles indexed by SCOPUS from 2017-2021. The results of this study indicated that science learning based on local wisdom and indigenous knowledge is considered very important as an innovation in ESD that affects the character and various abilities of students. These innovations can be carried out through revitalizing the science curriculum, developing learning products, and continuing scientific studies.

**Keywords:** Science Learning, Local Wisdom, ESD

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## 1. INTRODUCTION

One of the problems in science learning that often occurs today is that many students think that science learning is taught in an uninteresting and irrelevant manner [1]. Science learning is irrelevant according to their perception because of the lack of connection and linkage of science learning with everyday life and the socio-cultural background they experience [2]. Their perception could be caused by the dominant influence of the

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western science paradigm in science learning so far. This is also evidenced by the lack of science learning materials and resources that contain content contextually according to culture and social images that are still often neglected [3, 4]. So that the interests and interests of students are not aroused. Students will experience a tendency to have a low enthusiasm for learning and of course it will affect the achievement of learning outcomes and students' abilities later.

Many alternative solutions have been provided by experts through their scientific writings. One alternative solution to overcome the above problems and science learning becomes more relevant, it is necessary to revitalize the curriculum based on contextual concepts in accordance with the daily lives of students [5]. Several previous studies have used the cultural context of local wisdom as a form of actualization of contextual science learning [6]. This is because local wisdom is able to offer environmental, social, and cultural relationships in the order of life with nature. These innovations are even packaged in various variations, so that the integration of local wisdom with the science curriculum will increase student interest and ensure its relevance to everyday life [7].

Indonesia is one of the many countries in the world that has a wide variety of traditional ethnic groups and indigenous peoples. With its rich culture and strongly influenced by its natural conditions, Indonesia is a nation that maintains and inherits a lot of Indigenous Knowledge from generation to generation [7]. But in reality, this great wealth has not been used optimally by the people. The threat of cultural erosion that always lurks, the distortion of cultural values, and other substantial problems have made it a sentimental issue in its existence so far. In fact, if it is utilized and managed optimally, it is believed that this noble wealth will have a lot of impact on every aspect of the country, such as education, for example. One research in America has proven that when local wisdom culture and indigenous knowledge are included as learning content in schools, the results will make indigenous students feel proud and gain cross-cultural knowledge to respect each other [8].

This effort has always been pursued on the sidelines of the threat of marginalizing the value of indigenous knowledge in science learning [9]. Learning efforts by integrating local cultural content with such science are considered to be able to help reconstruct problems, increase students' knowledge, and socio-cultural values [10]. The philosophical value of local wisdom will reflect and provide positive directions for students in learning better in the future [11]. This is in line with Khoiri and Wilujeng which state that learning that connects the context of local potential with learning materials will be very helpful and beneficial for students to achieve learning goals [12, 13]. and equip them with the noble values contained in it. Knowledge of local potential is closely related to

the experience of students. Referring to several previous research results, there have been many similar research results showing that indigenous knowledge-based science learning will introduce cultural values in a sustainable manner and will contribute to developing close relationships between culture, science, and education [7].

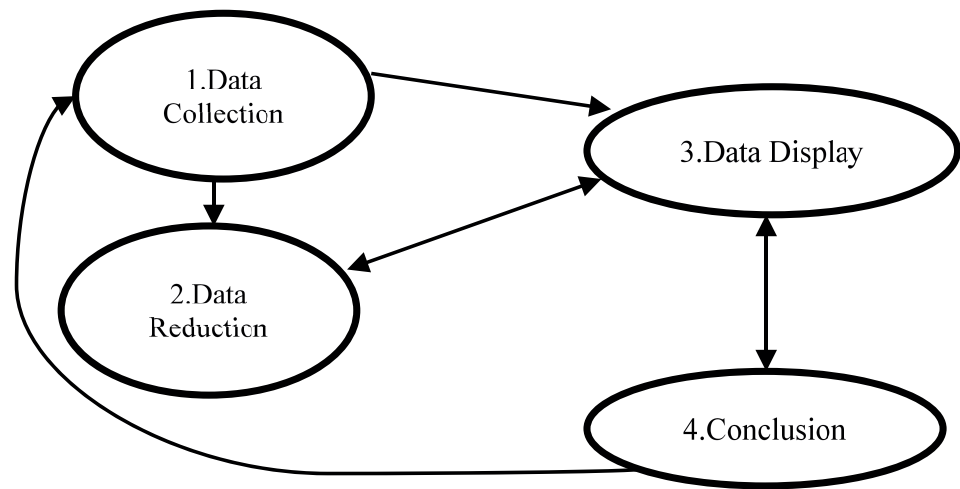
The solution efforts above are certainly not as easy as imagined. In fact, many values from Indonesia's local potential have not been utilized as a reference for teaching materials and integrated with the science learning process in schools [14]. This is due to the limitations and constraints of mastery of material in developing the needs of culture-based science learning [15]. Some people even tend to think that there is no connection between culture, science, and education. Even in their daily lives they tend to ignore local wisdom due to the swift and strong influence of foreign cultures entering the order of life so that they are able to replace their own cultural identity. This phenomenon is caused by distinction was a genuine knowledge of the community [14].

This article will discuss cumulatively from various perspectives and relevant study sources related to the topic of integrating local wisdom and indigenous knowledge in science learning which is a hot issue in an effort to support Education Sustainable Development (ESD). The focus of the study was centered on the topic of research questions, namely the background and urgency of developing science learning based on local wisdom and indigenous knowledge in the current era, as well as how to implement the research that has been produced so far in contributing to science education in Indonesia. Through various views and theories, the experts in the study will provide an overview and elaboration of the conceptual understanding of this discussion topic in the future. This literature review is expected to contribute to science education so that it becomes more transformative, adaptive, and can support education in maximizing the potential of local culture. This literature review is also expected to provide a mapping and an overview of several previous research sources related to scientific education research based on cultural content. Thus, the research findings that have been summarized through this literature study can be a stimulus and motivation for education actors, practitioners or teachers, to other important parties to be able to provide quality and sustainable science education.

## 2. RESEARCH METHOD

This literature review uses a type of qualitative research with a qualitative descriptive data analysis method by Miles and Huberman which consists of several stages such as

data collection, data reduction, data presentation, and conclusions. Miles and Huberman's data analysis model can be seen more clearly through in the Figure 1.



**Figure 1:** Several stages of miles and huberman analysis model [16].

The data in this study will be collected through literature studies in several Scopus and Sinta indexed journal articles which are collected through 3 keywords, namely Local Wisdom, Indigenous Knowledge, and Ethnoscience. The sources of the articles analyzed were SINTA indexed national articles and SCOPUS indexed reputable international articles for the last 5 years (2017-2021). The next step is to reduce, review, categorize, analyze, and synthesis. The analysis and synthesis of articles will focus on two aspects that become research questions, namely what's the background and urgency of the development of science learning based on local wisdom or indigenous knowledge, and what are the results and impacts of the research or development. In the next stage, the data will then be presented in the form of table results synthesis that refer to the research objectives and get conclusions.

### 3. RESULTS AND DISCUSSION

Local wisdom is believed to be a cultural value related to a community group that is passed down from generation to generation as a guide in thinking, acting, and behaving [11]. Meanwhile, according Dewi, et al., local wisdom is more defined as a conceptual idea that aims to direct habits and be passed on to each generation within a certain ethnic group [17]. From the definitive explanation above, it can be concluded that the existence of this local wisdom is a noble embodiment originating from cultural ideas which are then passed down from generation to generation.

In line with the definition of local wisdom, the existence of local wisdom is always juxtaposed with indigenous knowledge. In this context, indigenous knowledge is defined as all knowledge generated from human thought which is influenced by social, cultural, and intellectual circumstances [18]. Meanwhile, according to Gunara, et al., indigenous knowledge is knowledge based on life experiences that take into account certain cultures or customs by observing and adapting through the circumstances of the natural environment [19]. From these two meanings, indigenous knowledge is interpreted as an understanding of a knowledge that emerges from a particular community and is influenced by socio-cultural values and the environment. So that through this indigenous knowledge, local wisdom will be born as described previously. Because in essence these two elements have strong bonds and slices. Indigenous knowledge as the main parent as the forerunner of the birth of culture, local wisdom, and the values of the community itself.

Along with the times, the existence of local wisdom and indigenous knowledge is believed to be new ideas as innovations in the world of education. By integrating it into learning in schools, experts say this new step is very important [19]. Learning in schools is believed to have a high Social Prestige compared to non-formal cultural education in the community because it will provide more concrete meaning for students to have. However, the fact is that people even consider that the formal education process is different from their cultural context and has no relationship with each other. Whereas acculturation and adaptation of cultural values to education in schools will have a significant influence by being oriented to scientific theory. So that the values embedded in students are considered more comprehensive. Because basically, a culture that is only inherited without focusing on the meaning of its values will not grow a complete character in students. So, it is necessary to acculturate the education system and the community environment in combining these two things [20].

The results of the analysis from the 30 articles provide an explanation and conclude that the background and urgency of efforts to integrate local wisdom and indigenous knowledge is believed to be a bridge between the socio-cultural world of society and scientific academic education in schools [21]. Apart from being a liaison between the two different entities, studying culture is also the main right for students to explore their identity with the value of its own ontology meaning [22]. Especially for the Indonesian people who have a myriad of cultural values of local wisdom and indigenous knowledge as a priceless heritage [23].

However, it is also undeniable that the existence of science education today in schools also tends to prioritize western-oriented science by ignoring aspects of local

science studies which are much more contextual for students [7, 9]. In fact, if this study is implemented, it will lead to innovations and contributions to learning such as understanding the socio-cultural relationship with science that gives meaning through Contextual Based Learning and presenting experiences for students that connect life with science closely [7, 24]. Although so far, it is undeniable, in fact, science learning seems to provide a barrier between the world of education and the cultural entities of society. In many parts of the world, aspirations related to this have been voiced, such as in Australia, America, Russia, and several African countries [19, 21, 25, 26]. This proves that this idea is not an idea without a theory, but a theoretical idea based on scientific studies.

Of course, this effort will also be considered as a further introduction to cultural values and to foster admiration and efforts to preserve it [27]. Because in this era the literacy and understanding of the younger generation is still very low on their own culture [28]. Therefore, the idea of integrating local wisdom and indigenous knowledge in science learning which was later known as ethno science is considered an innovation and solution in education. The term ethno science is interpreted as an approach to science that is based on the cultural values of a particular group that are passed down from generation to generation [29, 30]. With this capital, this ancestral heritage should also be used in the world of education such as being applied in science learning in schools [18].

Local wisdom and indigenous knowledge born from life experiences with traditional values and norms will revitalize the strengthening of identity for the younger generation who study in school [19]. Science learning that is not only oriented to the theoretical aspect should be able to present learning that is much more contextual and affects the various abilities and characters of students [20, 32, 36], such as scientific process attitudes, scientific literacy, critical thinking, creative, communication, collaboration and logical and correct arguments [32, 33, 38].

But in reality, this learning innovation will not be as easy and simple as that. It takes scientific studies and theoretical approaches from experts to be able to mix the integration of local wisdom and indigenous knowledge with learning. Because behind it all there are still substantial obstacles such as teachers who are not used to and are not too optimistic in mastering aspects of local culture with their values [35, 39], starting from the lack of educational resources. culture which can be caused by the lack of traditional elders [26]. Thus, providing consequences and threats to the sustainability of this ancestral heritage. This problem is also supported by other problems such as the lack of curriculum, teaching materials, pedagogy, which are culturally sensitive. So

that this situation makes science learning that should be contextual too monotonous and can lead to negative stigma that is discriminatory oriented [15, 34, 39].

In actualizing it, of course, real steps need to be taken to be able to realize this learning innovation. A strong juridical basis through Permendiknas No. 22 of 2006 has provided opportunities and opportunities to innovate for every educational unit in Indonesia to be able to present interesting learning and according to the interests, talents, and needs of students through local potential, cultural environment, economic conditions and regional needs with reference to standards. Self-developed curriculum competencies [20, 32, 40]. This is also supported by the implementation of the 2013 curriculum for almost a decade which is considered suitable and very relevant in the potential to contextually integrate local wisdom in science learning. This innovation is very useful for students because it will equip them with the values of local wisdom in learning as a solution and of course respond to the PISA and TIMSS ratings which are accompanied by the low Indonesian science learning process [14, 17, 37]. So, it is necessary to revitalize the curriculum by providing a touch of learning with cultural and ethno science paradigms as a strategy in maintaining a balance between globalization and globalization and creating a quality learning atmosphere [41]. This is because local potential provides a more relevant and closer picture of the lives of students. So that it becomes an attraction and motivation for the enthusiasm of students who will be more enthusiastic and active in learning activities [20].

The results and discussion of this article contain a total of 30 articles related to local wisdom and indigenous knowledge in science learning. All articles have a relationship with each other through various aspects of the study with reference to several keywords as previously described in the research method. The following table will present important discussion aspects related to efforts to integrate local wisdom and indigenous knowledge in science learning from 30 articles analyzed with an emphasis on background studies, urgency, research results, and their impacts.

From the solution of the form of integration above, it can be seen that the most dominant form of integration done so far is by integrating it directly into the main aspects or components of learning such as learning tools and models. Meanwhile, further studies are presented as a theoretical basis and framework as a basis for the actualization of the integration of science learning based on local wisdom and indigenous knowledge. However, regardless of what packaging is displayed, this learning still has one clear goal, namely strengthening the value of cultural identity through the contextualization of science learning that supports the exploration of increasing the various abilities of students in their lives.

There are several solutions in the form of integration that the researchers found through the analysis of this journal, such as the development and application of learning models [35, 37, 42], learning tools in the form of lesson plans, teaching materials, and assessment of teaching materials [14, 17, 34, 36, 38, 40, 43, 20, 21, 23, 27, 28, 31–33], and further studies tan which contains a framework, elaboration, investigation, and other in-depth theoretical studies [7, 8, 34, 16, 17, 19, 21, 26, 43].

Science learning based on local wisdom will strengthen students' understanding by increasing their interpretative abilities in interpreting natural phenomena and phenomena. In addition, the integration of local knowledge with science learning will make a reflection of tradition intellectually packaged with a scientific approach in solving contextual and relevant problems in life. Constructivism learning theory adapted in this study will provide opportunities for students to not only interpret science as a product of science but also in the form of a way of thinking. This makes education based on local culture side by side with modern science education [44].

The learning that has been done so far must undergo a transformation to support ESD [46]. Because in this learning students will be invited to see the other side of their lives [47]. With the integration of science based on local wisdom and indigenous knowledge, it is indirectly a form of interdisciplinary relationship between different sciences which is then combined and able to become an innovation in ESD [48]. Thus, participants will be able to be more interested in learning their culture and make knowledge not only sourced from the teacher but also through the students' experience of their culture [7, 49].

The reconstruction of local culture through ethno science can be an opportunity and opportunity to re-introduce the values of the existing indigenous culture [50, 51]. This reconstruction can be started by revitalizing the science curriculum in Indonesia. In developing a science curriculum based on local wisdom, of course, there are several considerations, such as adjustments to learning objectives, detailed multi-disciplinary studies, socio-scientific cultural factors, and a balanced treatment perspective when exploring deeper understanding and abilities of students [7, 52, 53]. Although learning based on local wisdom and indigenous knowledge is highly recommended in science education, it must be done carefully and correctly.

## 4. CONCLUSION

Science learning based on local wisdom and indigenous knowledge is an innovation in full support of ESD. By loading studies and in-depth studies related to this integration,



it is then actualized through the development of proven learning products to be able to shape the character and various abilities of students. Although this innovation is highly recommended, it should be underlined that the implementation of this study still needs to consider many things and be carried out carefully.

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