



Diversity of Wood Plants and Its Utilization as a Learning Source

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Abstract: This study aimed to determine the types of wood that used in the manufacture of a wooden house with knock down system and its benefits as a learning resource. The wooden house of knock down model is a potential local culture of the South Sumatra region which adapts the shape of the traditional house model in South Sumatra. The method was a qualitative descriptive method with data collection techniques through literature studies and interviews. The results showed that there were four types of wood used in the manufacture of disassembled wooden houses namely, Kulim (*Scorodocarpus torneensis* Becc.), Merawan (*Hopea mengarawan* Miq.), Meranti Payo (*Shorea palembanica* Miq.), and Seru or puspa (*Schima wallichii* (D.C.) Korth). The results of the study could be used as an alternative learning resources to facilitate students in studying and understanding biodiversity material in class X SMA/MA.

Keywords: learning resources; types of wood; wooden houses

Introduction

Local culture is something that is passed down in society from generation to generation and contains noble values along with knowledge in the form of teachings to maintain and utilize natural resources (forest, land, and water) in a sustainable manner that can be used as a reference in learning (Adinugraha, 2018; Niman, 2019). Local culture has its own characteristics and uniqueness because it contains the value of trust and forms the personality of the community based on its own group (Sulistiani, 2017). The integration of local wisdom in learning can develop thinking skills and instill character values based on local wisdom (Zahroh et al., 2021).

Local cultural wisdom can be used as a learning resource in biology learning. This is because local culture carries a message of value conservation and the preservation of natural resources that must be known, understood, and preserved by the younger generation through education, especially from learning at school. Biology learning that is integrated with local wisdom, is able to explore the potential of thinking, train and

familiarize it to carry out problem-solving activities originating from local wisdom (Alimah, 2019). Local culture associated with biology learning must be analyzed to match the competencies to be achieved.

Local wisdom plays an important role in the development of science. However, local wisdom is often neglected along with the development of science because it is portrayed as something backward and unscientific (da Silva et al., 2023; Manalu & Suhartini, 2023). This local wisdom remains poorly documented and is at risk of being lost to future generations (Sukkho et al., 2022). In order to bridge the gap, it is possible to merge education with local knowledge by striving to create contextual science that is taught in schools. Local wisdom has great potential in science learning as it can make learning more meaningful, bridging the knowledge gap for students in schools and society (Handayani et al., 2018; Setianingrum et al., 2023).

One of the provinces in Indonesia that is rich in culture is the province of South Sumatra. South Sumatra is a province located in the southern part of the island of Sumatra, at a position of 1°-4° south latitude and 102°-

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106° east longitude (Badan Pusat Statistik Sumatera Selatan, 2020). South Sumatra has various regional conditions, such as lowlands, swamp areas that are affected by tides, hills, as well as coastal and mountainous areas. This condition makes this province rich in diversity of traditional houses. Some examples of traditional South Sumatran houses are pyramid houses, raft houses, warehouse houses, pasemah houses. The houses have the same structure, which is made of wood and without the use of nails so that they can be dismantled and reassembled easily (Siswanto, 2004; Syarifuddin et al., 2022).

The center for producing knock down wooden houses in South Sumatra was located in Tanjung Batu Village, Tanjung Batu District, Ogan Ilir Regency. This area produced traditional wooden houses with a knock down system whose marketing area was not only in South Sumatra, but also in other areas and even abroad. Ogan Ilir Regency is indeed famous as a craftsman area. These crafts can be in the form of wood, iron, gold, woven, stone, or aluminum crafts (Mulyana & Yasmin, 2018). Based on the developing story, these skills were inherited by Sang Sungging. The word "Sang" referred to the word in front of a person's name, while "Sungging" is a painting (jewelry) or interpreter or art. according to Indrahti (2012) the word "Sungging" had the meaning of a person who was an expert in carving. The expertise inherited by Sang Sungging was believed to be the forerunner to the formation of the local community's livelihood pattern.

The wooden house industry with knock down system was not only a form of preserving cultural assets, but also a source of income for the community because it had a fairly high economic value. The wooden house industry was managed and produced by the local community so the results have an impact on the local residents as well (Zarkasih et al., 2020). With the development of the times, changes in lifestyle and modernization had caused a decrease in interest in making houses using wood-based materials. The main raw material, which was original woods from South Sumatra was increasingly difficult to obtain. The scarcity of wood is caused by human activities such as illegal logging, forest exploitation, forest encroachment, and forest burning without regard to the surrounding environment (Niman, 2019). This had an impact on the production of knock down wooden house, causing prices to continue to rise. So far, there was no information regarding the use of different types of wood as raw materials for knock down wooden house in South Sumatra. Therefore, it was necessary to conduct a study to find out the local wisdom of wooden houses with knock down system and the types of wood used so that

the culture could still be preserved, as well as its application as a source of learning.

Method

The method used in this research was a qualitative descriptive method. Qualitative methods aimed to collect data or information about symptoms in a study (Viatra & Anggraini, 2018). Qualitative methods were used to describe the state of the subject as it was to answer a problem. Data collection techniques were carried out through literature studies and interviews. The study of literature aimed to analyze the local culture of wooden houses with knock down systems and the characteristics of the types of wood plants used. Interviews were conducted with the craftsmen of knock down wooden houses in Tanjung Batu area, Ogan Ilir, South Sumatra. This interview was used to find out what types of wood were used in the construction of knock down wooden houses in the area. The data that has been obtained is then analyzed and integrated into learning material. The integration model is shown in Figure 1.

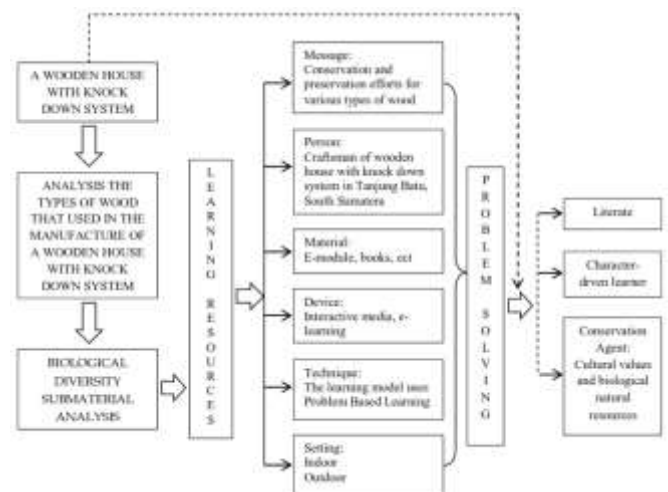


Figure 1. Integration the local wisdom in biological diversity submaterial

Result and Discussion

Based on a literature review and the results of interviews that had been carried out on the craftsmen of wooden house knock down system in Tanjung Batu Village, it was found that four types of wood were used in the manufacture of the wooden house with knock down system, namely kulim wood, merawan wood, meranti payo wood, and Seru wood or Puspa. These woods had their own intended use (Table 1). In Tanjung Batu area, there were two types of wood that were commonly used, namely: Meranti Payo (*Shorea*

palembanica Miq.) and Seru or puspa (*Schima wallichii* (D.C.) Korth).

Table 1. Types of Woody Plants Used as Raw Materials for Making Wooden Houses with Knock Down Systems.

Scientific name	Family	Purpose of utilization
Scorodocarpus borneensis Becc.	Olacaceae	The main pillars located at the corners
Hopea wading Miq.	Dipterocarpaceae	Doors and windows
Shorea palembanica Miq.	Dipterocarpaceae	Floor and walls
Schima wallichii (D.C.) Korth.	Theaceae	The whole house

The four types of wood, had advantages in terms of durability. The classification of the durability of wood species was divided into class I (very durable) to class V (very not durable). Kulim wood was included in the durable class I-II. Resistance to wood termites was included to class IV, but resistance to wood rot fungi was classified in class I and II. Puspa wood belonged to durable class III. Meanwhile, resistance to dry termites belongs to class II and resistance to wood rot fungi is included in class III-IV (Martawijaya, 1989).

Merawan wood resistance belongs to the durable class and strong class II-III (Maharani et al., 2013). For meranti wood, the durability belonged to durable class III-IV and strong class II-IV (Sanjaya, 2012). The durability of wood was influenced by extractive substances contained in wood and are toxic to an organism such as saponins, alkaloids, tannins, phenols, dama, and quinones (Tsoumis, 1991). This resistance affected the manufacture of wooden houses so that they could remain durable if moved in different environmental conditions.

Types of wood in the manufacture of a wooden house with knock down system

From the data that had been obtained, the four types of wood that were used as raw materials for the manufacture wooden house with knock down system were classified according to their respective characteristics. The characteristics and classification of each type of wood were classified as followed:

Kulim (Scorodocarpus borneensis Becc.)

This wood is included in the type of large tree with a height of 10-40 m and a diameter of 20-80 cm (Kustiawan et al., 2022). Kulim wood is resistant to acidic swamp soil conditions. This is proven through research of Kubota & Kobayashi (2010) which mentions that kulim wood has the potential as a natural preservative

because it contains sulfur. The bark has potential as a natural antibacterial and antioxidant source, making it an attractive candidate for development (Haryjanto et al., 2020). Kulim wood is also known as wood onion because it smells like garlic. This wood is classified as rather hard, with a density/dryness between 640-975 kg/m³, dark red or grayish with a hint of purple, classified in class I wood based on its durability (Yoza, 2015).



Figure 2. Kulim plant (*Scorodocarpus borneensis* Becc.) (Source : Haryjanto et al., 2020)

Merawan (Hopea mengarawan Miq.)

Merawan wood is medium to high, with a height of up to 40-60 m. General characteristics of merawan wood included: fresh heartwood was light yellow-brown, light brown, sometimes with greenish or pink irregular stripes and when exposed to air it became straw yellow in color. Brown-yellow or brown-red. The main threat from this wood was the conversion of land into oil palm plantations, settlements, and fields (Maharani et al., 2013). This plant is an important source of wood. Merawan produces good quality resin. This plant is known to produce oligomeric resveratrol which functions as an antibacterial, anti-cancer, antihetotoxic, anti-HIV and termite agent (Kusmana & Lathifah, 2021).



Figure 3. Merawan (*Hopea mengarawan* Miq.) (Source: www.nparks.gov.sg)

Meranti Payo (Shorea palembanica Miq.)

Meranti payo or *Shorea palembanica* is included in the red meranti group (Lestari, 2013). Meranti payo has the characteristics of a gnarled tree, large, paper-like leaves, dry brown-red leaves, and pink inner bark. Meranti payo was included in the category of

commercial class I trade timber along with 52 other types of wood based on the status of Ministry of Forestry Decree No. 163/Kpts-II/2003 (Maharani et al., 2013).



Figure 4. Meranti payo (*Shorea palembanica* Miq.) (Source : Maharani et al., 2013)

Puspa (Schima wallichii (D.C.) Korth.)

Puspa has a habit of a tree with a height of up to 47 m, has a characteristic red leaf when young, green when old, oblong oval-shaped with pointed leaf tips and smooth jagged leaf edges, has high resistance, and belongs to a plant that fireproof (Setyawan, 2000). *Puspa* has hard and strong wood, durable, very good for water furniture because it is resistant to termites, belongs to the type of strong class II wood. Although it is resistant to dry wood termites (class II), it is less resistant to wood rot fungi (class III-IV) (Utomo, 2020).

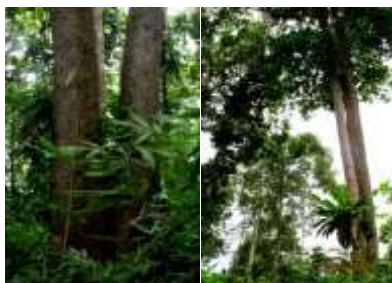


Figure 5. Puspa (*Schima wallichii* (D.C.) Korth.) (Source : Purnama et al., 2016)

Wooden House with Knock Down System

The wooden house with knock down system is a type of traditional house that adopts the shape of a traditional house in South Sumatra. These houses are generally designed to be easily dismantled and reassembled in another place by applying an interlocking system in the form of notches, presses, supports, hooks and pulls (Siswanto, 2004).

Wooden houses were traded by order technique and sold in ready-made form. The ordering technique was intended as an ordering activity that begun with deliberation to determine the desired architectural form in accordance with the wishes of potential buyers. The sales system in the finished form was intended in the manufacture of wooden houses that were assembled in

one place, after which the house would be moved. The transfer would be carried out by dismantling again. There were various types of wooden houses with knock down systems made of quality wood, so enthusiasts could choose according to taste, both in size and type. Some examples of wooden house with knock down system developed according to consumer demand were shown in Figure 5. The stretching of the wooden house industry was a very promising business. The selling price of a wooden house with knock down system could reach Rp.45,000,000 to Rp.100,000,000 more for one unit. The purchase price included shipping costs.



Figure 6. Different Types of Wooden Houses with Knock Down System

Integrating Wooden Houses as Learning Resources

The Covid-19 pandemic had made various changes to the world of education, one of which was the establishment of a distance learning system. Distance learning emphasized the use of various online platforms. The lessons gained during the pandemic, teachers and students might be able to use online learning tools. Likewise, after the pandemic ends, the use of online tools must be encouraged to improve teaching and learning activities in schools (Pokhrel & Chhetri, 2021).

The use of the right technology is a way to minimize the effects of the corona virus pandemic and other pandemics in the future that can affect the world of education (Onyema et al., 2020). Technology could be applied during distance learning in the manufacture of alternative teaching materials that students could use outside of learning hours. One of the forms of teaching materials integrated with technology was an electronic module or an e-module. E-modules can overcome space and time limitations in learning, increase student competence and understanding because they are equipped with audio, animation, images, and videos, and provide feedback to students who use them (Yevira et al., 2023). Subari et al. (2022) states that e-modules that

are prepared innovatively and creatively are able to attract students' attention and motivation to learn so that they can increase understanding in understanding the material being studied.

In the context of the local culture of wooden house with knock down system, e-modules could be a learning tool to present the diversity of types of wood plants that were used for the manufacture of wooden house with knock down system. The developed e-module contained pictures and detailed descriptions of each element such as classification, morphological characteristics, causes of scarcity, and conservation efforts.

The linkage of the material types of wood as the raw material of wooden house with knock down system with learning materials in high school could be related to the material for biological diversity in class X SMA/MA with the basic competencies: *Analyze various levels of biodiversity in Indonesia and their threats and conservation. Presenting the results of observations of various levels of biodiversity in Indonesia and proposed conservation efforts.*

It is hoped that by understanding the link between local wisdom and the diversity of wood species, students will be able to learn about the importance of biodiversity and how to conserve it. This is especially important due to the various threats that are causing the disappearance of different types of wood plants, which are used in the construction of disassembled wooden houses. It is becoming increasingly difficult to obtain these wood plants, so it is necessary to make efforts to ensure that they remain sustainable. Both local wisdom and raw materials, namely wood plants, are crucial in this regard. According to Manalu & Suhartini (2023), to ensure that students can retain knowledge and skills for an extended period, it's crucial to create learning materials that enable them to gain information, experience, knowledge, and skills by tackling real-life problems in their environment.

Biology learning by integrating local wisdom as a learning resource is indirectly able to train students to care about the surrounding environment, initiate to conserve biology and conserve the values contained in the local wisdom. Karmadi et al. (2023) stated that integrating biology learning with local wisdom can enhance problem-solving skills for local issues. Learning that utilizes local culture in its learning is able to train children to carry out critical analysis of existing local wisdom cases for creative problem solving (Alimah, 2019). The linkage of local culture in learning can improve students' understanding of learning materials and this linkage can be a way for local culture to continue to be conveyed to students as the next generation of the nation (Prastyo & Nuswantari, 2020).

Conclusion

Based on the conducted research findings, there were types of wood used in the manufacture of wooden houses with a dismantling system, namely Kulim (*Scorodocarpus torneensis* Becc.), Merawan (*Hopea mengarawan* Miq.), Meranti Payo (*Shorea palembanica* Miq.) and Puspa (*Schima wallichii* (D.C.) Korth). Local culture can be used as a learning resource in biology learning by being linked to the basic competencies for biodiversity material in class X SMA/MA. Linking local culture in learning can improve students' problem-solving skills and understanding of learning materials.

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Writing—review and editing, D. T; supervisor, E. Y; review writing, D. A. Authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

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