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# Eksplorasi Pembelajaran Biologi Berbasis Kearifan Lokal di Jawa Tengah Indonesia

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**Abstrak**

Penelitian ini bertujuan untuk mengeksplorasi bentuk-bentuk kearifan lokal yang dapat diintegrasikan dalam pembelajaran Biologi di tingkat sekolah menengah atas serta menganalisis tantangan dan peluang pelaksanaannya dalam pengelolaan Musyawarah Guru Mata Pelajaran (MGMP) Biologi di Provinsi Jawa Tengah, Indonesia. Pendekatan yang digunakan bersifat kualitatif dengan metode eksploratif dan studi kasus, melibatkan wawancara, *Focus Group Discussion* (FGD), observasi, dan analisis dokumen. Subjek penelitian adalah pengurus MGMP Biologi yang berpengalaman dalam pengembangan pembelajaran berbasis lokal. Hasil penelitian menunjukkan bahwa kearifan lokal seperti tradisi nyadran, ngapem, penggunaan obat herbal, pemanfaatan tanaman obat, dan pengamatan ekosistem telah berhasil diintegrasikan ke dalam pembelajaran Biologi dan memberikan dampak positif terhadap kemampuan kognitif, sikap afektif, dan keterampilan psikomotorik siswa. Namun, terdapat beberapa kendala, seperti keterbatasan bahan ajar, kurangnya pelatihan guru, minimnya kerja sama dengan masyarakat, serta keterbatasan waktu dan fleksibilitas kurikulum. Oleh karena itu, diperlukan kolaborasi antara MGMP, sekolah, pemerintah daerah, dan perguruan tinggi untuk mengembangkan perangkat ajar kontekstual, memberikan pelatihan bagi guru, serta merancang kebijakan yang mendukung pembelajaran Biologi berbasis nilai kearifan lokal agar lebih relevan dan bermakna bagi siswa.

**Kata Kunci**: Pembelajaran Biologi; Kearifan Lokal; MGMP Biologi Provinsi Jawa Tengah

# *Exploration of Biology Learning Based on Local Wisdom in Central Java Indonesia*

**Abstract**

*This research aims to explore the form of local wisdom that can be integrated in Biology learning at the high school level and analyze the challenges and opportunities for its implementation within the management of the Biology Subject Teacher Conference (Musyawarah Guru Mata Pelajaran/MGMP) of the Senior High School of Central Java Province, Indonesia. The approach used is qualitative with exploratory methods and case studies, involving interviews, Focus Group Discussions, observations, and document analysis. The subject of the study is MGMP Biology administrators who are experienced in the development of locally-based learning. The results of the study show that local wisdom such as nyadran, ngapem traditions, herbal medicine, medicinal plant utilization, and ecosystem observation have been successfully integrated into Biology learning and have a positive impact on students' cognitive abilities, affective attitudes, and psychomotor skills. However, there are several obstacles, such as limited teaching materials, lack of teacher training, lack of collaboration with the community, and limited time and curriculum flexibility. Therefore, collaboration is needed between MGMP, schools, local governments, and universities to develop contextual teaching tools, provide teacher training, and design policies that support Biology learning based on local wisdom values to be more relevant and meaningful for students.*

***Keywords:*** *Biology Learning; Local Wisdom; MGMP Biology Central Java Province*

## 1. Introduction

Indonesia has a wealth of local wisdom that reflects cultural values and traditions that have been inherited from generation to generation by the community. In the context of education, the development and application of learning methods relevant to local wisdom is getting more and more attention (Widiarini et al., 2025). Biology Education in Indonesia plays a crucial role in shaping students' understanding of fundamental scientific concepts related to life and the natural world around them. Local wisdom that includes knowledge, values, and practices that are passed down from generation to generation by the community can be a very valuable resource in supporting learning. Therefore, it is important for teachers to explore the potential of local wisdom to improve the quality of education. The integration of local wisdom in learning is crucial to preserve culture while improving students' understanding of subject matter (Rahmi et al., 2025). Integrating local potential significantly improves learners' scientific literacy, process skills, and scientific attitudes, thus strengthening the urgency of applying this approach in the classroom (Imtihana & Djukri, 2020). Sriyati et al (2021) confirmed that local wisdom-based teaching materials significantly improved students' problem-solving skills.

The Local Wisdom Approach serves as a mediator by navigating the intersection between different elements, ensuring a balanced integration between traditional and contemporary, local and global, thus contributing to a more inclusive and culturally sensitive approach in various domains, including Education (Asmayawati et al., 2024). The integration of local wisdom values is recommended to encourage a new paradigm in global competence, which aims to achieve the profile of Pancasila students through character education in pioneer schools (Rachman et al., 2024). This approach not only enriches the student's learning experience, but also forms a more adaptive character rooted in local values (Ashila & Utami, 2025). The traditional area represents a feasible and relevant source for learning, based on aspects such as curricular alignment, safety, efficiency, and accessibility-highlighting the strong connection between local culture and science education (Ilhami et al., 2018). The local wisdom-based teaching materials, such as traditional agricultural practices and rituals, significantly improved students' problem-solving skills, highlighting the transformative role of indigenous knowledge in education (Sriyati et al., 2021). Project-based learning combined with local wisdom via digital platforms enhanced science process skills, showing that local culture can effectively support 21st-century learning demands (Lidi & Daud, 2021).

Although the concept of learning based on local wisdom has received attention in various education sectors, its implementation in the classroom is still very limited, especially among the administrators of the Biology Subject Teacher Conference (Musyawarah Guru Mata Pelajaran/MGMP) of Central Java Province. Most of the Biology learning in schools is still oriented towards global theories and pays little attention to the elements of local culture (Anwar, 2021). In fact, understanding and applying local wisdom in learning Biology can provide a more real context for students, increase understanding of concepts, and foster a sense of love for the local environment and culture (Yektyastuti et al., 2024). The students' science process skills can be improved through outdoor learning connected to ecological and cultural issues, underscoring the importance of utilizing local contexts in biology education

(Hamidah & Suryadarma, 2021). For example, the understanding of the people of Central Java about rice cultivation patterns, the use of medicinal plants, or sustainable nature management methods can be used to explain various biological concepts such as ecosystems, biodiversity, or biotechnology. Therefore, there is an urgent need to explore how Biology learning based on local wisdom can be applied more widely at the management level of MGMP Biology in Central Java Province.

This study aims to explore the application of Biology learning based on local wisdom in the management of MGMP Biology in Central Java Province. This research focuses on identifying forms of local wisdom that have been or have the potential to be integrated in Biology learning, as well as analyzing challenges and opportunities in their implementation. This research can provide insight into how local wisdom is integrated in Biology learning, as well as how it can increase the relevance of learning for students. In addition, this research can also provide strategic recommendations in efforts to develop the professionalism of Biology teachers, especially in the preparation of teaching materials that are more contextual and based on local cultural values. The urgency of this research lies in the urgent need to preserve existing local wisdom through formal education. By integrating the values of local wisdom in Biology learning, students not only gain scientific knowledge, but also understand and appreciate their local culture.

## 2. Methods

This study uses a qualitative approach with exploration methods and case studies that aim to deeply understand the application of Biology learning based on local wisdom by the management of MGMP Biology of Senior High Schools of Central Java Province, Indonesia. The research activities were carried out in a blended manner, onsite participants took place in Universitas PGRI Semarang Indonesia and online participants in Zoom Meetings. The subject of this study is the management of MGMP Biology of Central Java Province who has experience in developing and implementing Biology learning at the high school level (high school and vocational). Data collection was carried out by in-depth interview techniques, Focus Group Discussion (FGD), participation observation, and documentation.

The collected data was analyzed using thematic analysis techniques, which included several stages. First, the researcher familiarizes the data by reading and studying the data obtained from interviews, FGDs, observations, and documentation to gain an initial understanding of the context and content of the data. Furthermore, the data is coded according to relevant themes, such as integrating local wisdom in Biology learning, challenges faced, and existing opportunities. After that, the researchers identified the main themes by grouping the codes found into larger and related themes. These themes are then analyzed to identify patterns or relationships between emerging issues. In the final stage, the researcher draws conclusions to formulate the main findings and provide a comprehensive interpretation of the application of Biology learning based on local wisdom, as well as the challenges and opportunities faced by the MGMP management. The process also involves triangulation to ensure the validity and validity of the data, by comparing findings from different sources and data collection techniques.

## 3. Result And Discussion

Based on the results of the research questionnaire, data findings on the implementation of local wisdom in Central Java were obtained as follows.

**Tabel 1.** Results of the questionnaire on the implementation of local wisdom in central java in biology learning

| No. | Statement | Present (%) | | | |
|---|---|---|---|---|---|
| | | Strongly Disagree | Disagree | Agree | Strongly Agree |
| 1. | Know the concept of local wisdom that is relevant to Biology learning. | 0 | 0 | 20 | 80 |
| 2. | Integrating examples of local wisdom in Biology teaching materials in the classroom in line with the spirit of Deep Learning. | 0 | 0 | 13,3 | 86,7 |
| 3. | Never used local cultural knowledge as part of learning Biology. | 40 | 60 | 0 | 0 |
| 4. | The integration of local wisdom makes learning Biology more relevant in daily life for students. | 0 | 0 | 33,3 | 66,7 |
| 5. | The integration of local wisdom in Biology learning makes the material easier for students to understand. | 0 | 0 | 33,3 | 66,7 |
| 6. | Biology learning based on local wisdom can have a positive impact on students' attitudes in appreciating local culture. | 0 | 0 | 26,7 | 73,3 |
| 7. | Believe that the integration of local wisdom in Biology learning can improve students' skills. | 0 | 0 | 33,3 | 66,7 |
| 8. | Biology learning based on local wisdom cannot enrich the learning experience of students. | 80 | 20 | 0 | 0 |
| 9. | The Biology subject curriculum developed by MGMP Biology at SMA Central Java currently contains local wisdom in Biology learning. | 0 | 6,7 | 60 | 33,3 |
| 10. | There are obstacles in accessing teaching materials based on local wisdom for Biology learning. | 13,3 | 46,7 | 33,3 | 6,7 |
| 11. | Seeing an opportunity to develop Biology learning based on local wisdom with support from MGMP Biology. | 0 | 0 | 20 | 80 |

| No. | Statement | Present (%) | | | |
|---|---|---|---|---|---|
| | | Strongly Disagree | Disagree | Agree | Strongly Agree |
| 12. | There is a need for teaching materials or references that can help teachers in integrating local wisdom in Biology learning. | 0 | 0 | 20 | 80 |
| 13. | They have never received adequate training or workshops to develop Biology learning based on local wisdom. | 0 | 20 | 33,3 | 46,7 |
| 14. | It is necessary to hold training or workshops that can help teachers in integrating local wisdom in Biology learning. | 0 | 0 | 20 | 80 |
| 15. | The management of the MGMP Biology of Central Java Province supports the development of Biology learning based on the local wisdom of Central Java. | 0 | 0 | 20 | 80 |

The results of the study show that most of the management of MGMP Biology High School in Central Java Province have high awareness of the importance of integrating local wisdom in biology learning. This can be seen from the percentage of questionnaires that agree that local wisdom can strengthen the relevance of biology materials to students' daily lives. These findings are in line with previous research that confirms that local wisdom-based learning model and tools was quite effective in improving student learning outcomes (Ramdiah et al, 2020).

The integration of local wisdom in Biology learning is very relevant to the Deep Learning approach, which emphasizes meaningful understanding and the interconnectedness between concepts, rather than just memorizing facts. Based on the results of the questionnaire, 86.7% of respondents strongly agreed and 13.3% agreed that the integration of local wisdom is in line with deep learning. This implementation aims to ensure that learning is not only theoretical but can be connected with students' daily lives. Learning by integrating local wisdom can enrich Biology material contextually and encourage students to think at a high level, be emotionally engaged, and work collaboratively in cultural and environment-based projects. This integration also fosters cultural and ecological awareness that is essential for the formation of students' character (Novenea et al., 2023; Wachidah et al., 2024). This corresponds to Regulation Minister of Basic Education and Intermediate Republic of Indonesia Number 13 Year 2025 (2025), which states that local content can be integrated into other subjects. This can be one of the efforts to realize learning that is relevant to the lives of students. Thus, Biology learning based on local wisdom becomes more meaningful, fun, and supports environmental conservation. Biology learning based on local wisdom makes students have an awareness to preserve the

environment, meaningful because it comes into direct contact with the surrounding life, and fun because it utilizes natural resources (Rai & Subrata, 2023).

Based on the results of the questionnaire, 66.7% stated that the integration of local wisdom makes Biology learning more relevant in daily life for students. Based on the interview, the management of MGMP Biology High School in Central Java Province realized that the Independent Curriculum provides flexibility for schools to develop learning in accordance with local potential and uniqueness. This policy supports the integration of local potential and uniqueness that aims to make learning more relevant, meaningful, and contextual for students. Thus, the natural resources found in the surrounding environment can be used as a learning resource that can improve the quality of innovative education and foster environmental sustainability (Pantiwati, 2015).

As a follow-up to this awareness, the management of MGMP Biology has developed various forms of integration of local wisdom in several teaching materials. In the Biodiversity material, for example, species names are applied in the local language and associated with the Nyadran tradition. In the Biotechnology material, students are introduced to the use of local plants as food and beverages, processing pineapple peel waste into *Eco Enzyme*, the tradition of "Ngapem" or the making of apem cakes typical of Central Java, as well as the use of essential oils from various parts of plants for perfume products. The material of Hereditas is also integrated with cultural values through the concept of "seeds, bebet, and weights" used in the traditional Javanese wedding tradition. Through culture, societies develop their own set of norms and practices. Then, these practices are ultimately embedded in the life of the community (Agung et al., 2024). These approaches prove that Biology material can be developed creatively by exploring local potential.

In addition, the MGMP management has also carried out various learning activities that support the strengthening of local wisdom values. Some of them are the process of making traditional herbal medicine integrated with Biotechnology and Biodiversity materials, observation of rhizome plants as herbal ingredients, and visits to mushroom cultivation sites in Mranggen. Other activities include the integration of the Tegal language and Javanese script in species naming, the use of honey as an ingredient in the Pancasila Student Profile project, and implementation of strengthening independent student character through art program to strengthen character by reflecting on the value of local wisdom. In fact, students are also involved in Cultural Week as a tangible form of celebration and cultural preservation. These findings show that the management of MGMP Biology not only has theoretical awareness, but has also implemented concrete steps in realizing Biology learning based on local wisdom in a sustainable manner. Integrating local culture into education goes beyond mere familiarity with one's own cultural heritage; This includes an appreciation of cultural diversity on a global scale (Sakti et al., 2024).

The implementation of local skills in biology learning has a positive impact on several aspects of students, including cognitive aspects, affective aspects, and psychomotor aspects (Laili et al., 2023). On the cognitive aspect, this integration makes learning more contextual and meaningful because students are directly involved in the learning process through real-life examples that they are familiar with in everyday life (Andira & Akbar, 2025). This is also shown by the results of the survey of 66.7% which states that the integration of local wisdom

makes Biology material easier for students to understand. In addition, the implementation of local wisdom in this biology material will help students to analyze, and create solutions to environmental problems based on biological understanding associated with cultural values (Pantiwati, 2015). In the interviews that have been carried out, the application of local wisdom has been carried out starting from the level of understanding of concepts and application, students more easily understand the material through traditions such as "earth alms" and application in the use of medicinal plants. Meanwhile, at the level of high-level thinking (analyzing, evaluating, and creating), students are given the task of creating educational posters or forest conservation strategies based on local values, which stimulate critical and creative thinking skills. This contextual approach not only improves cognitive outcomes but also supports the affective and ethical dimensions of science education (Mashami et al., 2025).

Another positive impact can be seen in the affective aspect, where local cultural values that are rich in moral and ethical messages are able to strengthen students' character education. This is supported by the results of the questionnaire which stated that as many as 73.3% of respondents strongly agreed that Biology learning based on local wisdom can have a positive impact on students' attitudes in respecting local culture. This is also supported by interviews that state that in this kind of learning, students not only receive Biology material theoretically, but also experience firsthand the learning process that involves noble values such as mutual cooperation, care, responsibility, and gratitude. For example, this integration fosters a sense of love for the homeland, responsibility for environmental conservation, and pride in one's own culture. Some of the characters formed include independence and creativity, such as when students solve the problem of spoiled milk by making processed innovations; honesty and responsibility in maintaining product quality; as well as cooperation and mutual cooperation when working in groups. Fadilah et al (2023) stated that the natural resources owned by Indonesia can be implemented in learning. The diversity of ecosystems, endemic flora, and traditional practices of the local community can be a contextual bridge between the subject matter and the real life of students This integration not only supports a deep understanding of concepts, but also instills the values of local wisdom, environmental conservation, and strengthens students' character as citizens who love culture and nature. This reflects efforts to strengthen emotional and cultural ties through the use of local resources (Mahaswa & Syaja, 2025).

The psychomotor aspect of students is also improved through practice-based learning activities that are connected to local culture. The results of the questionnaire showed that 66.7% of respondents strongly agreed that the integration of local wisdom in Biology learning can improve students' skills. This can be seen from activities such as observation, field practice, and traditional simulations that can train students' skills directly. For example, the practice of processing milk involves stages such as cleaning, fermentation, and packaging, which strengthens students' practical and technical skills. In addition, students also practice fine and gross motor coordination through activities such as mixing ingredients or using traditional tools. Not only that, the skills of working together in groups and communicating effectively are also honed during the process.

Concrete examples of learning activities that strengthen students' skills include the practice of managing food and beverages from surrounding natural resources, simulating the tradition of "bibit, bebet, bobot" in the context of heredity, and planting mangroves as a form of ecosystem conservation (Putri et al., 2022). Other activities such as the practice of making perfumes from plant essential oils and environmental rescue programs through the 5R and greening principles also show that local wisdom can be a learning vehicle that hone diverse and culturally relevant skills .

Thus, the integration of local wisdom in Biology learning not only improves cognitive, affective, and psychomotor aspects in a balanced manner, but also forms students who are characterful, skilled, and environmentally conscious. This approach is in line with the goals of 21st century education that emphasize meaningful, local context-based learning, and empower students to become independent, collaborative, and adaptive individuals to the environmental and social challenges of their surroundings. Therefore, this integrative practice needs to continue to be developed and supported by all parties in the education ecosystem.

Although the enthusiasm of teachers in developing Biology learning based on local wisdom is relatively high, there are a number of obstacles that are still obstacles in its implementation. Based on the results of the questionnaire, as many as 46.7% of respondents stated that they had never received adequate training or workshops to strengthen their competence in integrating local wisdom values into teaching materials. This condition shows that serious support is still needed in the form of strengthening teachers' capacity through structured training, so that they are able to design learning that is contextual and relevant to the local potential of each region. Without proper training, the integration of local wisdom risks becoming a discourse without effective implementation in the classroom. In addition, about 33.3% of respondents admitted that they experienced obstacles in accessing teaching materials based on local wisdom for Biology learning. This shows that there is still a gap in the availability and distribution of learning resources that support the integration of local values in schools. However, 46.7% of respondents stated that they did not experience similar obstacles, indicating that there are differences in conditions between educational units—both in terms of access to materials, institutional support, and collaboration networks with local communities. This difference emphasizes the importance of providing equitable, relevant, and easily accessible learning resources for all teachers in various regions.

Nowdays, there is a serious risk that the enormous and invaluable local knowledge gained through hundreds of years of experience will be lost (Chibuye & Singh, 2024). The majority of teachers expressed strong hopes for the availability of teaching materials and references that can support the integration of local wisdom in Biology learning. This is reflected in the results of the questionnaire which showed that 80% of respondents strongly agreed with the need for relevant teaching materials to assist teachers in relating Biology material to the cultural context and local potential. In addition, 80% of respondents also expressed their hope that training or workshops would be held that could equip teachers with knowledge and practical skills in integrating local wisdom into the learning process. This hope emphasizes the need for institutional support in the form of providing learning resources and strengthening teacher capacity on an ongoing basis. Thus, the integration of

local wisdom in Biology learning not only enriches the content of the material, but also forms students who are sensitive to the environment, proud of the local culture, and have a complete and contextual understanding of life sciences. These efforts are particularly relevant to support 21st century learning that is not only cognitive-oriented, but also spiritual, social, and life skills.

Based on the results of interviews with the management of MGMP Biology in Central Java Province, a number of strategic steps have been formulated to increase the integration of local wisdom in Biology learning. One of the main efforts proposed is the implementation of training and workshops that focus on the implementation of Deep Learning with a local context. This training not only aims to improve teachers' understanding and skills, but also encourages creativity in designing teaching tools that incorporate cultural elements and regional potential, such as folklore, conservation practices, and the use of traditional natural resources. This knowledge is important for developing local wisdom that varies in different regions (Utami et al., 2025). In addition, the development of thematic learning tools based on local wisdom is also expected to be an important part of supporting the contextual learning process.

In addition, other efforts can be made by establishing cross-sectoral cooperation with relevant agencies, conservation institutions, universities, and local communities to gain access to authentic learning resources, case studies, and field experiences. Educational visits to conservation areas and local ecosystems are designed to strengthen students' and teachers' understanding of the relationship between biological sciences and local wisdom. The establishment of digital libraries, educational multimedia production, and the establishment of local wisdom documentation communities are also alternative efforts that can be made. Mentoring and *Coaching* On an ongoing basis, teachers are able to implement this approach effectively, accompanied by a periodic monitoring and evaluation system that is equipped with awards for the best innovations. Collaboration with universities is also seen as important to enrich insights and strengthen meaningful, deep, and fun learning. Through this integrated effort, this dataset provides valuable insights in developing a more holistic and culturally inclusive educational paradigm that leverages local wisdom to enrich scientific learning and cultural understanding (Ramdiah et al., 2024).

## 4. Conclusion

This study shows that the application of Biology learning based on local wisdom has great potential in improving the quality of learning in schools. The integration of local cultural values in Biology material is able to strengthen contextual understanding of concepts, shape the character of students who care about the environment and culture, and develop practical skills through real-life experience-based activities. The management of the Central Java Provincial Biology MGMP has begun to initiate this integration effort, although it still faces a number of obstacles such as limited teaching materials, training, and external support. MGMP's role as an agent of change is very strategic in encouraging the preparation of locally-based teaching tools and continuous training. Therefore, broader support from various parties is needed to strengthen the implementation of Biology learning based on

local wisdom so that it is more systematic, sustainable, and has a real impact in the world of education.

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