Scientific literacy on peatland across various study programs, genders, and current domicile of university students in Borneo

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Article Info

Article history:

Received Jan 31, 2024
Revised Apr 23, 2024
Accepted May 18, 2024

Keywords:

Borneo
Peatland
PISA
Scientific competencies
Scientific knowledge
Scientific literacy

ABSTRACT

Scientific literacy is the ability that students must have to analyze and apply science concepts in solving everyday life problems. Students' scientific literacy on peatlands can be acquired by students from daily interaction with peatlands, understanding that comes from parents and the community, as well as from learning in the classroom. This study aims to analyze the scientific literacy skills of students from several campuses in Borneo on the topic of peatlands. In this study, scientific literacy is described into scientific knowledge and scientific competencies domain. The research was conducted using a survey method with 528 respondents from several universities in Borneo, Indonesia. Research results show that even half of the respondents live around the peatland area, students' scientific literacy is in the low category. The students' scientific competencies need serious attention. A proper learning resources and comprehensive learning is needed to improve student overall scientific literacy.

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1. INTRODUCTION

Environmental and natural degradation is often inevitable due to human activities [1]–[3]. Thick haze of pollution that is not worth breathing, pollution of river water bodies due to the accumulation of garbage, forest fires that continue to occur every year, and global warming that we have felt today. One of the activities that contribute to the degradation of environmental quality is land burning with the aim of land clearing, agriculture and housing development occurs massively and continuously [4], [5]. On the other hand, nature has its own way of recovering. One ecosystem that requires attention to maintain the quality of nature is peatlands.

Peatland is one of the most important ecosystems in Indonesia. Indonesia has a large area of peatland, 87% of the peatland area in the tropics is located in Indonesia [5]. Peatlands can naturally maintain carbon stocks [2], [5], [6]. Peatlands have important ecological, economic, and social functions. With these various functions of peatlands, they can maintain climate stability. Unfortunately, peatlands in Indonesia have been severely damaged. It was recorded that for 20 years there has been peatland degradation in the southeast Asia region, one of which is Indonesia. There are reports that every year there were forest fires in

2001-2015. In 2015 to 2016 there were forest fires that continued to increase [7]. Most of them were peatland fires. Indonesian peatlands (Sumatra and Borneo) were estimated to produce 119.7 million tons of carbon emissions per year in 2015 [4]. More than 37% of peatlands in Borneo have been degraded, making them more fragile and accelerating peat decomposition [8]. The same thing happened in peat forests in Central Borneo, resulting in degraded peatlands in Central Borneo Province [9].

Degraded peatlands experience changes in chemical, physical and biological properties that reduce their function as ecosystems. Peatland degradation can cause various problems, such as floods, fires, and climate change. Peatland degradation can be triggered by, among others, illegal logging activities; land clearing for agriculture, industry and settlements, and the creation of ditches/canals [10]. The preparation of peatlands for small-scale agriculture is generally done by burning the land [11], resulting in peatlands experiencing extensive drainage activities [5]. These activities result in peatland drainage, land subsidence and seawater intrusion, which in turn lead to fires in the dry season and floods in the wet season as well as other ecological disasters. This can have an impact on the ease with which peatlands burn in hot weather. Peatlands will lose their natural functions and properties. This damage will continue on a massive scale if peatland management is not properly controlled and managed.

One of the main causes of unwise utilization and management of peatlands is a lack of understanding of the properties of peatlands. For example, land management mistakes such as choosing the wrong activities in peat areas that are not in accordance with peatland characteristics, burning peatland to clear land for agriculture, or backfilling for housing development [9]. The lack of knowledge and skills related to adequate peatland management techniques can have fatal consequences for damaged peat ecosystems, suboptimal peatland functions, and widespread peatland degradation [8].

Understanding the nature of peatlands and how to manage them greatly influences how communities utilize them. On the other hand, the control of forest fires focuses more on the suppression aspect than the prevention aspect, especially for local communities or around the area where the fire occurred [2]. Sufficient knowledge about the peatland environment will change the mindset, attitude, and behaviour of the community to be more concerned about the environment. The need for scientific literacy on peatland is emerging. A good understanding of peatlands is expected to lead to sustainable peatland management. A literate citizen will be more responsible in managing and protecting the environment [12]–[14], so environmental damage can be addressed if people develop scientific literacy, especially scientific literacy about peat [1], [6], [15].

Students as young members of society are a milestone in preserving nature in the future [3], [16], [17]. In the future, In the long run, students are expected to protect and preserve peatlands in a sustainable manner [18]. As part of the community, students are expected to make a positive contribution to the proper utilization and conservation of peatlands. Students are also expected to develop innovations in peatland management. This contribution requires a good understanding and scientific literacy about peatlands. On the other hand, scientific literacy is needed by students and the wider community to analyze and solve problems related to the environment and peatlands [1]. This shows that information on the understanding and scientific literacy on peatlands from students is quite crucial [1], [2], [19].

Scientific literacy is known as the ability to understand, use and evaluate scientific information [20]. Scientific literacy is one of the economic development factors [15], [21]. Scientific literacy is important to be able to understand various problems that exist around the community, including problems related to peatlands. Scientific literacy is one of the provisions in facing future challenges, improving various lives, facing scientific issue problems and preserving nature for the sake of sustainable resources [14], [22], [23]. Scientific literacy ensures personal decision-making and participation in social community, cultural relations and economic productivity [24]. With scientific literacy skills, students are expected to understand the concepts and processes of science and the relationship between them and society.

Young people can contribute to a better future if they are equipped with the skills and resources needed for active participation in society. From throughout the Programme for International Student Assessment (PISA) assessment so far, students' scientific literacy skills are still very low. In several study reported high school students' scientific literacy skills on biology were still at the "start to develop" stage [25], and students scientific literacy on global warming topic was in moderate category [26]. It is only few of study research that measures university students' scientific literacy [27] and limited research on peatland scientific literacy. These problems are the basis for the importance of analyzing the scientific literacy of students in Borneo regarding peatlands. This research is expected to provide information that can be used to develop education or training programs that can improve students' scientific literacy on peatlands.

2. METHOD

This research method used a survey research method and descriptive analysis technique. This research aimed to analyze the quality of students' scientific literacy skills in peatland. Sampling was conducted by using random sampling. 528 university students in Borneo participated in filling out the survey. The respondents are students from various universities, such as Palangka Raya University, Lambung Mangkurat University, Mulawarman University, Tanjungpura University, and Borneo Tarakan University.

The questionnaire of scientific literacy on peatland instrument (SLPI) consists of 24 questions of scientific knowledge, and 13 questions of scientific competencies. Validity and reliability of instruments are presented in Table 1. The instrument was developed based on scientific literacy in PISA 2018. Aspects in each domain are described in Table 2.

Table 1. Validity and reliability of instruments

Scientific literacy domain	Construct validity (%)	Cronbach's Alpha (reliability)
Scientific knowledge	82.34	0.845
Scientific competencies	80.09	0.847

Table 2. Distribution of scientific literacy domain

Domain	Component
Scientific knowledge	Content knowledge
	Procedural knowledge
	Epistemic knowledge
Scientific competencies	Explaining scientific phenomena
	Interpreting data and evidence scientifically
	Evaluating and designing scientific questions

The data were analyzed using MANOVA test to see any differences between independent variables, and also the quantitative descriptive analysis method to describe students' scientific literacy skill. The percentage of student answer scores and the percentage of correct answers for each domain item were calculated using the following formula:

$$Percentage\ Score = \frac{J_b}{N} \times 100\%$$

Jb: total questions answered correctly
N: total students

Descriptive analysis was conducted by grouping students' scores into several categories. This method made it easier for the author to describe students' scientific literacy skill. Student scores are categorized based on the following Table 3.

Table 3. Category percentage of students' score [37]

No	Category	Interval
1	Very high	81–100
2	High	61–80
3	Moderate	41–60
4	Low	21–40
5	Very low	0-20

3. RESULT AND DISCUSSION

The collected data provides information to draw student's scientific literacy on peatland. Total of 37 questions were administered to the students online (formal) to assess scientific knowledge knowledge and scientific competencies domain, as part of scientific literacy. Specifically, the survey consists of three main majors: i) individual description, including gender, university, study department, and current residence; ii) 24 items assessed scientific knowledge, including content knowledge, epistemic knowledge, and procedural knowledge; and iii) 13 items assessed Scientific competencies, including explaining scientific phenomena, interpreting data and evidence scientifically, and evaluating and designing scientific questions. 528 university students were involved in this survey. The students from several universities in Borneo, Indonesia. The individual descriptions of the respondents are presented in Table 4.

Scientific literacy is defined in three measured domains [20], namely scientific knowledge, scientific competencies, and attitude toward science. University students, as part of society, need scientific literacy to understand nature (peatland), identify nature problems, and solve them for good. Students with good scientific literacy are expected to protect and conserve peatland ecosystems for a sustainable environment. A description of students' scientific literacy can be seen in Table 5.

Table 4. Description of sample

Variable	Frequency	%
Gender:		
Male	126	23.86
Female	402	76.14
Study program:		
Science	384	72.72
Non-science	144	27.28
Home region:		
Close to peat area	218	41.28
Far from peat area	310	58.72

Table 5. Students' scientific literacy description

	Minimum statistic	Maximum statistic	Mean statistic	Std. deviation statistic	Category
Scientific literacy	7.69	69.23	37.82	11.54	Low
Scientific knowledge	12.50	66.67	41.37	10.78	Moderate
Scientific compentencies	7.69	69.23	34.27	12.29	Low

Based on Table 5, the average of students' scientific literacy is 37.82 with standard deviation 11.54. This average score is in the low category. The average of students' scientific knowledge is 41.37 with standard deviation 10.78. This average score is in the moderate category. The average score of students' scientific competencies is 34.27 with standard deviation 12.29. This average score is in the low category Students' competencies is lower than students' scientific knowledge. On the other hand, the level of students' scientific literacy shows the quality of education [26], [28], [29]. The formation of environmental literacy can be done since elementary school through effective education [19], [30]. It is hard to say that this finding leaks the weakness of Indonesia's education. Living around peatland area does not mean students understand it automatically. A school community with good nature skills will have a great impact on students' nature skills and knowledge [10], [31]. Systematic and comprehensive education is needed to educate students about peatlands, their characteristics, and how to be peat literate. An in-depth analysis of students' scientific knowledge is presented in Tables 6 and 7.

Table 6. Frequency and percentage of students' scientific literacy in scientific knowledge domain

No	Category	Interval	N	Percentage (%)
1	Very high	81–100	0	0
2	High	61–80	34	6.44
3	Moderate	41–60	310	58.71
4	Low	21–40	178	33.71
5	Very low	0-20	6	1.14

Table 7. Students' scientific literacy in scientific knowledge aspects

Item	Percentage (%)
Content knowledge	59.88
Procedural knowledge	39.78
Epistemic knowledge	31.57

The scientific knowledge domain is more focused on students' understanding of nature and phenomena. In this study, peatland characteristics and its nature were being context of the study. The scientific knowledge domain provides an overview of students' abilities in understanding the nature and characteristics of peatlands. This domain discussed content knowledge, procedural knowledge, and epistemic knowledge.

The scientific knowledge questionnaire consists of 24 items, 8 of them to assess content knowledge, 9 items to assess procedural knowledge, and 7 items to assess epistemic knowledge. Analysis of students' scientific knowledge domain in Table 6 shows that more than half of respondents (58.71%) are in the moderate category, 33.71% are in the low category, 1.14 are in the very low category, and only 6.44% are in the high category. There is no respondents in the very high category.

The scientific knowledge domain consists of three aspects, content knowledge, procedural, and epistemic. In Table 7, further analysis was conducted to see the percentage of correct answers for each aspect. The percentage of content items are 59.88%, the procedural items are 39.78%, and the epistemic items are 31.57%. All of them are very low category. The trend that occurs is a decreasing in the value of content, procedural to epistemic. Epistemic knowledge is the lowest percentage, which means only 31.57% of students gave the correct answer.

41.3% of respondents were born and grew up in area near peatland and 58.7% of respondents were born and live far from peatland area. Some of them moved to a place close to the peatland. By living in peat area, every day students can see and interact with the peatlands around them. Home region, where students surrounded by peatland area, are expected to be learning resources for students. Learning and understanding about peatlands can also occur. MANOVA analysis was conducted to see any differences scientific literacy among students who live near peatland area and far from peatland area. The MANOVA analysis result is presented in following Table 8.

Table 8. Multivariate tests of scientific literacy by home region

	Value	F	Hypothesis df	Error df	Sig.	Partial eta squared
Wilks' Lambda	0.997	0.872[b]	2.000	525.000	0.419	0.003

The analysis results are quite surprising. Based on Table 8, there is no differencess of scientific literacy between students who live near peatland area and far from area (Sig.=0.419). In more details, Table 9 explains that there is no differencess of scientific knowledge (Sig.=0.409) and scientific competencies (Sig.=0.291) between students. Even if we hope higher the interaction between students and peatlands, the higher the understanding of peatlands [18], the analysis explains the opposite. It could be understood that the use of peatlands by parents or communities that are not in accordance with the nature and characteristics of peatlands can affect students' knowledge. The community utilizes peatlands by converting land into plantations and covering peatlands with soil for housing development [24]. This ignores the principles of peatland conservation and function [32]. This shows the lack of understanding of peatlands in the community. On the other hand, students can learn about peatlands from the mass media. News about peatlands often appears in the mass media, especially about peatland fires and environmental damage in peatlands. Unfortunately, not many scientific explanations about the characteristics of peatlands and why they are so susceptible to fires can be found in the news. There is also little mention in the media of the risks of clearing peatlands for industrial purposes, and the impact on ecosystems and the global climate [33].

Students are exposed to a lot of information nowadays. Many people who act as content creators produce information that can be consumed at any time. Hoax, misinformation, and even misleading information are inevitable. An incomplete question or statement can give rise to differences of opinion and views. Procedural and epistemic knowledge is also important for deciding whether any of the claims circulating in media were obtained using appropriate and justifiable procedures. Content knowledge, procedural and epistemic knowledge, help students to identify problems scientifically, evaluating information and interpreting information, and data. In the curriculum, students are never faced with epistemic knowledge as well. Epistemic knowledge is something new for students. Students are accustomed to learning facts that are often presented as rote memorization. This is what causes students' procedural and epistemic knowledge low.

Table 9. Tests of between-subjects effects of scientific knowledge and scientific competencies domain by home region

Dependent variable	Type III sum of squares	df	Mean square	F	Sig.	Partial eta squared
Scientific knowledge	89.223	1	89.223	0.684	0.409	0.001
Scientific competencies	168.614	1	168.614	1.118	0.291	0.002

The low number of students who were able to answer correctly in this domain shows that there is a lack of understanding of the nature and characteristics of peatlands. Students did not understand how the peatland formation. Some of them thought that peatland is a pile of decomposed plant residues, peatlands have unique characteristics that differ it from land in general. Peatland is land that has a soil layer consisting of organic matter from plant and animal vegetation for thousands of years [24], [34], which cannot decompose because decomposing organisms cannot live due to anaerobic environmental conditions. Most of the students know that peatlands are acidic. Although peatlands tend to be less fertile, this does not mean that they cannot be utilized for agriculture. With its nature and characteristics, peatland requires special care in order to be utilized for agriculture [35], as well as the selection of plants that are suitable for the condition of the processed soil [36].

On the other hand, there is no special education or learning about peatlands at the school or university level. Peatland as a characteristic and local wisdom has not been included in the curriculum. This exacerbates students' scientific literacy skills about peatlands. Several studies have tried to bring together classroom learning with the topic of peatlands as local wisdom. Some mentioned that classroom learning still does not touch peatlands [37]. Teachers' understanding of peatlands is still low [18], [38]. Some of the obstacles in teaching material about peatlands include lack of time, lack of preparation for both teachers and students [18], and learning resources that discuss peatlands [39]. Special attention is needed so that the topic of regional local wisdom can be included in the curriculum. This can be an effort to preserve the environment and live with nature well. A further analysis was conducted by using MANOVA test to see if any differences in students' scientific knowledge by gender and study program. The analysis result can be seen in the following table.

MANOVA test results with Wilks' Lambda analysis in Table 10 reveals a significance value of 0.000 (<0.05). It can be concluded that there are significant differences when viewed by study program. In more details analysis, Table 11 tells us that scientific knowledge domain is the domain that accounts for significant difference values. Students have significant differences in scientific knowledge domain (Sig.=0.000). On the other hand, there is no significant difference in ability in the scientific competencies' domain (Sig.=0.876).

Based on Table 12, science study program students' average score of scientific knowledge about peatland is 45.59 with standard deviation 10.93. In another side, non-science study program students' average score of scientific knowledge about peatland is 38.77 with standard deviation 11.45. Both values are in the moderate category. It turns out that there is a significant difference between science and non-science students in the scientific knowledge domain. This is understandable because science study program students are always exposed to scientific information. Students are familiar with scientific terms and see and think about phenomena scientifically.

Table 10. Multivariate tests of scientific literacy by *study program*

	Value	F	Hypothesis df	Error df	Sig.	Observed power[c]
Wilks' Lambda	0.935	9.046	2.000	261.000	0.000	0.974

Table 11. Tests of between-subjects effects of scientific knowledge and scientific competencies domain by *study program*

Source	Dependent variable	Type III sum of squares	df	Mean square	F	Sig.	Partial eta squared
Study	Scientific knowledge	4439.418	1	4439.418	36.316	0.000	0.065
Program	Scientific competen	3.692	1	3.692	.024	0.876	0.000

Table 12. Students' scientific literacy in the scientific knowledge domain by study program

Component	Department	Mean	Std. deviation	Category
Scientific knowledge	Science	45.59	10.93	Low
	Non-science	38.77	11.45	Low

MANOVA test result of students' scientific literacy among male and female students with Wilks' Lambda analysis in Table 13 has a significance value of 0.015 (<0.05). It can be concluded that there are significant differences of students' scientific literacy when viewed by gender. In more details analysis, Table 14 tells us that scientific knowledge domain is the domain that accounts for significant difference values. Students have significant differences in scientific knowledge domain (Sig.=0.005). On the other hand, there is no significant difference in ability in the scientific competencies' domain (Sig.=0.493). This kind of analysis result is similar with the analysis of students' scientific literacy by study program. There are significant differences in students' scientific knowledge both based on gender and study program, and conversely there are no significant differences in scientific competencies based on gender and study program. This finding requires attention that the ability of scientific competencies is a serious problem. It can be concluded that overall students have minimal experience in developing scientific competencies thus they have low scores.

Based on Table 15, male students' average score of scientific knowledge about peatland is 41.67 with standard deviation 11.62. In another side, female students' average score of scientific knowledge about peatland is 44.92 with standard deviation 11.23. Both values are in the moderate category. There is no significant difference between male and female students in the scientific knowledge domain. Female students have better score than male students in scientific knowledge domain [40]. It shows that female students have better understanding and experience peatland's characteristic. Unfortunately, both male and female students have low scientific knowledge scores. It can be understood that the current curriculum does not include an in-depth discussion of peatlands. Students understand peatlands through daily life and explanations passed down through generations.

The scientific competence questionnaire consists of 13 questions, which are 4 of them to assess the students' ability in explaining scientific phenomena, 5 of them to assess interpreting data and evidence scientifically, and the last 4 questions to assess students' ability to evaluate and design scientific questions. An in-depth analysis of students' scientific knowledge is presented in Tables 14 and 15.

Table 13. Multivariate tests of scientific literacy by study program

	Value	F	Hypothesis df	Error df	Sig.	Partial eta squared
Pillai's trace	0.016	4.253	2.000	525.000	0.015	0.016
Wilks' lambda	0.984	4.253	2.000	525.000	0.015	0.016
Hotelling's trace	0.016	4.253	2.000	525.000	0.015	0.016
Roy's largest root	0.016	4.253	2.000	525.000	0.015	0.016

Table 14. Tests of between-subjects effects

Dependent variable	Type III sum of squares	df	Mean square	F	Sig.	Partial eta squared
Scientific knowledge	1016.229	1	1016.229	7.893	0.005	0.015
Scientific competencies	70.954	1	70.954	0.470	0.493	0.001

Table 15. Students' scientific literacy in the scientific knowledge domain by gender

Component	Gender	Mean	Std. Deviation	Category
Scientific knowledge	M	41.67	11.62	Low
	F	44.92	11.23	Low

Analysis of students' scientific competencies domain in Table 16 shows that more than half of respondents (64.02%) are in the low category, 21.97 % are in the moderate category, 12.50 are in the very low category, and only 1.50% are in the high category. There are no respondents are in the very high category. The scientific competencies domain consists of three aspects: explaining scientific phenomena, interpreting data and evidence scientifically, and evaluating and designing scientific questions. In Table 17, further analysis was conducted to see the percentage of correct answers for each aspect. The percentage of explaining scientific phenomena items are 39%, interpreting data and evidence scientifically are 39.78%, and evaluating and designing scientific questions items are 31.57%. All of them are low category. The aspect of explaining scientific phenomena is the item with the highest percentage (39%) compared to items in other aspects of competence. This is because the aspect of explaining scientific phenomena is a question that is easily understood by students [20], [41]. In the items explaining scientific phenomena, students are required to recall knowledge that has been learned and can use and interpret it in certain situations based on existing facts to explain a scientific phenomenon.

Table 16. Frequency and percentage of students' scientific literacy in the scientific competencies' domain

No	Category	Interval	N	Percentage (%)
1	Very high	81–100	0	0
2	High	61–80	8	1.50
3	Moderate	41–60	116	21.97
4	Low	21–40	338	64.02
5	Very low	0-20	66	12.50

Table 17. Students' scientific literacy in scientific competencies domain

Item	Percentage (%)
Explaining Scientific Phenomena	39
Interpreting data and evidence scientifically	31.6
Evaluating and designing scientific questions	33

The item of interpret data and evidence scientifically, and evaluating and designing scientific questions had a lower percentage compared to explaining scientific phenomena. These items need more specific skill from students to analyze and explore the scientific problem. The questions given are questions that need students to identify problems through scientific exploration, distinguish scientific questions, propose ways to explore and evaluate scientific questions as the way scientist did. In scientific competencies, students need to be able to describe clear and logical relationships regarding evidence and conclusions of a particular problem [42]. Students should draw a common thread and relevant explanation [43]. Without those skill, students tend to get low score. A further analysis was conducted to see if any differences in students' scientific knowledge by gender and study program. The analysis result can be seen in Tables 18 and 19.

Table 18. Students' scientific literacy in scientific competencies domain by gender

Component	Gender	Mean	Std. Deviation
Scientific competencies	M	34.92	12.32
	F	34.06	12.24

Table 19. Students' scientific literacy in scientific competencies domain by study program

Component	Department	Mean	Std. Deviation
Scientific competencies	Science	34.21	12.31
	Non-science	34.40	12.16

Based on Table 18, male students' average score of scientific competencies about peatland is 34.92 with standard deviation 12.32. In other side, female students' average score of scientific knowledge about peatland is 34.06 with standard deviation 12.24. Both values are in the low category. There is no significant difference between male and female students in the scientific competencies' domain. This shows that male and female students have the same experience and understanding of peatlands and its process. In this domain, gender and ethnicity of students did not contribute to students' scientific literacy skills [59]. It is understood that the current curriculum does not include an in-depth discussion of peatlands. Students do not get learning experiences that can hone scientific competencies sufficiently [26], [44]. Students understand peatlands through daily life with beliefs that have been passed down from generation to generation.

Based on Table 19, science study program students' average score of scientific knowledge about peatland is 34.21 with standard deviation 12.31. In other side, non-science study program students' average score of scientific knowledge about peatland is 34.40 with standard deviation 12.16. Both values are in the low category. It turns out that there is no significant difference between science and non-science students in the scientific competencies' domain. This trend is different than students' scientific knowledge. Although science study program students are familiar with scientific terms and got exposed every day, they are not yet accustomed to the way scientist think as outlined in the scientific competencies. This reinforces the notion that students' literacy skills need to be supported by a good curriculum. Students are not fully able to apply the knowledge they learn in a real context, hence students' scientific literacy skills are still low [41], [45].

The low scientific literacy skills of students regarding peatlands are very concerning. This requires serious attention. Government support by including local content provides space for teachers to introduce students to the diversity and natural wealth that exists. However, limited learning resources require more effort from teachers to implement this learning. Therefore, the development of learning tools and other learning resources to support learning about peatlands is highly recommended. Furthermore, learning that supports the development of scientific literacy skills and its domains, especially on the topic of peatlands, is urgently needed. Learning that does not only contain memorization, but also in-depth discussions so that it can help students solve various scientific issue problems.

4. CONCLUSION

We all have hopes for the younger generation to preserve nature, including peatlands. Good knowledge and understanding are needed in maintaining and cultivating peatlands in a sustainable manner. Students as successors are expected to have adequate scientific literacy skills. This study aims to look at the scientific literacy skills of students in several universities in Borneo. The results show the average score of scientific literacy on peatlands is generally low (37.82). In detail, students' scientific knowledge of 41.37 is in the moderate category and students' scientific competencies of 34.27 is in the low category. Based on the MANOVA test, scientific knowledge has significant differences between genders and study programs, and on the other side, there is no significant differences of students' scientific competencies by gender and study program. Living around peatland areas does not guarantee understanding of peatlands, as community utilization may not align with peatland conservation principles.

The low number of students able to answer correctly in the scientific knowledge domain indicates a lack of understanding of peatland nature and characteristics. Students' procedural and epistemic knowledge is also low, affecting their ability to identify problems scientifically, evaluate information, and interpret data. Special education and learning about peatlands are needed to improve students' scientific literacy skills. Comprehensive learning is required to improve students' scientific literacy skills on peatlands, which can contribute to sustainable peatland management and environmental preservation. Comprehensive learning about peatlands should be included in the curriculum to provide students with the necessary knowledge and skills.

ACKNOWLEDGEMENTS

The authors would like to thank Palangka Raya University, especially Faculty of Teacher Training and Education, for its financial support for this study. We would like to thank our fellow lecturers from various universities in Borneo for their assistance in conducting this study.

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