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Integration indigenous science in merdeka curriculum to strengthen scientific literacy and environmental care in elementary schools: Need analysis

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Abstract: This research aims to analyze the needs of integration indigenous science approach in the Merdeka Curriculum to strengthen scientific literacy and environmental care in elementary schools for elementary school students. This research uses a qualitative approach with a case study design. The subjects of this study were 160 elementary school teachers in one of the big cities in Indonesia. Research data collection techniques consist of interviews and questionnaires. The research data analysis technique used an interactive model consisting of data condensation, data presentation, and drawing conclusions. The results of this research show that the teachers propose the reconstruction of indigenous science into scientific science and its integration in learning based on the national curriculum. Analysis of the needs for multimodal reconstruction of indigenous science in science learning in elementary schools shows a very important category. Multimodal indigenous science is proposed from Javanese culture which is specified with the needs of the elementary school sciences scope with the integration of indigenous science carried out in the content, process and product aspects. The results of the initial study recommend that teachers and future researchers can develop learning tools with a multimodal indigenous science approach in the Merdeka Curriculum to strengthen scientific literacy and care for the environment in elementary schools.

Keywords: *Elementary school, Environmental care, Indigenous science, Scientific literacy.*

1. Introduction

Scientific literacy fosters awareness of how science and technology shape the natural, intellectual and cultural environment, as well as a willingness to be involved in and concerned about issues related to science so that they play an important role in overcoming life's problems in the 21st century. However, in fact, the results of the Program for International Student Assessment study (PISA) from 2000-2018 shows that Indonesia's score has relatively fallen in the field of science and until now it has not been satisfactory. Indonesia occupies 70th position out of 78 countries, the score is still below neighboring Thailand, Malaysia and Vietnam [1]. To overcome this problem, the government took steps to formulate Merdeka Curriculum in Elementary Schools in which science and social studies learning content was combined into Natural and Social Sciences (IPAS) subjects [2]. This perspective places science learning as ideal, contextual (according to local wisdom and the times) and holistic (stimulating students to manage the natural, social and cultural environment) [3-6]. The problems that have arisen so far are that there is no learning model framework that is applicable to teachers so

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that they still find it difficult to apply it in designing teaching devices and their application in elementary schools.

The ethnopedagogical model framework requires adjustments to the needs of the digitalization era and the industrial revolution 4.0, so that the framework is developed on a digital basis, namely through the use of multimedia visual, auditory, kinesthetic, reading and writing [7-9]. Indigenous science in the form of customs, morals, culture and technology created by certain societies containing scientific knowledge can be reconstructed into science learning content [10][11]. The current dynamic escalation of internal and social interactions places the ethnopedagogical model framework as a learning model needed to help teachers carry out learning to strengthen science process skills and care for the environment in students in elementary schools.

The Ministry of Education and Culture directs the development of scientific literacy through the Strengthening Character Education (PPK) approach which needs to be carried out through the development of an ideal, contextual and holistic science learning model [12]. The reality on the ground is that the current implementation of the Merdeka Curriculum does not yet have a structured pattern for instilling character education. Therefore, it is very urgent and requires a learning model framework which is also an actualization of local wisdom integrated learning called ethnopedagogy [13-15].

The development of scientific literacy cannot be separated from the character of caring for the environment as students who are cultured to be able to interact with nature and society, so that it is deemed relevant to elevate the reconstructed regional indigenous science concept into scientific science in the form of a learning model framework so that it can be implemented by teachers in appropriate classes. with the Merdeka Curriculum [16]. In order to get an overview of the needs of teachers for the design of science learning models in elementary schools, it is necessary to conduct research to explore the implementation of science learning in elementary schools related to inculcating indigenous science values and exploring the needs of teachers for science learning models that use an indigenous science approach. to strengthen scientific literacy and environmental care character in elementary school students.

2. Literature Review

The Independent Curriculum as a national education policy in Indonesia provides schools and teachers with the freedom to design learning that suits the needs and potential of students. One of the significant changes in the Independent Curriculum is the merging of Natural Sciences (IPA) and Social Sciences (IPS) into a subject called Natural and Social Sciences (IPAS) [17][18]. This merger aims to create learning that is more contextual, integrative, and relevant to students' daily lives. Through IPAS, students are invited to understand the relationship between natural and social phenomena in one unit, which is expected to form critical and analytical thinking. The implications of IPAS in the Independent Curriculum are carried out with a project approach and problem-based learning [19][20]. Teachers are encouraged to provide student-centered learning experiences, where students actively explore their surroundings and seek solutions to real problems faced in everyday life. Therefore, this content is close to original science knowledge that must be explained scientifically to students. Students can be invited to do projects on the impact of climate change on the lives of local communities, which include aspects of science (for example, natural phenomena that occur) and social studies (for example, social and economic impacts). Learning becomes more interactive and meaningful, and supports the development of 21st century skills such as creativity, collaboration, and problem-solving abilities.

Science learning that utilizes indigenous science in elementary schools can improve students' scientific literacy by connecting scientific concepts with local knowledge that is already familiar in their daily lives. Indigenous science includes local wisdom about nature, the environment, and socio-culture, providing a real context for students to understand science [21][22]. With this approach, students not only learn scientific theories in the abstract, but also see their direct relevance in the traditions and

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practices around them, such as traditional farming techniques, water management, or knowledge of local ecosystems. This makes learning more meaningful, easier to understand, and increases student engagement, which in turn will improve their ability to think critically, observe, and solve problems based on scientific facts as well as their overall scientific literacy. In addition, indigenous science-based learning also has an impact on environmental awareness in students [23][24]. By studying and being directly involved in local wisdom related to nature conservation and environmental sustainability, students will better understand the importance of maintaining the balance of nature. The knowledge they gain about environmentally friendly traditional practices, such as sustainable agricultural systems or the preservation of indigenous forests, will foster a strong ecological awareness. This encourages them to be more responsible for the surrounding environment and to implement environmentally friendly behavior in their daily lives.

3. Methodology

This study uses a qualitative approach with a case study design. The exploration of this research study focuses on the needs of elementary school teachers regarding the integrating Indigenous Science to strengthen scientific literacy and the character of caring for the environment in elementary school students. The case study is seen as an appropriate design for research purposes in identifying and analyzing the needs of teachers in integrating Indigenous Science to strengthen scientific literacy and environmental care characters in elementary school students. Participants in this study were elementary school teachers in a city in Indonesia. The number of participants was 160 people and selected by purposive sampling. Determination of participants is considered on the ability to provide sufficient information and teaching experience to provide useful and appropriate empirical data support. The working period of the participants selected in this study had at least 3 years of teaching experience.

The research data is in the form of primary data obtained using interviews and questionnaires. The interviews were conducted in an unstructured manner but still focused on the purpose of the interview, namely exploring the experience of teaching natural sciences in elementary schools by integrating indigenous sciences. The questionnaire data collection technique was carried out to measure the teacher's level of agreement with the concept of integration of indigenous science in elementary science learning expected by the teacher. The questionnaire was developed with reference to the urgency level aspect content, the concept of integration in content, the concept of integration in processes, the concept of integration in learning products.

Research data using qualitative analysis. Analysis of the research data consists of the stages of condensation, data presentation, and drawing conclusions. Data condensation aims to sharpen, sort, focus, discard, and organize data in such a way as to get conclusions. Data condensation can be done through the activities of writing summaries, coding, developing themes, creating categories, and so on, with the aim of sorting out irrelevant data or information for further verification. Data presentation is an organized collection of data or information that allows for conclusions to be drawn and action taken. The temporary conclusion is not yet clear, but with the addition of research data, the meaning contained in these data will be seen more clearly. The data is verified during the research process and continues with the conclusion and verification stages [25].

4. Results Discussion

The results of the needs analysis study in this research are identifying research problems in learning to strengthen scientific literacy and caring for the environment in elementary schools and exploring learning with existing models, needs analysis and identifying the required model framework specifications. Problem analysis has the following results.

Scientific literacy is an understanding of science and the skills to apply it in everyday life. Teachers view that scientific literacy is needed by students to understand everything about science, as previous researchers have argued that scientific literacy includes understanding scientific issues, the risks and

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benefits of science, as well as understanding the nature of science, including its relationship with culture [26-28]. Someone who has scientific literacy skills can apply scientific concepts in their interactions with the environment and use scientific processes in solving problems and making decisions in daily life based on scientific evidence [29-32]. The implementation of scientific literacy can develop students' thought patterns and behavior and build human character to care, be responsible for themselves, society, the universe and the problems faced by modern society today. Students who are able to develop scientific literacy can make basic decisions and are able to recognize sources of solutions, namely science and technology [33]. The implementation of scientific literacy is taught in science learning as a unit of content and process. The content of science includes studying the scope of elementary school science by teaching science process skills (KPS) as a process aspect in the integration of empowering scientific literacy in elementary science learning. In the FGD activity, teachers studied aspects of scientific literacy to find out how they are applied and measured in science learning in elementary school. The teachers agree that the fulfillment of literacy aspects is in accordance with the scientific literacy aspects based on PISA 2015 and 2018 consisting of content aspects, context aspects, competency aspects and attitude aspects [34][35].

The discussion on strengthening the character of caring for the environment by teachers remembers that the government has made efforts to address environmental problems with early prevention. This is demonstrated by the joint agreement that has been established by the Minister of Environment and the Minister of National Education regarding "Environmental Education", which was followed by steps to provide Environmental Education to educational institutions. However, in reality, the government's efforts do not receive support from education organizers and implementers. The togetherness of the school community is very necessary in creating an educational institution that cares about the environment. The implementation of character values, including the value of caring for the environment in schools, is carried out based on the grand design (implementation strategy) from the Ministry of National Education as stated in the Guide to Implementing Character Education in Schools [36]. The program for implementing the value of caring for the environment in schools has so far been carried out through self-development programs, integration in subjects, and school culture which provides an atmosphere for students to interact with each other in instilling the value of caring for the environment.

Teachers are of the opinion that strengthening the character of caring for the environment is an integral part of learning natural sciences in elementary schools. Learning science holistically and integrated with students' social life including culture requires cultural intelligence. So far, science learning has alluded to the application of student life, but the study of local wisdom has not been optimally integrated into learning. Therefore, teachers are of the opinion that the integration of local wisdom in science learning is very necessary, which is then referred to as ethnopedagogy. The results of the analysis of the needs of this research show that teachers propose the need for multimodal indigenous science reconstruction in the Merdeka Curriculum to strengthen scientific literacy and care for the environment in elementary schools.

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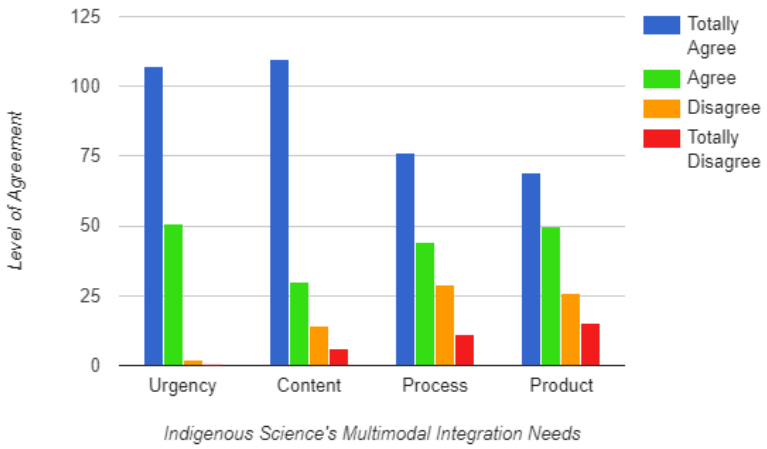

Figure 1.
Teacher needs analysis of the ethnopedagogical model framework in elementary school.

Analysis of the needs for multimodal reconstruction of indigenous science in science learning in elementary schools shows a very important category. Multimodal indigenous science was proposed from Javanese culture which was specified with the needs of the elementary science scope. The integration of indigenous science needs to be carried out in the content, process and product aspects.

Content relates to indigenous science input as material that will be taught by teachers in class or studied by students in class. There are two ways to create different lesson content, namely: (a) adapting what the teacher will teach; or (b) what will be learned by students based on the level of readiness and interest of students according to how the content to be taught or learned will be conveyed by the teacher or obtained by students based on the learning profile (style) owned by each student. Processes are activities carried out by students in class as activities that are meaningful to students for their learning experience in class, not activities that are not correlated with what is being learned. The activities carried out by these students were not given a quantitative assessment in the form of numbers, but a qualitative assessment, namely in the form of feedback notes regarding what attitudes, knowledge and skills bridge the existence of scientific science with indigenous science. Products can be the end result of learning to show students' knowledge, skills and understanding after completing one unit of study or even after discussing science with multimodal indigenous science content. Products can involve a broader and deeper understanding of students related to their involvement in scientific literacy or strengthening environmental care.

5. Discussion

Strengthening scientific literacy and environmental care in elementary schools in its application is still experiencing problems. The problem of strengthening scientific literacy and caring for the environment in elementary schools requires ideal science learning, contextual (in accordance with local wisdom and current developments) and holistic (stimulating students to manage the natural, social and cultural environment) [37-39]. The government formulated the Merdeka Curriculum in elementary schools where science and social studies learning content is combined into science subjects, but it is not yet supported by an applicable learning model framework [40-43]. Different from previous research, this research aims to produce a digital ethnopedagogical model framework that can be applied by teachers to support strengthening scientific literacy and environmental care in elementary schools.

Learning science requires a balance or harmony between the knowledge of science itself and the inculcation of local wisdom values that exist in science itself. Therefore, the socio-cultural environment of students needs to get serious attention in developing science education in schools because it contains

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original science (indigenous science) that can be useful for their lives. Stanley & Brickhouse (2001) suggest that science learning in schools balances Western science (normal science) with indigenous science by using a cross-cultural approach [44]. If the modern science subculture taught in schools is in harmony with the subcultures of students' daily lives, science teaching will tend to strengthen students' views of the universe, and the result is enculturation [45]. If enculturation occurs, students' scientific thinking about everyday life will increase. Therefore, the reconstruction of indigenous science into scientific science and its integration in learning is the consequence of the ideal science learning in the future. The two major stages are concluded in two things, namely: (1) the reconstruction of indigenous science into scientific science through ethnoscience studies; and (2) the integration of indigenous science in elementary science learning.

The results of the ethnoscience study conducted by the teachers through FGD revealed two categories of indigenous science when associated with western science, namely Category I, original science that can be explained by Western science; and Category II, original science that cannot be explained by Western science. Category I original science includes the concepts of energy and its transformation, and the universe and the solar system. Second, the link between indigenous science and scientific science can be traced in ethnopedagogical-based science learning, as one of the essences of education as a vehicle for the socialization and internalization of cultural values. This concept then influences the field of education by integrating indigenous science into science learning, namely learning that combines culture with science [46][47]. Multimodal indigenous science in research shows that there is more than one indigenous science that is integrated with science learning in elementary schools according to the Merdeka Curriculum.

Based on the results of the needs analysis, the specifications for the ethnopedagogical model framework in this research: First, the framework is a framework to assist teachers in planning and implementing science learning with a multimodal indigenous science approach in learning natural sciences in elementary schools. Second, the product of the digital ethnopedagogical learning model framework in this study is in the form of an application that can be accessed online by teachers with interactive facilities. As for the function, the framework is expected to help produce products in the form of lesson plans for learning science with a multimodal indigenous science approach for elementary students. Third, the application of the digital ethnopedagogical model framework with the multimodal indigenous science approach is adapted to the format of learning tools in the Merdeka Curriculum by focusing on strengthening scientific literacy and caring for the environment in elementary schools.

Armed with the specifications that have been obtained, the researchers designed a digital ethnopedagogical model framework prototype with a multimodal indigenous science approach to the Merdeka Curriculum in Elementary Schools. This design is a stage of problem solving in this study, namely actualizing integrated learning of local wisdom (ethnopedagogy) by elevating the concept of original science (indigenous science) of the reconstructed area into scientific science and a multimodal indigenous science approach according to the philosophy of reconstructionism. Reconstructionism in the philosophy of education seeks to overhaul the old structure and build a modern pattern of cultural living arrangements, namely how technology is a support system for planning and implementing learning activities [48-50].

6. Conclusion

The urgency of multimodal indigenous science reconstruction is part of the needs of teachers in science learning in elementary schools which shows a very important category. Multimodal indigenous science is proposed from Javanese culture which is specified with the needs of the elementary school's science scope with the integration of indigenous science carried out in the content, process and product aspects. The results of the initial study suggest that teachers analyze the phenomenon of indigenous science and study it in scientific science which has been adapted to the science curriculum in elementary schools. Apart from that, recommendations for future researchers are to develop learning tools with a multimodal indigenous science approach in the Merdeka Curriculum to strengthen

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scientific literacy and care for the environment in elementary schools. This research is an early stage of development research, namely the needs analysis stage. The limitation of this research is the number of samples which are only 160 people. Future research can use a larger sample to obtain data that can be generalized.

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