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## The local potential of Peng'Angguran village as a source of biology learning

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### ABSTRACT

Local potential-based learning utilizes regional resources to help students recognize and understand their area's potential while simultaneously developing their skills in resource management and participation in relevant local activities. Therefore, this research aims to identify local potential as a source of biology learning in the Peng'Angguran village that can be integrated into the Merdeka Curriculum. The research method used is qualitative. Data collection techniques are based on literature studies, observations, and interviews. Observations were conducted in Peng'Angguran village and one high school in Metro City, Lampung, along with interviews with the founders and managers of the Peng'Angguran village community, biology teachers, and high school students. Data analysis includes data reduction, data presentation, and data validation. The results of the study indicate that there are various potential local resources, such as grape cultivation, Maggot BSF (Black Soldier Fly), herbal garden, livestock farming including cows, Etawa goats, catfish, KUB layer chickens (Kampung Unggul Balitbangtan), honey bees, biogas, and liquid smoke. The identification and utilization of these local potentials can enhance students' interest and motivation to learn, as well as provide a more contextual and relevant learning experience. Despite the significant potential of leveraging local learning resources, data reveals persistent implementation barriers, underscoring the urgent need for practical integration guidelines.



## INTRODUCTION

Biology education plays a vital role in shaping students' understanding of life and the environment. However, in practice, biology learning often focuses on theoretical aspects and fails to connect the material with relevant local contexts. This can lead to a lack of interest among students in learning biology and a diminished awareness of environmental issues around them (Azizah & Alberida, 2021). Therefore, to facilitate students in the learning process and understanding of the material, the selection of learning resources becomes an important aspect of education. Not only does it serve as a facility for students, but appropriate learning resources will also be more efficient in utilizing a teacher's time (Carroll & Heffernan, 2022). Learning resources can encompass a variety of elements, such as local knowledge, local wisdom, traditions, culture, natural environments, tourist attractions, historical sites, local plants, traditional foods, and various other local potentials. The utilization of these learning resources not only makes learning more contextual (Slamet et al., 2020) but can also foster a sense of love and pride for the surrounding environment (Sakti et al., 2021). One of the aspects that can be implemented in students' daily lives is the utilization of local potential as a source of learning. Local potential-based learning uses the resources of a region to help develop students' skills. The goal of this learning is for students to recognize and understand the potential of their area, as well as to develop skills in managing resources and participating in relevant activities (Saputri & Desstya, 2023).

Education in Indonesia is currently undergoing a transformation with the implementation of the Merdeka Curriculum. This curriculum emphasizes the importance of learning that focuses on developing student competence and character, and linking education to everyday life (Dokumen Monografi Kelurahan Yosodadi, 2022). The Merdeka Curriculum provides learning flexibility through the flexibility of Learning Outcomes (CP) which can be related to the students' environmental conditions (contextual) (Anggraena et al., 2022). CP flexibility can be developed with the local context of the education unit. This creates a wider space for local wisdom and potential to be integrated in learning compared to the previous curriculum. Although the context of local wisdom in the previous curriculum was regulated through PP No. 19 of 2005 article 14 paragraph 1, PP No. 17 of 2010 article 34, and the Ministry of Education's Strategic Plan 2010-2014 regarding the recommendation to include local excellence in learning (Muchsin et al., 2023), it is only in the Merdeka Curriculum that local wisdom gets its own portion. This is regulated through a scheme proposed by the Ministry of Education and Culture through 3 ways, namely integration of local wisdom with other subjects, integration into the theme of the Pancasila Student Profile project and standing alone as a special subject. The existence of rules related to the integration scheme of local wisdom in classroom learning, especially in Biology Subjects, requires teachers to identify local wisdom in their respective regions that can be used as learning materials.

Peng'Angguran Village is one of the villages in Metro City in Lampung Province that has local potential to be integrated into biology learning. The Peng-Angguran Village community is located in Yosodadi Urban Village, East Metro District, Metro City, Lampung Province. Yosodadi Urban Village with area code C.4.2 (18.72.04.1002) was formed in 2000 with the legal basis of Metro City Regional Regulation No. 25 of 2000 concerning the expansion of urban villages and sub-districts in Metro City. The typology of Kelurahan Yosodadi consists of rice fields, farms, plantations, livestock, offices, crafts and small industries, medium and large industries as well as services and trade (Monographic Document of Yosodadi Urban Village, 2022). Based on the observation and Interview Informants from Peng'Angguran Village, this village has several local potentials that are generally recognized such as grape cultivation, Maggot BSF (Black Soldier Fly), herbal garden, livestock farming including cows, Etawa goats, catfish, KUB layer chickens (Kampung Unggul Balitbangtan), honey bees, biogas, and liquid smoke.

Various studies have shown the importance of utilizing learning resources in education. For example, leveraging local potential in the school environment, such as a variety of medicinal plants

found in the school's herbal garden, can serve as a basis for innovation in the development of student worksheets, thereby providing students with real learning experiences (Kurniati et al., 2022). Unique ecosystems, such as those in the Kembang Island area, allow students to engage with scientific concepts in meaningful ways. This method promotes contextual learning, making science more relevant and applicable to students' lives (Purwasih & Wilujeng, 2023). Additionally, the use of appropriate learning media, such as digital technology, can support the utilization of local potential and enhance students' understanding (Hesti et al., 2023). Learning tools based on local potential that incorporate science process skills have been developed and can be used to teach conventional biotechnology concepts (Sriyati et al., 2021). Guided inquiry modules based on the potential and local wisdom of the Tahura War community in Pesawaran Regency, Lampung, on the topics of plant diversity, ecosystems, and environmental changes can be further implemented for students (Jayanti et al., 2020).

Overall, the integration of local potential as a learning resource not only enhances learning outcomes but also helps students develop critical and analytical thinking skills, as well as increase their appreciation for the local environment and culture. Thus, it becomes an effective approach to improving the quality of education and creating more relevant and contextual learning experiences for students. The purpose of this research is to identify the local potential present in the residential area of Peng'angguran Village as a source of learning for high school Biology in Metro City. With the results of this identification, it is essential for teachers to integrate the local potential around the school into their teaching, so that students can more easily construct their knowledge.

## METHODS

This research is qualitative descriptive research (Creswell & Clark, 2017). Data collection techniques are based on literature studies, observations, and interviews conducted in one of the Kampung Peng'angguran areas in Metro City, Lampung Province. This study identifies data sources, which include primary and secondary data. Primary data is obtained directly in the field during the research, specifically from observations and interviews. The primary data sources come from the founders and managers of the Kampung Peng'angguran community, biology teachers, and 10th graders at a high school in Metro City. Secondary data sources are derived from books, journals, and articles relevant to the research topic. The instruments used for data collection in this study are interview questions and observation sheets aligned with the research topic. The research consists of several stages, including:

### Literature Review and Data Collection

The first step taken in this phase is a literature review to determine the needs, determine the direction and steps of the research to be taken. The first step is to identify high school Biology learning materials in Phase E. This aims to determine the suitability of Biology materials in the Merdeka Curriculum with the situation in the field, especially related to the local potential of Peng'Angguran village. From this literature review, some information related to Learning Outcomes (CP), Flow of Learning Objectives (ATP) recommendations and Subject Matter in Phase E related to local issues, changes in the ecosystem environment are presented in the following Table 1.

**Table 1.** CP, ATP recommendations and subject matter of biology phase E based on merdeka curriculum

Learning outcomes (CP)	Subject matter phase E biology	Flow of learning objectives (ATP)
At the end of Phase E, students have the ability to create solutions to problems based	Ecosystems and their interactions	Analyzing local wisdom that can prevent

Learning outcomes (CP)	Subject matter phase E biology	Flow of learning objectives (ATP)
on local, national or global issues related to understanding the diversity of living things and their roles, viruses and their roles, Biological technology innovation, ecosystem components and interactions between components and environmental change.		ecosystem imbalance by considering ecosystem components and their interactions.

### Implementation

At this stage, observations were conducted at schools by interviewing 10th-grade Biology teachers at one of the local high schools regarding the selected priority themes and the challenges in implementing the learning process. The interview guidelines for Biology teachers (Table 2) and students (Table 3) are presented in the following table.

**Table 2.** Interview guide for teachers

No	Questions
1	During the one-year implementation of the Merdeka Curriculum (Semester I and II), what priority theme did your school choose to focus on?
2	Could you share what types of local potential from Peng'Angguran Village were integrated into classroom learning to support that chosen theme?
3	What challenges did you face in implementing this priority theme in the classroom—starting from the preparation phase, through to the teaching process, and finally during the evaluation stage?

**Table 3.** Interview guide for students

No	Questions
1	Are you familiar with the Merdeka Curriculum?
2	In the Merdeka Curriculum, there is a priority theme focused on local potential. Do you know what local potential is? Can you give some examples?
3	Have you ever visited the Peng'Angguran Village community? What activities did you do there? What did you discover or learn from the visit?

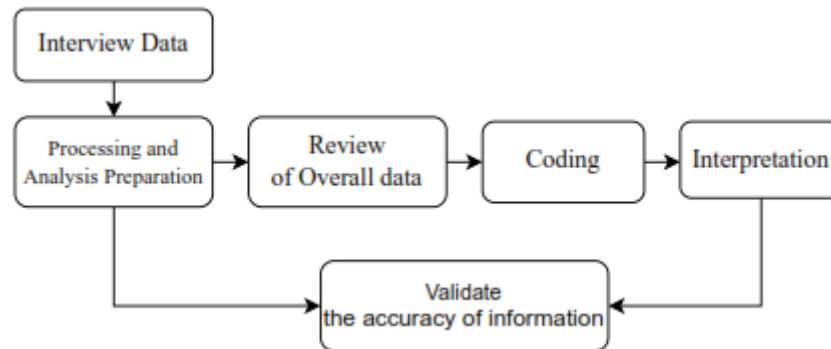
In addition to interviews conducted at the school, interviews were also carried out with several informants from Peng'Angguran Village, as presented in Table 4 below.

**Table 4.** Interview guide with informants from peng'angguran village

Interview guide	
Assalamu'alaikum Sir/Madam, I am currently conducting a research study on the local potential of Peng'Angguran Village as a learning resource for high school Biology. My visit today is intended to ask a few questions regarding the Peng'Angguran Community. With your permission, I would like to conduct this interview and gather information from you as one of the key informants from this village.	
1	Could you tell me about the history of the Peng'Angguran Community?
2	Who were the parties involved in the establishment of the Peng'Angguran Community?
3	What types of local potential exist in Peng'Angguran Village?
4	This village is well known for grape cultivation. Besides grapes, are there any other related natural resources?
5	How is waste managed in this village? Could you describe the process?

### Data Analysis & Interpretation of Results

Data analysis and validation of the accuracy of the obtained information were conducted using a triangulation strategy. In this study, data triangulation was applied by utilizing more than one source of information for comparison and cross-checking purposes. The collected information was then manually coded to identify and categorize data according to themes, facilitating easier data processing. The steps for qualitative data validation follow the validation flow outlined by Creswell (2017), as illustrated in Figure 1 below.



**Figure 1.** Information validation steps according to Creswell (2017)

## RESULTS AND DISCUSSION

### Integration of Local Potential of Peng'Angguran Village in Biology Material Phase E

Local potential is developed in reference to the Biology learning outcomes for Phase E of the Merdeka Curriculum, specifically: At the end of Phase E, students have the ability to create solutions to problems based on local, national or global issues related to understanding the diversity of living things and their roles, viruses and their roles, biological technology innovation, ecosystem components and interactions between components and environmental change. Drawing from these learning outcomes, we synthesized four subject areas with local potential, resulting in an 'educational potential' framework suitable for adaptation in biology lessons. The results of the identification of local learning resources are presented in Table 4.

**Table 5.** Results of integration of local potential of peng'angguran village in biology material phase E

Subject matter phase E	Flow of learning objectives (ATP)	Local potential	Educational potential
Diversity of living organisms and their roles	To understand the levels of biodiversity within the local environment and to critically evaluate the - effectiveness of conservation measures undertaken.	Grapevine ( <i>Vitis vinifera</i> )	Scientific classification, anatomy, physiology and morphology of plants, and the health benefits of grapes.
		BSF (Black Soldier Fly) Maggot Farming	Life cycle of maggots, anatomy, physiology, and morphology of maggots, organic decomposition, utilization of by-products for livestock feed, fish, and organic fertilizer.
		Trigona bee ( <i>Trigona sp</i> )	Bee colony systems, reproductive biology, foraging ecology,

Subject matter phase E	Flow of learning objectives (ATP)	Local potential	Educational potential
			interactions with plants, and the health benefits of Trigona bee products for humans.
		Herbal Garden	Botany, Learning about the growth and development of medicinal plants and vegetables.
Ecosystems and their interactions	Analyzing local wisdom that can prevent ecosystem imbalance by considering ecosystem components and their interactions.	Ploughing rice fields with cows	<ol style="list-style-type: none"> <li>1. Ecology: The interaction between humans, animals (cows), and the environment (rice fields) in the ploughing process.</li> <li>2. Animal Physiology: The physiological adaptation of cows to perform ploughing activities.</li> <li>3. Soil Biology: The impact of ploughing on soil structure and fertility.</li> <li>4. Environmental Conservation: The importance of maintaining the balance of the rice field ecosystem and preserving local wisdom.</li> </ol>
		Minapadi: Fish farming carried out in conjunction with rice cultivation ( <i>Oryza sativa</i> )	Organic farming techniques and agricultural ecosystems.
Environmental changes and pollution	To plan and carry out an investigation to determine the causes and impacts of environmental changes, and to campaign for solutions to prevent them.	Management and cultivation of local livestock such as: <ol style="list-style-type: none"> <li>1. Cows (<i>Bos taurus</i>)</li> <li>2. KUB layer chickens</li> <li>3. Etawa goats (<i>Capra aegagrus-hircus</i>), Catfis (<i>Clarias Batrachus</i>)</li> </ol>	<ol style="list-style-type: none"> <li>1. Anatomy, physiology, and morphology of livestock.</li> <li>2. Biotechnology, such as genetic engineering, plays a role in increasing livestock production, for example by producing livestock that are more disease resistant or produce more milk.</li> <li>3. Biotechnology techniques are also used to produce vaccines, growth hormones, and high-quality animal feed.</li> <li>4. Hybridization techniques (crossbreeding) and artificial insemination utilize biological principles to produce livestock offspring with desired traits.</li> <li>5. Reproductive biology.</li> </ol>

Subject matter phase E	Flow of learning objectives (ATP)	Local potential	Educational potential
			6. Microbiology and immunology, which help in understanding diseases that affect livestock and how to prevent and treat them.
	To analyze various types of waste and useful natural materials, along with their management methods.	<ol style="list-style-type: none"> <li>1. Recycling and management of organic waste from Metro City</li> <li>2. Vegetable Market and grape plants for maggot feed.</li> <li>3. Recycling process of cow manure waste</li> <li>4. Management for biogas production.</li> <li>5. The recycling process of rice husk waste</li> <li>6. Management for the production of liquid smoke.</li> <li>7. Kasgot fertiliser is the process of composting organic waste by BSF larvae.</li> <li>8. Management of goat manure into organic fertiliser.</li> </ol>	<ol style="list-style-type: none"> <li>1. Environmental biotechnology.</li> <li>2. Organic waste management.</li> <li>3. Goats and cows manure waste has great potential in the field of biotechnology, both for environmental management and increasing agricultural productivity.</li> </ol>
Biological Technology Innovation	To understand local and global issues related to the development of innovations in biological technology.	<ol style="list-style-type: none"> <li>1. Production of Rice Husk Liquid Smoke.</li> <li>2. Dapur Bumi (Boiled Refilled Gallon Water Business).</li> <li>3. Etawa Goat Milk.</li> <li>4. Trigona Honey.</li> <li>5. Kasgot Fertilize.</li> </ol>	<ol style="list-style-type: none"> <li>1. Liquid smoke: Agricultural biotechnology.</li> <li>2. Kasgot: Conventional biotechnology, livestock feed supply.</li> <li>3. Biogas: Conventional Biotechnology.</li> </ol>

The results shows that the abundance of local potential that can be utilised in learning and maximised for innovation in biology education (Table 5). Various studies have highlighted the importance of utilising local potential in the context of biology education. The identification of local potential in grapevines (*Vitis vinifera*), rice (*Oryza sativa*), vegetables, and medicinal plants in Peng'Angguran Village provides students with the opportunity to learn directly about biodiversity, the structure and function of plant organs, and local ecosystems. Additionally, local plant resources can serve as valuable biology learning materials, as demonstrated by Slamet et al. (2020) in their study on the potential of local plants from Buton Island as a source of biology education. Wahyuni et al. (2023) reported that the community of Paciran Village, Lamongan Regency, employs 46 plant species for daily use, categorized into traditional medicine, food, and ornamentals. Traditional medicine is the predominant use, with most related knowledge transmitted orally and

embedded as a form of local wisdom. An example of a classroom practical or research project that uses local flowers to teach concepts of evolution and biodiversity—relevant for designing fieldwork and locally based inquiry activities (Ahuja, 2021).

Identifying the potential of local Black Soldier Fly (BSF) maggots, Trigona bees (*Trigona sp*), and Livestock farming can be utilised as learning resources related to environmental change, making learning more tangible in addressing environmental issues. Here is an example of a lesson design about ecosystems and the environment that utilizes the local potential of Peng'Angguran Village to meet the Biology learning objectives for senior high school according to the Merdeka Curriculum in Table 6.

**Table 6.** Lesson design about ecosystems and the environment that utilizes the local potential of peng'angguran village

Component	Description
<b>Learning Objectives</b>	1) Identify biotic & abiotic components in the local ecosystem. 2) Analyze interactions between ecosystem components. 3) Evaluate environmental problems and propose solutions based on local potential. 4) Present observations in written reports and oral presentations.
Component	Description
<b>Learning Outcomes (LO)</b>	<b>Phase E (Grade X)</b> – Students can understand the structure and function of ecosystems and analyze the relationships between biotic and abiotic components, as well as the impact of human activities.
<b>Integrated Local Potentials</b>	1. Small river & community ponds (aquatic biodiversity). 2. Community gardens (agroforestry ecosystems). 3. Vacant land & shrubland (ecological succession). 4. Community activities: catfish farming, composting, waste management.
<b>Model &amp; Approach</b>	Project-Based Learning (PjBL), contextual learning, local wisdom-based approach.
<b>Learning Steps – Session 1 (Field Observation)</b>	<b>Introduction (15')</b> : Motivation, connecting the topic with daily life, explaining objectives, briefing on observation locations. <b>Main Activities (60')</b> : Group field observation in assigned locations, noting biotic/abiotic components, interactions, and environmental issues. <b>Closing (15')</b> : Share initial findings in class.
<b>Assessment</b>	<b>Knowledge</b> : Short test, observation report. <b>Skills</b> : Observation, analysis, and data presentation. <b>Attitude</b> : Collaboration, environmental awareness.
<b>Final Product</b>	Poster/infographic of the local ecosystem and recommendations for solving environmental problems based on the potential of Peng'Angguran Village.

This aligns with Fitriyani et al. (2021), who state that local potential can be utilised by teachers as a learning resource, particularly in biology lessons, to enhance students' understanding of environmental topics. Additionally, environmental education can serve as an effort to impart environmental knowledge; if environmental knowledge increases, human behaviour towards environmental care can also improve (Rokhmah & Fauziah., 2021; Maesaroh et al., 2021). Biology learning developed with the uniqueness and local potential found in a region, including nature, culture, and local technology, facilitates students' creative thinking skills (Ramdiah et al., 2020). Learning that utilises local potential is expected to enhance students' creative thinking through a learning process integrated with the students' environment, making it easier for students to understand the learning material (Leksono et al., 2020).

Previous researchers have not done much to develop test instruments based on local wisdom and potential. Previous researchers have primarily focused on developing learning modules and learning tools based solely on local wisdom and potential, such as creating learning tools that highlight local potential from the Minangkabau region of West Sumatra, particularly the Sijunjung area, in the context of conventional biotechnology (Sriyati et al., 2021). Some previous researchers also developed guided inquiry modules based on the potential and local wisdom of the Tahura War community in Pesawaran District, Lampung, on the subject of plant diversity, ecosystems, and environmental changes (Jayanti et al., 2020). Additionally, the development of a science literacy test instrument based on local wisdom in Trenggalek aims to train students in improving their science literacy skills (Murti & Sunarti, 2021). The development of a science literacy test instrument based on local wisdom was also conducted in Lamongan District with the same objective (Murti & Sunarti, 2021).

### **Integrating Local Potentials in Biology Learning**

In this study, the results of interviews with teachers and students showed that students only knew about a few local potentials that were generally well known, such as grape cultivation, BSF (Black Soldier Fly) maggot cultivation, and cattle farming. Furthermore, students do not understand the connection between biological concepts and these local resources. For example, students only know one type of grape that is cultivated, while in Kampung Peng'angguran, various types of grapes are cultivated. Additionally, some students only know that cattle manure waste is processed into organic fertiliser, while it can also be processed into biogas, so students cannot explain this. From interviews with Biology teachers at several schools in Metro City, it was found that there are challenges in connecting the material being studied with existing local potential, so they prefer to use examples that are widely known. This results in a lack of knowledge and understanding among students regarding the existing local potential.

Based on a literature review, several researchers have stated that local potential can serve as an effective learning resource in biology education. Wulandari & Djukri (2021), in their study, identified local potential in Lampung as a source for teaching biology in senior high schools. Their research showed that utilizing local potential not only increases students' interest in learning but also helps them better understand biological concepts. The use of locally based learning resources, such as school gardens, parks, and the surrounding environment, can provide a more concrete and applicable learning experience.

Nurhidayati (2021) emphasises that students as prospective teachers need to be accustomed to innovating in learning. One example is assigning students to identify local potential in their neighbourhood and innovate learning by integrating the local potential they find into learning. Sriyati (2020) also emphasises that there is still a need to develop learning resources based on other local potential and wisdom so that the local wisdom of various ethnic groups in Indonesia can be known, understood, and preserved by students as the next generation of the nation. Because culture is the identity of a nation. Integrating students' abilities, including scientific process skills and 21st-century skills, into learning resources based on local wisdom aims to enable students to compete and thrive in real life in the 21<sup>st</sup> century. Further research is still needed that leverages advancements in digital technology integrated with local wisdom in line with the era of the 4th Industrial Revolution. This is also in line with the findings of Abidinsyah et al. (2019), which showed that implementing learning activities that utilize local potential and advantages can enhance students' abilities in scientific content, context, and processes.

Education in Indonesia is currently undergoing a transformation with the implementation of the Merdeka Curriculum. This curriculum emphasizes the importance of learning that focuses on developing students' competencies and character, as well as connecting education to real-life contexts (Kemendikbud, 2022). The intention is for students to concentrate on a reduced amount of content so that learning can be conducted more deeply, resulting in higher quality education (OECD, 2020). Local wisdom and potential are given space within the Merdeka Curriculum to be

integrated with other subjects. To strengthen the Profile of Pancasila Students, projects assigned must be related to exploring local potential (Dapodik, 2022). For example, climate change materials can be linked to environmental issues in the surrounding area. This approach aims to reinforce students' character and their ability to solve problems while demonstrating responsibility and care for their environment (Ditsmp Kemdikbud, 2022)

Overall, identifying local learning resources, utilising appropriate learning media, and paying attention to local wisdom in learning strategies can significantly support innovation in biology learning. This approach not only increases students' interest and motivation to learn but also provides a deeper understanding of biological concepts in a relevant and contextual context.

## CONCLUSION

Based on the above explanation, it can be concluded that there are various potential local learning resources, such as grape plants (*Vitis vinifera*), rice (*Oryza sativa*), vegetables and herbal garden, BSF maggots (Black Soldier Fly), Trigona bees (*Trigona sp.*), and Livestock farming. The identification and utilisation of this local potential is expected to increase students' interest and motivation to learn and provide a more contextual and relevant learning experience. Data analysis shows that although there is great potential in utilising local learning resources, there are still obstacles in their implementation. It is necessary to develop practical guidelines for integrating local learning resources into learning.

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