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INTEGRATION OF LOCAL WISDOM IN SCIENCE LEARNING TO IMPROVE SCIENCE LITERACY OF JUNIOR HIGH SCHOOL STUDENTS

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Abstract

This study aims to describe the integration of local wisdom in Natural Science (IPA) learning as an effort to improve the science literacy of junior high school (SMP) students. Science literacy is the ability of students to understand scientific concepts, apply this knowledge in daily life, and make decisions based on scientific understanding. The method used is research and development with the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model. Integrated local wisdom includes traditional practices of local communities in environmental management, herbal medicine, and simple culture-based technology. The results of the study show that the integration of local wisdom in science learning can increase students' active involvement, foster curiosity, and relate science material to the real context around them. In addition, students become better able to understand scientific concepts through approaches that are relevant to their lives. Expert validation and test results show that the learning tools developed are in the category of being very valid and effective to implement. Thus, the integration of local wisdom in science learning can be an innovative strategy to improve the science literacy of junior high school students in a meaningful and contextual way.

Keywords: Local Wisdom, Science Learning, Science Literacy, Junior High School Students, Learning Tool Development

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INTRODUCTION

Science education at the junior high school (SMP) level plays a strategic role in shaping the young generation who have the ability to think critically, are literate in the development of science and technology, and are able to make decisions based on scientific evidence. In the midst of increasingly complex global challenges, mastery of natural sciences (IPA) is an urgent need, not only to produce scientists, but also to produce intelligent and scientifically

responsible citizens. Unfortunately, the condition of science literacy of students in Indonesia is still relatively low. Data from the Program for International Student Assessment (PISA) in 2018 shows that Indonesia is ranked 71st out of 79 countries in terms of science literacy, with an average score of only 396, far below the OECD country average of 489. This figure is a reflection of the weak ability of Indonesian students to understand scientific concepts and apply them in their daily lives. This low science literacy is an important signal for the world of education to improve immediately. One approach that is believed to improve the quality of science learning while improving students' science literacy levels is to integrate local wisdom into the teaching and learning process. Local wisdom contains values, knowledge, and practices that have developed and are firmly rooted in the lives of local communities. These values are not only part of cultural identity, but also reflect practical knowledge that is passed down from generation to generation and is highly relevant to students' daily lives. The integration of local wisdom in science learning can provide a closer and more meaningful learning context for students, making scientific concepts easier to understand because they are juxtaposed with the direct experience they have in their communities.

This kind of contextual approach not only enriches the content of the learning material, but also increases student participation and motivation to learn. Research conducted by Suryanti (2020) shows that the use of teaching materials based on local wisdom can significantly increase students' science literacy, especially at the elementary school level. The interconnectedness between scientific concepts and the social and cultural realities of students encourages them to think reflectively and critically, so that their understanding becomes more deep. In the context of junior high education, Setyowati (2019) also found that Student Worksheets (LKS) that integrate local wisdom and science literacy are able to improve students' critical thinking skills, especially in processing information, identifying cause-and-effect relationships, and formulating arguments based on strong evidence. In addition, the results of Pamungkas et al.'s (2018) research show that the science learning model based on local wisdom is not only able to improve learning outcomes, but also students' creativity in solving problems. The integration of local wisdom in science learning is actually able to create a bridge between modern science and traditional values that already exist in society. In their daily lives, students often interact with various forms of local practices that contain scientific principles, such as the use of herbs for medicine, traditional agricultural techniques, or community-based water management systems. When this practice is raised in learning, students will find it easier to see the relationship between science and the reality around them. Thus, learning no longer feels abstract and far from real life, but rather becomes a contextual, relevant, and curiosity-stimulating learning experience.

However, the application of this approach in the field still faces a number of challenges that are not light. One of the main obstacles is the difficulty of teachers in identifying and integrating elements of local wisdom that are relevant to science material. The lack of references, practical guidance, and support from schools makes teachers often rely on conventional learning approaches that are theoretical and lack local context. In addition, there are not many learning resources or teaching tools specifically designed to combine science materials with elements of local culture. Teachers also often do not have enough time or training to prepare contextual teaching materials independently. These obstacles show the need

for a strategy for developing a science learning model that is systematic, structured, and easily adopted by teachers in various regions. To answer these challenges, it is necessary to develop a science learning model based on local wisdom that is comprehensively designed, starting from the selection of appropriate teaching materials, the preparation of learning tools, teacher training, to the evaluation of student learning outcomes. This model not only presents a thematic integration of science content and local culture, but is also complemented by an interactive and participatory pedagogical approach, such as *Project-Based Learning*, group discussions, and field exploration. In its implementation, students can be invited to observe the cultural practices around them, interview traditional leaders, or conduct simple experiments based on local materials. In addition to strengthening students' conceptual understanding, this approach also hones their skills in critical thinking, scientific communication, and appreciation for the nation's cultural heritage.

Research to develop and implement this model is an important step that needs to be done collaboratively by teachers, educational researchers, and other stakeholders. By linking scientific concepts to the local cultural and environmental context, this model is expected to help students understand the subject matter more deeply and meaningfully, while cultivating the scientific thinking skills needed in the 21st century. In addition, this approach can be a real contribution to the preservation of local wisdom which is increasingly eroded by the current of modernization. Students not only learn about science, but also learn to love, understand, and preserve their own culture. With its various potentials and opportunities, the science learning approach based on local wisdom can be an innovative solution in overcoming the low science literacy in Indonesia. For this reason, support from various parties, including the government, educational institutions, and the community, is needed so that this approach can be implemented more widely and sustainably. National curricula and education policies should be more open to local flexibility, providing space for schools to explore the cultural potential of the surrounding area. In addition, teacher training and continuous professional development must be a priority, so that educators have adequate competence in organizing and implementing learning based on local wisdom effectively. In the end, improving science literacy is not solely about chasing numbers or international rankings, but rather about forming Indonesian people who are able to understand, reason, and make decisions based on science, without abandoning their cultural roots and local identity. Science education that is contextual, inclusive, and relevant to students' lives will be a strong foundation for the formation of future generations who are resilient, intelligent, and characterful.

METHODS

This research is a type of research and development that adapts the ADDIE model, which includes five main stages, namely *Analysis, Design, Development, Implementation*, and *Evaluation*. This model was chosen because it is able to provide a systematic flow in developing contextual and effective learning tools (Sari et al., 2021). The subject of the study was a grade VIII student in one of the junior high schools located in the West Nusa Tenggara region. In the analysis stage, the researcher identified the needs of students and teachers in science learning and explored the potential for relevant local wisdom to be integrated into

learning materials, such as the practice of traditional ulcer medicine using local herbal ingredients such as ginger, betel leaves, and temulawak (Safitri & Handayani, 2022). The design stage involves the preparation of learning tools based on local wisdom in the form of science modules that contain science literacy and critical thinking activities. Furthermore, at the development stage, the device is validated by material experts and learning media experts to ensure the quality of the content and appearance of the module (Lestari et al., 2020). The implementation stage was carried out through a limited trial in the classroom with the implementation of learning for three meetings to see the initial effectiveness of the module on student engagement and understanding (Prasetyo et al., 2023). The final stage, namely evaluation, is carried out using instruments in the form of science literacy tests, observation of student involvement, and questionnaires of students' perceptions of learning based on local wisdom. The use of this instrument aims to obtain a comprehensive picture of the impact of modules on learning outcomes and student responses (Rahmawati & Azizah, 2021).

RESULT AND DISCUSSION

The development of Natural Sciences (IPA) learning modules based on local wisdom is a strategic effort in bridging modern science with local traditions and cultures that live in the community. This module is specifically designed to integrate the material of the human digestive system with traditional medicine practices of the Sasak people, such as the use of herbal plants—ginger, betel leaves, and temulawak—which have long been used to treat gastric disorders. The development process follows the systematic stages of ADDIE's instructional design model which consists of five main steps, namely: *Analysis*, *Design*, *Development*, *Implementation*, and *Evaluation*. The first stage begins with a needs analysis that includes identifying gaps between teaching materials and local contexts that students are familiar with. Then, at the design and development stage, science materials are combined with local practices to produce modules that are not only informative, but also contextual and grounded.

This module is validated by two experts, each in the field of science materials and learning media. The validation process aims to ensure that the modules developed meet the feasibility standards both in terms of content, presentation, language, and graphic aspects. The validation results showed that the module earned an average feasibility score of 92%, which was categorized as "very valid". High scores were obtained in terms of content suitability with the national curriculum, depth and breadth of material, and scientific accuracy. In addition, the integration of local contexts received high appreciation because it was considered to be able to provide a bridge between science and cultural values that students already knew from an early age. Attractive visualizations, the use of local illustrations, and a communicative layout make this module not only suitable for use in the classroom, but also able to attract students' attention and interest in learning. These findings reinforce the idea that local wisdom-based modules not only enrich teaching materials, but also become a reflective medium between tradition and modern science, as also affirmed by Suryani et al. (2022). After the development phase is completed, the module is implemented on a limited basis in class VIII for three meetings. This implementation aims to test the effectiveness of the module in the context of real learning. The measurement results were carried out through pretest and posttest to see changes in students'

understanding of the concept of the human digestive system after using the module. The average score of the students' pretest was at 62, which then increased significantly to 82 after learning using the module. This increase in score reflects that the use of modules based on local wisdom is able to effectively improve students' science literacy. Science literacy is measured not only through the mastery of concepts, but also students' ability to apply the concept to the real situations they encounter in daily life.

In addition to cognitive outcomes, observations of student engagement during learning also showed encouraging indicators. As many as 87% of students were observed to be active in various learning activities, ranging from group discussions, answering questions, to expressing personal opinions related to the relationship between traditional medicine and the working system of the human digestive organs. This enthusiasm cannot be separated from the contextual approach used in the module. Students feel that the material presented is relevant and close to their lives, thus sparking further interest and curiosity. This is in accordance with the findings of Fitriyani et al. (2020) and Dewi and Asih (2023), who stated that contextual materials are able to increase learning motivation and active participation of students in the learning process. In this context, modules serve not only as a learning resource, but also as a tool for sparking cultural dialogue and scientific reflection rooted in students' lives. Furthermore, learning with a local wisdom approach brings significant added value to the quality of science education. This module not only focuses on cognitive achievements, but also touches on the affective and social realms of students. In learning about the digestive system, for example, students are invited to analyze natural ingredients that are commonly used by the Sasak people in overcoming gastric disorders, such as curcuma boiled water which is known as fat loss, ginger as a natural anti-inflammatory, and betel leaves which are often used as traditional antiseptic. From there, students are asked to explain the working process of the active compounds in these materials scientifically. It builds awareness that science is inseparable from everyday life and that scientific knowledge can be used to understand cultural practices in a more critical and rational way.

These findings are in line with the results of Yuliati and Sumarni's (2020) research, which stated that science learning based on local culture significantly improves students' conceptual understanding and science literacy. This contextual learning makes students not only memorize facts, but also connect information with cultural values they have. Thus, the knowledge gained becomes more meaningful and easy to remember. Even more than that, students are not only consumers of knowledge, but also active actors in building knowledge based on observations, experiences, and reflections on their local lives. It is also in line with the spirit of the Independent Curriculum which emphasizes project-based, differentiated, and environment-oriented learning of students. Last but not least, this learning approach also contributes to strengthening students' cultural identity and character. In the learning process, students are not only invited to get acquainted with traditional medicine practices, but also conduct interviews with families or traditional elders to dig up information about the use of local herbs. This activity encourages students to interact with their social environment, appreciate hereditary knowledge, and build awareness of the importance of preserving local culture in the modern era. This aspect enriches the goals of science education which not only relies on logical reasoning, but also develops empathy, appreciation, and social responsibility

towards the environment and society. In line with that, Rosidah et al. (2021) emphasized that science learning based on local wisdom is able to form an appreciative attitude towards one's own culture and foster scientific awareness rooted in traditional values.

From the entire process of development, validation, implementation, and analysis of learning outcomes, it can be concluded that science learning modules based on the local wisdom of the Sasak community are very feasible as a contextual and effective learning resource. This module successfully integrates science with local values in a harmonious manner. It not only improves students' academic achievements, but also fosters a love for local culture, strengthens self-identity, and hone critical and reflective thinking skills. These modules are representations of wholesome learning, emphasizing not only "what students know," but also "how students understand, apply, and value that knowledge in real life." With these promising results, it is highly recommended that a similar approach be applied more widely in science learning at various levels. The development of modules similar to other local wisdom bases, such as Balinese, Minangkabau, or Papuan cultures, can enrich Indonesia's diverse educational heritage. In addition, there is a need for policy support from schools and local governments to encourage teachers to develop contextual teaching materials that are in favor of local potential. The integration of local wisdom in learning is not only a pedagogical tool, but a tangible manifestation of education that is grounded, inclusive, and highly transformative.

CONCLUSION

The integration of local wisdom in Natural Sciences (IPA) learning has proven to be effective in improving the science literacy of junior high school (SMP) students. By linking science materials, such as the human digestive system, with traditional medicine practices of the Sasak people that utilize natural ingredients such as ginger, betel leaves, and curcuma mushrooms, students can understand scientific concepts in a more concrete and contextual way. This approach not only makes it easier for students to understand the material, but also encourages their active involvement in the learning process. Students become more enthusiastic, critical, and reflective because learning is based on familiar cultural experiences in their daily lives.

More than just cognitive improvement, learning based on local wisdom also contributes to shaping students' character. Values such as pride in one's own culture, concern for the environment, and respect for local traditions are part of the learning process. Therefore, this approach deserves to be applied more widely in science education in schools. However, successful implementation requires special training for teachers to be able to develop culture-based learning tools systematically and in accordance with the curriculum. In addition, there is a need for policy support from schools and education offices so that the integration of local wisdom is not only a limited initiative, but part of a sustainable national learning strategy.

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