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KNOWLEDGE AND PERCEPTION OF STUDENTS ABOUT PEAT: ITS IMPLEMENTATION IN LEARNING SCIENCE IN JUNIOR HIGH SCHOOL

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Abstract

Natural peatlands are home to a wide variety of animals and plants and provide ecosystem services for humans and the environment. Peatlands in Jambi are still not appropriately managed, partly because of the lack of community knowledge regarding peat. This study reveals the knowledge and perceptions of junior high school students about peat, the factors that influence it, and its implementation in science learning. We conducted the study on 228 junior high school students and 21 science teachers in Tanjung Jabung Timur. Data were collected through questionnaires, observations, and focused discussions. Data were analyzed descriptively. Furthermore, the data were analyzed using Smart PLS to determine the relationship between students' background, perceptions, and interactions with their knowledge of peat. Students' knowledge of peat is in a low category. The level of student's knowledge is significantly influenced by their experiences (interactions) with peatlands and their perceptions of these resources. The student's family background does not affect students' knowledge of peat.

Keywords: Science Education, Peat Integration, Contextual Learning

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INTRODUCTION

Jambi Province has a wealth of natural resources that are very diverse and abundant. For example, this area has very varied ecosystems, from the lowlands on the east coast to the highland ecosystems in the Mount Kerinci area and its surroundings. One of Jambi's unique ecosystems is the peat ecosystem, which is spread mainly in the eastern coastal region.

Peatlands have different characteristics from land in general (mineral land). Peatland is a heap of plants and animals that have yet to decompose in almost (saturated) water conditions entirely and are poor in oxygen (Rydin et al., 2013). As it gets older, the peat layer will get thicker, with more and more plants and animals dying on it. The accumulation rate of organic matter is much faster than the decomposition rate.

Under natural conditions, peatlands are almost always wet. Some peatlands are permanently submerged. Natural peatlands also have high biodiversity and essential ecosystem roles (services). Various species of animals and plants can live on peatlands (Posa et al., 2011), including endangered animal/plant species such as the Sumatran tiger (*Pathera tigris* sumatrae) and ramin wood (*Gonystylus bancanus*). Peatlands can also hold large amounts of carbon stocks (Murdiyarso et al., 2010; Cole et al., 2015), helping maintain global climate stability.

Utilization that is not wise causes peatlands to suffer damage. For example, draining peat to support agricultural cultivation causes the peatland water level to drop drastically, far below safe water level conditions. These conditions cause peatlands, mainly composed of organic matter, to experience drought, making them highly vulnerable to fires. Even the slightest source of fire can start a fire which then spreads to the surrounding peat. It is not surprising that forest fires have almost always occurred in Jambi Province in recent years, especially during the long dry season.

Good management can protect peatlands from fires. However, until now, the existing peatlands have yet to be adequately managed due to various reasons, including a lack of knowledge and concern for the conservation of peatlands. For this reason, good knowledge and understanding of peatlands is needed.

The Indonesian government and several other organizations have made efforts to provide knowledge and awareness to the public about the importance of peatlands. Efforts to impart knowledge and understanding of peatlands also need to be carried out more systematically and sustainably, one of which is through education in schools. Many students live and interact with peat areas but need help understanding peatlands. Good knowledge and understanding of peatlands could provide provisions for the younger generation so they can later give birth to the next generation, who can manage and make wise decisions regarding peatlands.

This study aims to analyze the perceptions and knowledge of junior high school students regarding peat ecosystems and identify the factors that influence students' knowledge regarding peatland. In addition, this study also aims to analyze science learning materials that can be enriched with peat material. The findings are expected to contribute to formulating contextual science learning based on local resources, especially peatland.

METHOD

We conducted research at ten junior high schools associated with the East Tanjung Jabung Science Subject Teacher Forum (MGMP IPA) Rayon 1, Jambi Province. The main subjects of this study were science students and teachers at junior high schools in the region.

The type of data collected is in the form of qualitative data and quantitative data. We arranged qualitative data in statements, definitions, and descriptions of the research object into descriptive sentences to complete the research discussion. The qualitative data were obtained from discussions and interviews with resource persons, especially science teachers. Quantitative data were obtained from the responses of students, and junior high school science teachers collected through a questionnaire. In addition to primary data, researchers also collect secondary data to support research from documents and references related to the enrichment (integration) of local resources in learning natural sciences.

We collected data using several techniques: observation, tests, questionnaires, focused group discussions, and documentation. Observation is carried out through activities on a process or object intending to feel and understand the knowledge of a phenomenon based on previously known knowledge and ideas. In this case, observations were made of various aspects related to peat ecosystems, science learning at schools, and other aspects of community life in the East Tanjung Jabung Regency area.

Data on students' knowledge and perceptions were collected through tests and questionnaires prepared beforehand. Following Zuriah (2006), the questionnaire used was in the form of written questions which were also answered in writing by the respondents.

Referring to Riduan (2013), distributing this questionnaire aims to find complete information about a problem (integrating peat material in science learning). We adjusted the method of filling out the questionnaire with respondents' conditions to make them feel comfortable choosing answers following their respective opinions and knowledge. The questionnaire used is a semi-structured questionnaire. Before being used, the test and questionnaire instruments had been tested on 32 students from three classes at Junior High School (SMPN) 1 Jambi City to ensure their reliability and validity.

We collected test and questionnaire data through g-forms provided with the help of science teachers at each school. Two hundred sixty-eight students participated from 10 junior high schools, namely SMP Negeri 1, SMP Negeri 4, SMP Negeri 12, SMP Negeri 14, SMP Negeri 17, SMP Negeri 24, SMP Negeri 26, SMPN Satap 3, SMPN Satap 4, and SMPN Satap 6. Researchers validated all incoming responses so that finally, the number of respondents was 229 students. Among others, 39 responses were declared invalid due to multiple entries, unclear identity, and inconsistent questionnaire filling (filling in haphazardly). Questionnaires were also given to 21 science teachers who are MGMP Rayon I East Tanjung Jabung district members. We then performed a focused group discussion with the science teacher to explore the data and information obtained from the questionnaire.

The qualitative data obtained were analyzed descriptively following Miles et al. (2014) to obtain an overview of peat ecosystems and science learning in the East Tanjung Jabung Regency Region. Quantitative data from the questionnaire was calculated to get an overview of students' knowledge about peat and local resource-based learning. The answers for the knowledge aspect include two categories (true or false). At the same time, the perception assessment used a Likert scale with four levels: negative, negative, positive, and very positive.

Following Sugiyono (2010), the percentage of students' knowledge level is calculated using the following formula:

$$P = \frac{X}{N} \times 100\%$$

Description: P = Percentage of knowledge
X = Total Score
N = Maximum Total Score

The perceptions of students and teachers regarding peat and learning based on local resources (peat) were grouped using the following formula.

Scale range

$$R_s = \frac{(m-1)}{m}$$

N = number of samples
M = the number of alternative answers for each item

Student perceptions were measured using a questionnaire based on four criteria, namely 1 (very negative), 2 (negative), 3 (positive), and 4 (very positive). For negative statements (questions), scoring is done oppositely. Calculations were performed using the following formula:

$$R_s = \frac{(4-1)}{4} = \frac{3}{4} = 0{,}75$$

Furthermore, the teacher's perception assessment decision regarding peat-based science learning is presented in Table 1.

Table 1. Average score of teacher perception assessment

Average Score	Description
1,0 - 1,75	Very Negative
1,75 - 2,50	Negative
2,50 - 3,25	Positive
3,25 – 4	Very Positive

Data kuantitatif selanjutnya dianalisis menggunakan Partial Least Square-Structural Equation Modeling (model PLS-SEM) melalui software Smart PLS versi 3.0. Analisis menggunakan SEM ini bertujuan untuk mendapatkan model persamaan struktural hubungan antara persepsi, latar belakang, dan pengalaman (interaksi) siswa terhadap pengetahuannya mengenai gambut. Analisis data menggunakan PLS dilakukan untuk melihat kaitan antara latar belakang, persepsi, dan interaksi terhadap gambut terhadap pengetahuan siswa. Variabel latar belakang terdiri dari enam indikator, variabel persepsi terdiri tiga indikator, sedangkan variabel interaksi terdiri dari empat indikator (Tabel 2).

Quantitative data were then analyzed using Partial Least Square-Structural Equation Modeling (PLS-SEM model) through Smart PLS software version 3.0. This SEM analysis aims to obtain a structural equation model of the relationship between students' perceptions, backgrounds, and experience (interaction) toward their knowledge of peat. Data analysis using PLS was carried out to see the relationship between background, perceptions, and interactions with peat on students' knowledge. The background variable consists of six

indicators, the perception variable consists of three indicators and the interaction variable consists of four indicators (Table 2).

Table 2. Indicators of the observed variables

No	Variable	Indicator
1.	Perception	Value/benefit of peat land Peatland conservation Learning about peatlands
2.	Background	Hobbies/interests Current residence Childhood residence Parents' job Current school Origin of school (elementary school)
3.	Interaction	Experience hearing about peatlands Experience of seeing peatlands Experience touching peatland The experience of stepping on peatland
4.	Knowledge	Characteristics of peatlands Condition & geographic distribution of peatlands Ecological function of peatlands Peatland damage

RESULTS AND DISCUSSION

Student Perceptions of Peatland

The students who were the subjects of this study were 229 people from 10 public junior high schools in Muara Sabak City and its surroundings. Most of these students are children born and grew up in the East Tanjung Jabung Regency, where most of the area is peatland (about 73%). A small proportion of students are displaced residents from other districts with extensive peatlands, such as Tanjung Jabung Barat and Muaro Jambi Regencies (8%). Only a small % of students (19%) came from non-peat areas (Figure 1).

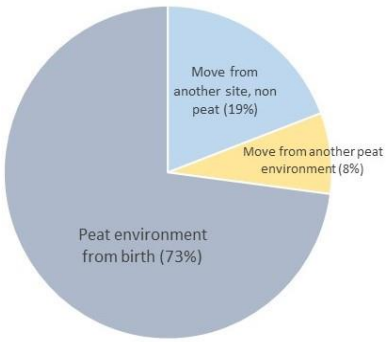

Figure 1. Students background

Generally, the students come from families working as farmers (69%), mainly owner-farmers. Others are sharecroppers (farm laborers). They cultivate several types of plants, especially oil palm, on peatlands.

These students have interacted with peatlands in daily life, even though they may not realize it. For example, the condition of the roads (asphalt), both the main roads leading to the Regency Capital and connecting roads to sub-districts or villages, is short-lasting (broken easily). The soil structure on peatlands is unstable, causing these roads to crack quickly.

Peat areas are generally areas that are almost always wet. Swamps and rivers (canals) are often found in peat areas which are also often used as a means of transportation, both passenger transportation and transportation for transporting agricultural products. The community also utilizes existing water resources for domestic purposes. The black-brown color of the water is one of the characteristics that distinguishes peat water from water from that of mineral soils.

In general, peatland is less fertile land for agriculture. Peatlands have a low level of fertility and depend heavily on mineral layers to meet the nutritional needs of plants. In addition, the deeper the peat, the more carbon stock it has, so the potential for carbon loss is even greater if peatland is converted into agricultural land (Masganti et al., 2017). Oil palm plants on peatlands are generally prone to toppling or tilting due to the nature of peatlands with high porosity, so they cannot support large palm oil stems. The fibrous root system in oil palms only accumulates around the surface layer of the soil. The palm oil root system is quite different from native peatland trees, which generally have specific structures such as buttresses that can support trees so they can grow and develop properly.

The condition of roads, water resources, and agriculture on peatlands illustrate the daily life environment of students who are very close to peatlands. A more in-depth study could reveal a long list of objects, experiences, knowledge, inspiration, and student awareness in interacting with peatlands.

The connection (proximity) of students with peatlands is also a resource that can facilitate learning in schools to produce meaningful learning, especially science learning. In general, junior high school students have interacted with peatlands. These students have heard the terminology regarding peat and have seen, stepped on, and even touched peat soil (Figure 2). However, only about 50% of the students had held peat land soil. They mainly obtained information (knowledge) about peat obtained from parents (47%) and the media (34%). Other sources of information about peat are from teachers and peers. The data shows that students learned about peat mainly from parents and the media, not from the teacher (school). Integrating peat material into some relevant lessons at school will further enhance students' understanding of peatland.

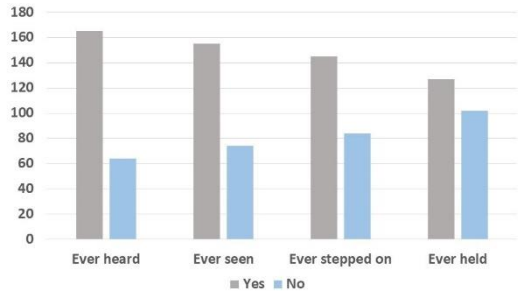

Figure 2. Student interaction on peat

Realizing their daily environment is in a peat area; most students state the need to learn about peat (85%; Figure 3). In addition, students are also interested in learning more about peat. Most of them are interested in studying peat (77%). They are interested in studying peat mainly because of the characteristics of peatlands that differ from other lands. In addition, students are interested in learning about peat to find and develop different potentials use of peatlands. Interestingly, even though the students have experienced and felt the impact of forest fires on peatlands for themselves, only a small number of them are interested in studying conservation and fire protection on peatlands.

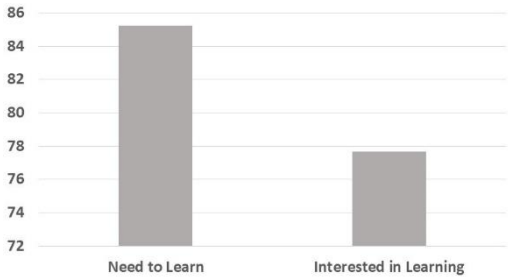

Figure 3. Students' perceptions regarding peat material learning

Student Knowledge of Peat

Despite direct interactions with the peat area, most students displayed a limited understanding of peat. Based on the test scores obtained, the average knowledge level scored a modest 58.5 out of 100. Notably, students demonstrated a grasp of certain aspects, including the characteristics of water on peatlands, the occurrence of fires on peatlands, and the general conditions of peat ecosystems. Peat water, for instance, exhibits distinct blackish-brown coloring. Indeed, peatlands are typically either permanently submerged wetlands or occasionally so (Kowalczyk-Juśko et al., 2016; Takada et al., 2016).

However, there are other crucial aspects of peat that remain less understood, notably the ecological functions of peatlands. This lack of comprehensive knowledge among students is not entirely surprising. According to Husamah et al. (2020), as students progress to higher classes, their awareness and knowledge of the surrounding environment are likely to improve.

We then analyzed the obtained data using SEM PLS to explore the relationship between the observed variables. Of the 27 indicators observed, only ten were valid for further analysis: two background indicators, one perception indicator, and four interaction indicators (Figure 4).

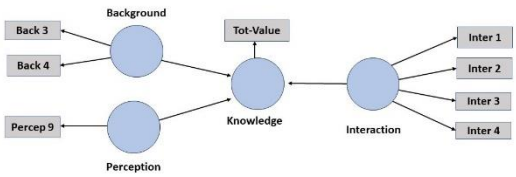

Figure 4. The relationship between perception, interaction, and background on students' knowledge of peatland

Of the three variables, the interaction (direct experience of students) with peatlands and students' perceptions of peatlands significantly affected students' knowledge of

peatlands (p1=0.00; p2=0.00). However, the student's background variable did not affect the level of knowledge about peatland (p=0.36).

Learning through direct experience, in this case, peatlands can help increase student knowledge. Learning will be more meaningful by implementing a contextual approach, linking students' experiences to the students' daily environment Sya'ban (2014). Research conducted by Hendriani (2009) also shows that learning with direct experience (contextual) can improve students' ability to receive, store, and apply the concepts they have learned.

Students' knowledge of peat aligns with their perception of the resource. Kusaeri & Ekky (2016) added that students' perceptions of the object being studied significantly influence their knowledge. There is a positive correlation between the perception of the object being studied and the knowledge acquired, which means the higher student's perception of the object being studied, the higher student's insight and learning about the thing (Nurhayati et al., 2020), likewise, with students' perceptions of peatlands. Students who have positive perceptions have better knowledge about peat. The more information students get about the peatland will improve their positive perception of the resource.

The student's family background does not affect the student's knowledge of peatlands. Most students do not help their parents do farming because they prefer other activities, such as playing with gadgets, rather than helping their parents on the farm. The results of research by Bağcı & Pekşen (2018) state that currently, students use more gadgets to the point where they don't know the time; they even feel anxious, confused, and lonely if they don't play with gadgets. The behavior of playing with gadgets continuously can harm student social relations. Students tend to be individualistic and spend more time playing with gadgets than socializing with their surroundings (Wardhani, 2018). Currently, most of the work on the plantation (oil palm) is done by other people, so it does not involve family members, especially children, which is another factor that causes students not to participate in farming. This phenomenon causes students not to gain much knowledge about plantations, including about peatlands, even though their parents work as farmers on peatlands.

Teacher's Perceptions Regarding the Integration of Peat Materials in Learning Science

All science teachers who were respondents to this study (21 people) assessed the importance of enriching science learning materials by integrating various potential local resources in their surroundings. This kind of learning connects learning materials with the natural and socio-cultural conditions that exist in the environment around students, making it easier for them to grow their awareness of environmental sustainability.

An approach to local resource-based learning is the contextual approach. Through this approach, a teacher conditions his/her teaching in such a way as to facilitate students to relate the material taught at school with their experiences obtained in everyday life. According to Kadir (2013), in this learning model, students are aware of the benefits of the studied material, how to achieve it, and the position (role) of students in the learning process. Thus it will produce more meaningful learning. A contextual approach based on local resources can increase student interest and learning achievement Sulistyawati (2020). Through contextual learning, students can connect the material studied with real-life situations to encourage them to apply it (Sanjaya, 2006).

Peatland is one of the potential local resources to enrich natural science learning. In general, the teachers also positively assessed efforts to integrate peat material into science lessons (Figure 5). Integrating local resources in science learning can strengthen the nature of meaningful learning and encourage students to have a wise attitude in solving problems in the environment around students (Parmin, 2015). In addition, the use of local resources in science learning can also foster students' self-awareness in preserving nature (Clayton & Myers, 2009).

Regarding efforts to integrate peat into science learning, most teachers support efforts for this learning. In this case, the teachers considered they were ready and had the ability and supporting resources to develop local resource-based learning (62%). However, some other teachers must still be ready to plan and implement local resource-based learning (38%). The teacher needs to be used to integrating such material and the limited resources to support learning.

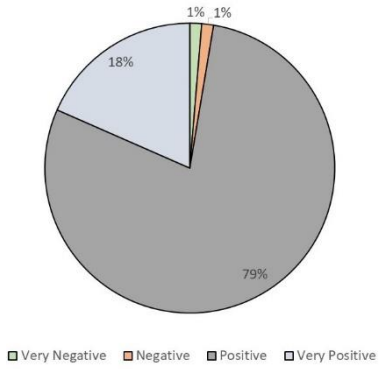

Figure 5. The need for peat-based learning

Some obstacles teachers encounter in implementing learning based on local resources include limited implementation time, inappropriate learning methods, lack of preparation for teachers and students, and lack of planning. To effectively carry out local resource-based learning, the teacher should improve their skill in designing lesson plans that follow learning objectives (Nurzaelani, 2017). Teacher competency improvement programs such as training may increase teacher competence to utilize local resources to support science learning.

Some science teachers in East Tanjung Jabung have interacted with peatlands. The teachers had visited peatland (have stepped on peatland; 58%, Figure 6). However, only a small number of teachers have handled peat soil. Several teachers even stated that they had never directly interacted with (seen) peatlands. The teachers should have seen peatlands before, considering that most of the East Tanjung Jabung area is a peatland. However, maybe because they do not know about peatlands, they say they have never interacted with (seen) peatlands. Teachers who say they have never interacted with peatlands may be teachers who come from outside the East Tanjung Jabung area, so they do not know any information about peatlands. This condition was also one of the reasons the teacher stated that he had never interacted with peatlands.

A teacher should know and understand the condition of the surrounding environment, which can then be linked to his teaching material in class. To do so, a teacher needs to study and understand many things related to the material he teaches so that the learning resources are not limited to books (Payong, 2011). Teachers with a good understanding of the surrounding environmental conditions will ease them to deliver learning material in class. Erwinsyah (2017) added that a teacher who understands his teaching material would enjoy learning more and be confident in increasing student learning motivation. With their knowledge, teachers can create a smooth, fun, and meaningful teaching and learning process in class.

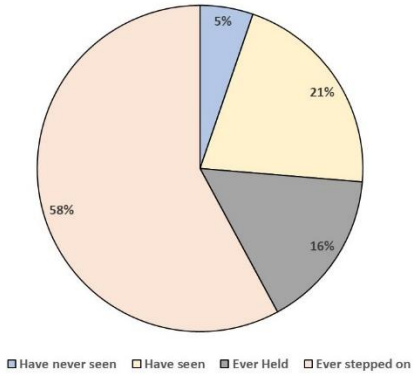

Figure 6. Teachers' interaction with peatlands

Peatland and the Subject of Science Learning

In K-13, science learning materials consist of 12 topics for grade 7, 11 for grade 8, and 10 for grade 9 (Table 2). Through the questionnaire, the researcher asked the teacher to determine what materials were relevant (can be enriched) with peat material in their learning. Based on the data collected cumulatively, the teacher stated that peat material could enrich all existing topics.

Table 2. Subjects of science learning in junior high schools

7th grade	8th grade	9th grade
1. Science Objects and Their Observations	1. Movement of Objects and Living Creatures in the Surrounding Environment	1. Human Reproductive System
2. Classification of Living Things	2. Efforts and Simple Machines in Everyday Life	2. Plant and Animal Breeding Systems
3. Classification of Material and its Changes	3. Structure and Function of Plants	3. Inheritance of Nature in Living Things
4. Temperature and its Changes	4. Human Digestive System	4. Static Electricity in Everyday Life
5. Heat and its Transfer	5. Additives and Addictive Substances	5. Dynamic Electricity in Everyday Life
6. Energy in Living Systems	6. Human Circulatory System	6. Magnetism and its uses
7. Life Organization System	7. Substance pressure and its application in everyday life	7. Biotechnology
8. Interaction of Living Things with Their Environment	8. Human Respiratory System	8. Particles that make up objects and living things
9. Environmental Pollution	9. Human Excretor System	9. Soil and Survival
10. Global		10. Environmentally Friendly Technology

Warming	10. Vibrations,
11. Earth	Waves, and
Structure and	Sounds
Dynamics	11. Light and Optica
12. Solar System	Instruments

In order to further ascertain what learning material could be enriched with peat, we undertook a group discussion to discuss and verify the same question. The teachers gather in groups of 3 to 4 people to discuss again the appropriate learning topics that can be enriched with peat material.

The discussion was then followed up with a focused group discussion to discuss the same topic. From the two stages of the discussion, it can be concluded that only a few discussion topics could be enriched with peat material (Table 3). Most of the material is grade 7 learning material (eight subjects). For grades eight and grade 9, there is only one subject, respectively.

Table 3. Subjects of science learning that can be enriched with peat materials based on group discussions and focused group discussions

7th grade	8th grade	9th grade
1. Classification of living things	Pressure on a liquid	Soil and survival of life
2. Classification of matter and its changes		
3. Temperature and its changes.		
4. Energy in living systems		
5. Interaction of living things with their environment		
6. Environmental pollution		
7. Global warming		
8. The structure of the earth and its dynamics		

Changes in the number of topics related to peat that are significant between the questionnaire data and the discussion results align with findings which state that teachers' knowledge about peat is generally still relatively low. For this reason, efforts to integrate peat material in science learning, apart from requiring pedagogical efforts such as developing learning tools, also require an increase in teachers' understanding of peat material. Mastery of peat material will significantly assist teachers in designing creative and fun lessons for their students.

Integrating peat material into science learning should first provide insight to foster a positive perception of peatlands. Providing insight can be done by displaying learning media through interesting videos about peat to students. The learning video contains an in-depth introduction to peatlands and their uniqueness (advantages). The insight is intended to build positive student perceptions about peatlands and to increase environmental awareness of the potential of local resources in their area. Following Tresnawati (2018), integrating local resources into learning can be done by conveying the advantages of existing local resources.

Furthermore, learning should provide the broadest possible space so students can interact directly and get closer to the peatlands. Exploratory activities on learning based on local resources will facilitate students to have direct experience interacting with peatlands in the hope of increasing students' understanding and insight about the lands. Through this activity, it is hoped that students will feel proud of their local resources, be able to explain (prove) basic scientific concepts related to peatlands and participate in efforts to conserve peatlands. Lidi (2019) added that students would more easily understand the material being taught if the learning resources used were close to students' daily lives and could be reached by students through the information-gathering process.

CONLUSIONS AND SUGGESTIONS

Conclusion

Overall, junior high school students in East Tanjung Jabung have limited knowledge about peat, despite its prevalence in the district. Their understanding is mainly influenced by direct experiences and perceptions of peatlands. While 69% of students come from farming families who work on peatlands, others have diverse family backgrounds such as entrepreneurs, civil servants, and private employees, but this did not significantly impact their knowledge of peatland. Science teachers respond positively to efforts to integrate local resources into science learning. They are interested in being able to connect peat material in learning. The students are also interested in studying peatlands, especially regarding the characteristics of peatlands and their use.

Suggestion

Some teachers need help integrating the peat material into their lessons. In addition, there

are also limited resources to support peat-based science learning. For this reason, it is necessary to have tools and learning media that assist teachers in carrying out peat-based science learning and guidance about the use of the learning tools and media.

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