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Exploration of Plant Literacy of High School Students in Mentawai: A Quantitative Approach through Inventory, Processing, and Data Reporting

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ABSTRACT

This study explores the plant literacy of high school students in the Mentawai Islands using a quantitative approach that includes the stages of inventory, processing, and data reporting. The survey method was applied to 302 students from three schools to evaluate their understanding of plants in four dimensions: nominal, functional, structural, and multidimensional. The results of the study show that plant literacy among students is still relatively low, especially in the nominal aspect of the level that needs the most improvement. Low data analysis skills and ecological interpretation are also inhibiting factors in improving student understanding. To address this, the study recommends the application of contextual learning methods based on direct exploration, such as the integration of local biodiversity in curriculum and experiential learning activities, including field practice and project-based experiments. This approach is expected to increase students' ecological awareness as well as strengthen their data analysis skills in understanding biodiversity more deeply.

Keyword: Biodiversity Education, Data Analysis, High School Students, Mentawai Islands, Plant Literacy, Quantitative Research

INTRODUCTION

The exploration of plant literacy among high school students in Mentawai is a theme that is relevant to the context of environmental and biology education. Research related to plant literacy focuses on students' understanding of plants and their important role in ecosystems (Gutiérrez-García, Blanco-Salas, et al., 2024; Gutiérrez-García et al., 2020;

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Gutiérrez-García, Sánchez-Martín, et al., 2024). The exploration of plant literacy among high school students in Mentawai through a quantitative approach involves several stages, including inventory, processing, and data reporting (Nuraeni & Rahmat, 2019).

A quantitative approach in data processing can be applied by adapting the techniques described by Klug et al., which emphasize the importance of using long-term data in the context of ecological learning to improve students' quantitative literacy (Klug et al., 2017). By utilizing data from plant inventories, students can engage in more in-depth analysis of biodiversity and environmental health in their area (Nyberg et al., 2019). The use of quantitative instruments not only improves students' analytical skills, but also serves as a tool to influence their understanding of plant literacy (Arsyad et al., 2023). In this context, Koga underlined the importance of statistical literacy skills that can be applied to effectively evaluate plant-related data, so as to create a better understanding among high school students of complex concepts in biology and ecology (Koga, 2022).

One of the main challenges is the collection of accurate and representative data (Silam et al., 2021). As Nunes et al. reveal, the collection of local information on botanical knowledge often faces difficulties in terms of data validity, especially when it involves different parties who have different understandings of the plants they are familiar with (Nunes et al., 2018). To address this problem, the use of systematic quantitative methods and proper survey design can improve data accuracy and reduce bias (Fox, 2005). For example, adjustments to survey instruments used to measure plant literacy levels can help in getting a more comprehensive picture of student comprehension (Sharma, 2017).

Another challenge arises from complex data processing (Staunton et al., 2019). Thoma et al. (2018) underlined the importance of following evaluation criteria and reporting guidelines in quantitative research to ensure that the data generated has a high degree of consistency and validity. In the context of plant literacy, this means that data processing and reporting must be carried out to clear standards, including appropriate descriptive and inferential analysis to accurately infer and interpret the data (Chan et al., 2017).

In reporting results, it is also important to pay attention to how information is presented to stakeholders, including teachers, students, and the community. Research by Özcan et al. emphasizes the need for rigor in formulating reports that are not only informative but also easy to understand for non-technical audiences (Özcan et al., 2015). Furthermore, the use of clear illustrations and supporting tables can help in conveying the results of the plant inventory in a more interesting and informative way (Eguchi & Koshijima, 2018). Overall, challenges in plant literacy inventory and reporting include accurate data collection, consistent processing, clear and informative reporting. In this case, correct statistical science is needed.

Statistics is the science or method of collecting, organizing, processing, analyzing, presenting, and interpreting data into information to help draw conclusions and make effective decisions (Thoma et al., 2018). In a research, inventory, processing, and reporting of data is a very important aspect and cannot be ignored (Rancher et al., 2016). Data inventory is an important first step in applied statistics. Research (Rancher et al., 2016) emphasizing the importance of accurate data collection in detecting fraud, where incomplete or invalid data can lead to incorrect conclusions (Simpson et al., 2019).

Once the data is inventoried, the next stage is data processing. Effective data processing, including reduction, presentation, and verification processes, allows researchers to extract meaningful insights and findings from raw data (Rea et al., 2012). Overall, challenges in plant literacy inventory and reporting include accurate data collection, consistent processing, and clear and informative reporting. Therefore, statistical science is very important in this study. Statistics is a method of collecting, organizing, processing, analyzing, presenting, and interpreting data into information that can be used to draw conclusions and make effective decisions (Thoma et al., 2018). In a research, inventory, processing, and reporting of data is a crucial aspect that cannot be ignored (Rancher et al., 2016).

The gap between theory and practice in plant literacy research is the main background of this research. This study aims to: (1) identify the main obstacles in the process of inventorying, processing, and reporting data in the field of plant literacy, (2) design an appropriate approach to the local context of Mentawai, and (3) provide guidelines that can be used by other researchers in managing similar data. Thus, this research will not only enrich insights on plant literacy among Mentawai students but also make a methodological contribution in improving the quality of research in this field. By integrating quantitative methods that are more systematic and adapted to the local context, this study seeks to address existing challenges and provide more applicable solutions for similar research in the future.

METHOD

Research Design

This study uses a quantitative approach with a survey method to measure student plant literacy in Mentawai Islands Regency High School. The number of samples in this study is 302 students. Collection of student plant literacy data with modified instruments (Uno, 2009) carried out on November 18-21, 2024. Data is collected through Google Forms for schools with internet access and paper use for schools without internet access. Meanwhile, the collection of student perception data on biodiversity and plants was carried out on November 11-14, 2024 using a questionnaire (Pedrera et al., 2023) with a similar method, namely through Google Forms and paper according to the availability of internet access in each school. The data were tested for normality, homogeneity, and linearity, then analyzed using descriptive and inferential statistics, such as T test, ANOVA, and correlation analysis with SPSS 30.

Participants

The total population of this study consisted of 11 State Senior High School (SMAN) located in the Mentawai Islands Regency, Indonesia. The sample was selected using a purposive sampling technique, which involves choosing participants based on specific predetermined criteria. Three schools were selected to represent different categories relevant to the study: SMAN 2 Sikakap, SMAN 2 Sipora, and SMAN 1 Siberut Tengah. The number of respondents in this study was 302 students consisting of three schools. At SMAN 2 Sikakap, which has a total enrollment of 163 students, a sample of 34 students was selected from Grade 11 and 12.

Instruments

In this study, the students' plant literacy instruments were adapted and modified (Uno, 2009) Then adjusted to biodiversity materials. This test question is designed to measure four levels of plant literacy, namely nominal level, functional level, structural level, and Multidimensional level. This study uses a questionnaire that has been modified from (Pedrera et al., 2023) to explore students' perceptions of biodiversity and plants. This questionnaire is designed to measure students' knowledge, attitudes, and awareness regarding the importance of biodiversity, by adjusting the local context to provide a more relevant and accurate picture.

Data Analyis

Data analysis in this study was carried out using the SPSS 30 statistical tool. Before the main analysis, validity and reliability tests were carried out on the research instruments to ensure the quality of the data obtained. Overall, the results of the validity test show that this plant literacy question instrument has good quality and can be used as a measuring tool. Most questions have a very high validity, so they can accurately measure the construction in question. Based on the results of the plant literacy reliability test, the Alpha Cronbach score of 0.973 for 30 questions indicates very high instrument reliability. This value far exceeds the commonly used minimum reliability limit, which is 0.700, so it can be concluded that the plant literacy instrument has excellent internal consistency.

RESULTS AND DISCUSSION

Results

Demographic Data of Research Sample

The study involved 302 State High School students in the Mentawai Islands, who were selected representatively from three main islands: Sikakap, Sipora, and Siberut. The selection of the location aims to include geographical and socio-cultural diversity, so that the data reflects a comprehensive picture of students' plant literacy. By involving students from various regions, this study is expected to identify understanding patterns and factors that affect plant literacy among high school students. Samples by gender can be seen in Figure 1.

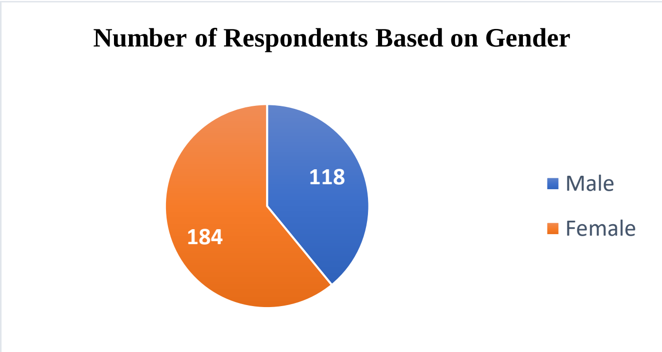


Figure 1. Number of Respondents by Gender

Based on Figure 1, out of a total of 302 students sampled, there were 118 male students and 184 female students, indicating a larger proportion of female respondents. This proportion allows the identification of differences or similarities in patterns of understanding and factors that influence plant literacy between gender groups. In addition, the distribution of samples was also categorized based on grade level, providing a comprehensive overview of the variation in plant literacy understanding among State High School students in the Mentawai Islands. This data is important to analyze the influence of gender on students' interests and interactions with the natural environment and plants.

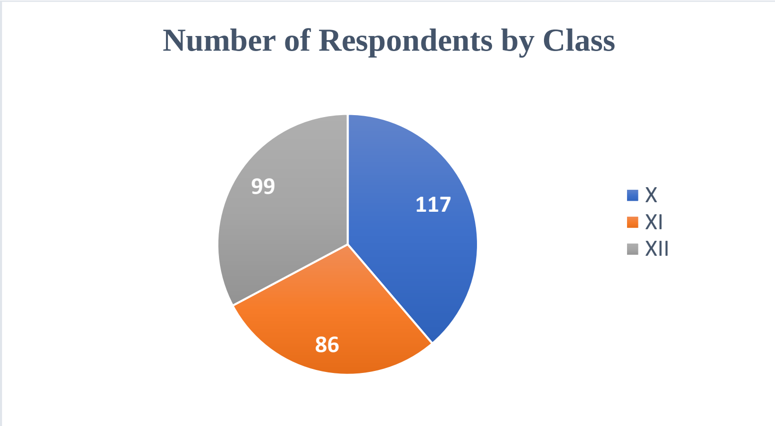


Figure 2. Number of Respondents by Class

Based on Figure 2, the distribution of respondents shows quite even variations among grade levels, with 117 students from class X, 86 students from class XI, and 99 students from class XII. A higher proportion in class X reflects dominant involvement, while students in grades XI and XII still make significant contributions. This distribution allows for a comprehensive analysis of plant literacy at different levels of education, helping to identify the development of students' understanding related to learning experiences and curriculum at each level. With equal representation, this study is expected to be able to describe the patterns and differences in plant literacy as a whole. Furthermore, the number of respondents based on age can be seen in Figure 3.

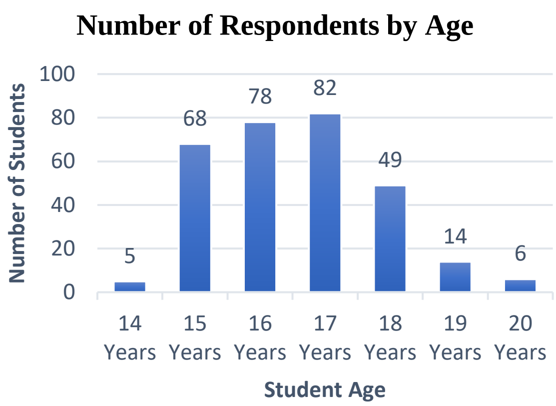


Figure 2. Number of Respondents by Age

Based on Figure 3, the majority of respondents were in the age range of 15–18 years, with the dominance of 17 years old (82 students), followed by 16 years (78 students) and 15 years old (68 students). The 18-year-old age group totaled 49 students, while other ages were smaller: 14 years old (5 students), 19 years old (14 students), and 20 years old (6 students). This data reflects a representation that corresponds to the age of high school education, with the dominance at the age of 16 and 17 years representing students in grades X and XI. This group is important because it is in the ideal cognitive development phase to understand plant literacy and biodiversity. Age representation covering various ranges provides a comprehensive overview of students' understanding and challenges related to plant literacy in the Mentawai Islands. Furthermore, the number of respondents based on the origin of the school is as shown in Figure 4.

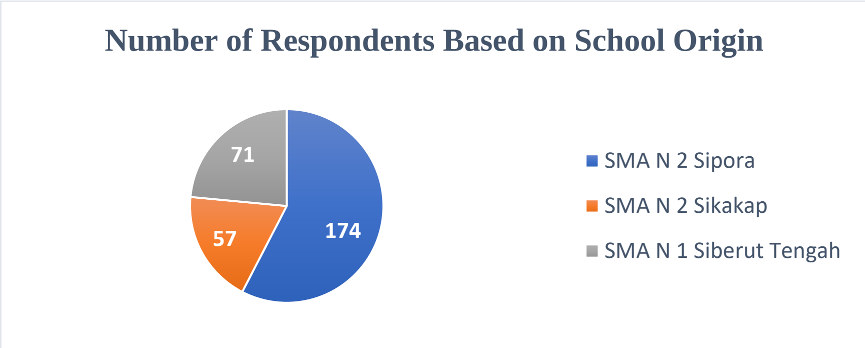


Figure 4. Number of Respondents Based on School Origin

Based on Figure 4, the distribution of respondents includes 174 students from SMAN 2 Sipora, 57 students from SMAN 2 Sikakap, and 71 students from SMAN 1 Siberut Tengah, according to the proportion of the student population in each school. Sampling was carried out proportionally, namely 20% of the total population in each school, to represent the condition of students in the Mentawai Islands. With representatives from three schools covering Sipora, Sikakap, and Siberut Islands, this study has a strong generalization to describe the level of students' plant literacy. This distribution also allows for the identification of patterns of understanding and challenges of plant literacy in various geographical and cultural contexts.

Student Plant Literacy

Descriptive Statistics Reporting

Descriptive statistics are applied to assess data by describing information as it has been collected, without attempting to draw broad or general judgments (Sugiyono, 2016) Descriptive statistics share a summary of data based on mean, standard deviation, maximum, and minimum. Reporting descriptive statistical data for plant literacy as shown in Table 1.

Table 1. Results of Descriptive Statistics of Student Plant Literacy

Nomor Soal	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
N Valid	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270
Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0,17	0,09	0,21	0,22	0,12	0,76	0,40	0,44	0,06	0,26	0,34	0,08	0,18	0,56	0,55
Std. Error of	0,023	0,018	0,025	0,025	0,020	0,026	0,030	0,030	0,014	0,027	0,029	0,017	0,023	0,030	0,030
Median	0,00	0,00	0,00	0,00	0,00	1,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1,00	1,00
Mode	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1
Std. Deviation	0,377	0,290	0,406	0,414	0,328	0,426	0,492	0,497	0,237	0,439	0,474	0,274	0,386	0,497	0,498
Variance	0,142	0,084	0,165	0,171	0,108	0,182	0,242	0,247	0,056	0,193	0,224	0,075	0,149	0,247	0,248
Skewness	1,763	2,827	1,451	1,370	2,320	-1,244	0,395	0,240	3,754	1,105	0,693	3,077	1,662	-0,240	-0,210
Std. Error of	0,148	0,148	0,148	0,148	0,148	0,148	0,148	0,148	0,148	0,148	0,148	0,148	0,148	0,148	0,148
Kurtosis	1,118	6,035	0,107	-0,124	3,406	-0,457	-1,858	-1,957	12,185	-0,785	-1,531	7,522	0,768	-1,957	-1,971
Std. Error of	0,295	0,295	0,295	0,295	0,295	0,295	0,295	0,295	0,295	0,295	0,295	0,295	0,295	0,295	0,295
Range	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sum	46	25	56	59	33	206	109	119	16	70	91	22	49	151	149

Nomor Soal	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
N Valid	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270
Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0,31	0,17	0,48	0,41	0,73	0,72	0,20	0,46	0,26	0,20	0,25	0,23	0,39	0,30	0,24
Std. Error of	0,028	0,023	0,030	0,030	0,027	0,027	0,024	0,030	0,027	0,024	0,026	0,026	0,030	0,028	0,026
Median	0,00	0,00	0,00	0,00	1,00	1,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Mode	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Std. Deviation	0,464	0,380	0,501	0,493	0,445	0,451	0,398	0,500	0,439	0,398	0,433	0,421	0,489	0,457	0,428
Variance	0,215	0,144	0,251	0,243	0,198	0,203	0,158	0,250	0,193	0,158	0,187	0,178	0,239	0,209	0,183
Skewness	0,821	1,729	0,075	0,363	-1,040	-0,977	1,538	0,149	1,105	1,538	1,173	1,293	0,442	0,897	1,220
Std. Error of	0,148	0,148	0,148	0,148	0,148	0,148	0,148	0,148	0,148	0,148	0,148	0,148	0,148	0,148	0,148
Kurtosis	-1,337	0,996	-2,009	-1,882	-0,926	-1,053	0,367	-1,992	-0,785	0,367	-0,630	-0,331	-1,818	-1,204	-0,516
Std. Error of	0,295	0,295	0,295	0,295	0,295	0,295	0,295	0,295	0,295	0,295	0,295	0,295	0,295	0,295	0,295
Range	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sum	84	47	130	111	197	194	53	125	70	53	67	62	106	80	65

The results of descriptive statistics for 30 questions showed that the majority of mean values were below 0.5, median and mode 0, and the distribution of answers that tended to be skewed to the right, indicating that more respondents answered with low scores. Standard deviations indicate variation in answers, with questions such as Questions 6 and 7 having high variation, while Questions 2 and 9 are low. Skewness is mostly positive, except for a few questions like Questions 6 and 15 which are negative. Curtosis shows that questions such as Questions 9 and 12 have a very peak distribution (leptokurtic), while Questions 14 and 15 are flatter (platykurtic). Low-mean questions (e.g., Questions 2, 9, and 12) tend to be difficult, while high-mean questions (Questions 6, 15, and 20) are easier. No data is lost, allowing for further analysis for the validity and reliability of the questions to ensure consistency and accuracy of measurements.

Reporting of Student Plant Literacy Data

The reporting of student plant literacy data was carried out to provide an overview of the results of measuring plant literacy skills of all participants involved in this study. As seen in Figure 5.

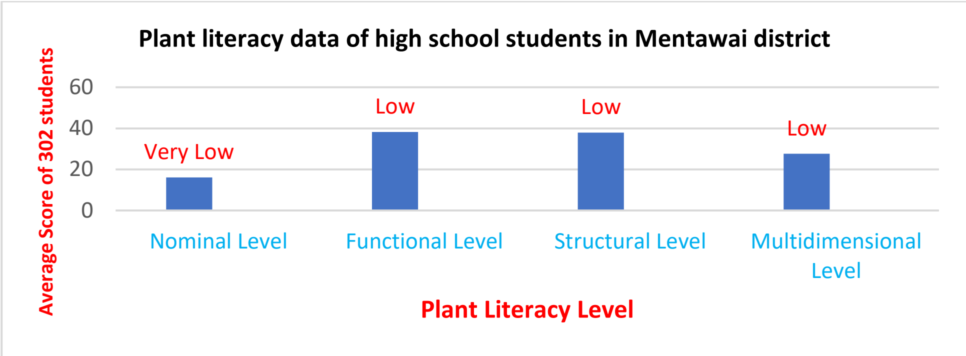
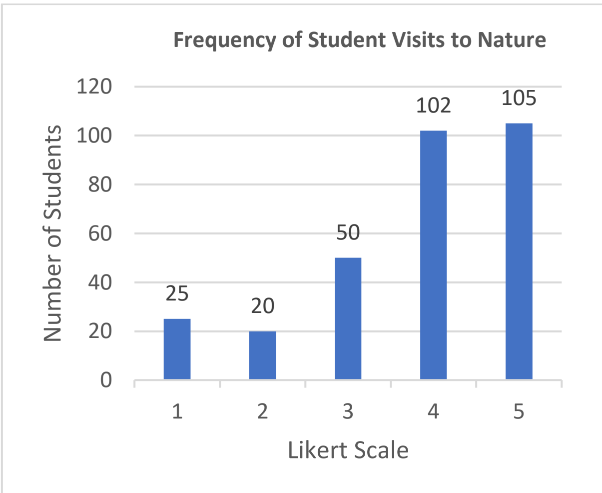


Figure 5. Plant Literacy Data for High School Students in Mentawai Regency

Based on Figure 5, the level of plant literacy of high school students in Mentawai Islands Regency shows variations in four level categories. The Nominal Level has the lowest average with a very low category (about 15 students), reflecting a limited understanding of basic concepts. The Functional Level and Structural Level have an average of close to 40, still in the low category, indicating that the functional and structural abilities are not optimal. The Multidimensional Level is also low, with an average of about 30, indicating difficulty understanding plant concepts broadly and interdisciplinarily. These results confirm the need for a more effective and contextual learning approach to improve students' plant literacy at all levels. The low literacy of students in Mentawai is a problem that is influenced by various interrelated factors. Based on the data obtained as shown in Figure 6.

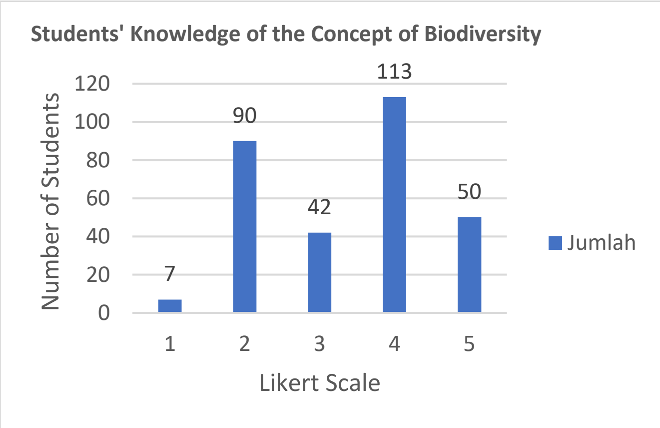


Information:

1. Very rare (< 5 times a year)
2. Rare (about 5-7 times a year)
3. Occasionally (about 8-10 times a year)
4. Often (1-2 times a month)
5. Very often (> 1 time a week)

Figure 6. Frequency of Student Visits to Nature

Based on Figure 6, the low plant literacy of students in Mentawai is related to the pattern of less effective interaction with the natural environment. Although 105 students frequently visited nature more than once a week and 102 students 1–2 times a month, the visits tended to be recreational without structured education-based exploration. Very rare (25 students) and rare (20 students) students visiting nature further exacerbate the plant literacy gap due to the lack of direct experience and limited integration of plant materials in the curriculum and learning facilities. Increasing plant literacy requires a directed exploration approach, such as the introduction of local species, plant utilization, and cultural linkage with the natural environment of Mentawai. On the other hand, students' knowledge of the concept of biodiversity is also a factor causing low plant literacy as shown in Figure 7.



Information:

1. I have never heard of it.
2. I had heard of it, but I didn't fully understand it.
3. I know a little.
4. I quite understand.
5. I fully understood it and was able to explain it to a friend.

Figure 7. Students' Knowledge of the Concept of Biodiversity

Based on Figure 7, the level of students' understanding of the concept of biodiversity varied, with 113 students fully understanding (scale 4) and 50 students fully understanding (scale 5). However, 90 students had only heard of this concept (scale 2), 42 students knew little (scale 3), and 7 students had never heard of it (scale 1). This data shows that although there are students with fairly good understanding, the number of students with low understanding is still significant, reflecting the limitations of deep and contextual learning. The low plant literacy is also influenced by the lack of learning methods that associate the concept of biodiversity with local plants in Mentawai. To improve plant literacy, a practical, contextual and direct exploration-based learning approach is needed in the natural environment. Another factor that causes low plant literacy is low interest in plants as shown in Figure 8.

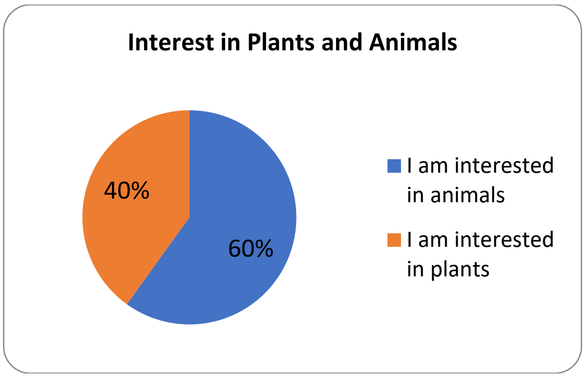


Figure 8. Interest in Plants and Animals

Based on Figure 8, students' interest in animals was higher (60%) than plants (40%), reflecting the tendency of students to focus on more visually appealing and interactive animal topics. The lack of interest in plants is due to the lack of contextual learning approaches and direct exploration of local plant diversity. Students tend to be less aware of the vital role of plants in ecosystems and daily life. This inequality exacerbates plant literacy in Mentawai, especially without innovative educational programs. Improving plant literacy requires engaging nature-based learning, such as hands-on exploration, introduction to local plants, as well as practical activities such as planting and observation, to increase students' appreciation and understanding of plants. The last factor in this study that causes the low plant literacy of mentawai students is as shown in Figure 9.

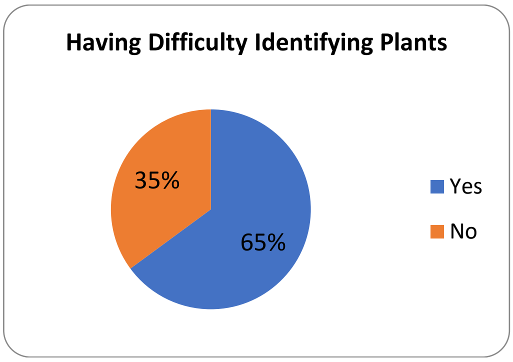


Figure 9. Students Have Difficulty Identifying Plants

Based on Figure 9, as many as 65% of students have difficulty identifying plants, showing limitations in recognizing and distinguishing plant species that contribute to low plant literacy in Mentawai. This difficulty is caused by the lack of exploration-based learning, the lack of material on local plants, and the lack of interesting teaching methods. Students' low interest in plants (40%, Figure 8) and limited understanding of biodiversity (Figure 7) further exacerbate this condition. To improve plant identification skills, more contextual educational approaches, such as nature exploration, direct observation, and the introduction of local species, are needed, which can also arouse students' interest and appreciation for the environment.

Results of Plant Literacy Data Homogeneity Test

The homogeneity test was carried out to find out whether the variance of data between groups was homogeneous or not. Homogeneity of variance is one of the basic assumptions in parametric statistical analysis such as ANOVA, where this test aims to ensure that the variance of the data in each group does not differ significantly. If Sig. ≥ 0.05, then the data has a homogeneous variance (assumption of homogeneity is met). If Sig. < 0.05, then the data has non-homogeneous variance (assumption of homogeneity is not met) (Sugiyono, 2016). The results of the homogeneity test on this data are as shown in Table 2.

Table 2. Results of Plant Literacy Homogeneity Test

Tests of Homogeneity of Variances		Levene Statistic	df1	df2	Sig.
Plant Literacy Score	Based on Mean	2.067	2	147	.130
	Based on Median	1.943	2	147	.147
	Based on Median and with adjusted df	1.943	2	143.044	.147
	Based on trimmed mean	2.143	2	147	.121

Based on the results of the variance homogeneity test using Levene's Test shown in Table 2, it is known that the test is carried out through four methods, namely based on mean, median, median with adjusted df, and trimmed mean. The significance value (Sig.) obtained was 0.130 for the mean, 0.147 for the median, 0.147 for the median with adjusted df, and 0.121 for the trimmed mean. All of these significance values are greater than the error tolerance limit (α = 0.05), so it can be concluded that the variance between the plant literacy score data groups is homogeneous.

Results of Plant Literacy Data Normality Test

The data normality test aims to test whether the sample used has a normal distribution or not. The results of this data normality test can be seen in Table 3.

Table 3. Results of Plant Literacy Normality Test

One-Sample Kolmogorov-Smirnov Test			Skor_literasi_tumbuhan
N			270
Normal Parameters[a,b]	Mean		9.80
	Std. Deviation		4.419
Most Extreme Differences	Absolute		.152
	Positive		.152
	Negative		-.090
Test Statistic			.152
Asymp. Sig. (2-tailed)[c]			<,001
Monte Carlo Sig. (2-tailed)[d]	Sig.		<,001
	99% Confidence Interval	Lower Bound	.000
		Upper Bound	.000

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. Lilliefors' method based on 10000 Monte Carlo samples with starting seed 2000000.

Based on the results of the One-Sample Kolmogorov-Smirnov Test on plant literacy scores with a sample of 270, a test statistical value of 0.152 was obtained with a significance value (Asymp. Sig. (2-tailed)) of < 0.001. In addition, the Monte Carlo Sig. (2-tailed) results also showed a < value of 0.001. The significance value is less than the error tolerance limit (α = 0.05), so the null hypothesis (H_0) stating that the normally distributed data is rejected. In other words, plant literacy score data is not normally distributed.

This mismatch of the data distribution to the normal distribution indicates that statistical analyses that require assumptions of normality, such as parametric tests, may not be usable. Therefore, for a follow-up analysis comparing plant literacy averages between three or more groups (e.g., groups of students based on grade level and school) researchers used alternative methods such as non-parametric tests, e.g. the Mann-Whitney or Kruskal-Wallis tests, which do not require the assumption of normality.

Results of the Kruskal-Wallis Test of Plant Literacy Data

The Kruskal-Wallis test was conducted to compare the average plant literacy score between three school groups, namely SMA N 1 Siberut Tengah, SMA N 2 Sikakap, and SMA N 2 Sipora. This test was chosen because the plant literacy score data did not meet the assumption of normality based on the results of the previous test. The hypotheses for this test are; H_0 (Zero Hypothesis): There was no significant difference between the average plant literacy scores in the three school groups. H_1 (Alternative Hypothesis): There was a significant difference between the average plant literacy scores in the three school groups. The results of this test can be seen in Table 4.

Table 4. Results of the Kruskal-Wallis Test of Plant Literacy Data

Test Statistics^{a,b}	Skor Literasi Tumbuhan
Kruskal-Wallis H	9.935
df	2
Asymp. Sig.	.007

a. Kruskal Wallis Test
b. Grouping Variable: Sekolah

Based on the results of the Kruskal-Wallis test shown in Table 4, this study aims to compare the average plant literacy scores between three school groups, namely SMA N 1 Siberut Tengah, SMA N 2 Sikakap, and SMA N 2 Sipora. This test was used because the plant literacy score data did not meet the assumption of normality based on the results of the previous test. The Kruskal-Wallis H value obtained is 9.935 with a degree of freedom (df) of 2. The significance value (Asymp. Sig.) is 0.007, which is smaller than the significance tolerance limit of 0.05. The results showed that the null hypothesis (H_0), which stated that there was no significant difference between the average plant literacy scores between school groups, was rejected. Thus, it can be concluded that there is a significant difference in the average plant literacy score between SMA N 1 Siberut Tengah, SMA N 2 Sikakap, and SMA N 2 Sipora.

Discussion

The data collection stage starts from planning. Careful preparation at each stage is expected to provide optimal results to support learning and nature conservation in the area.

Data Inventory Planning

Based on the data processing plan, students' plant literacy will be analyzed using a 30-question test (Uno, 2009) with a primary quantitative approach. The data were analyzed through question validity and reliability tests, descriptive statistics (mean, median, mode, standard deviation, and variance), and inferential statistics using SPSS 30. Meanwhile, students' perceptions of biodiversity and plants will be measured by questionnaires (Pedrera, 2023) using a primary quantitative approach. The data were tested for normality, homogeneity, and linearity, then analyzed using descriptive and inferential statistics, such as T test, ANOVA, and correlation analysis with SPSS 30.

Implementation of Data Collection

The implementation of this project will be carried out through a series of structured activities to achieve the goal of collecting, processing, and reporting plant literacy data among Mentawai High School students. The collection of student plant literacy data was carried out on November 18–21, 2024 using a 30-question test (Uno, 2009). Data was collected through Google Form for schools with internet access and using paper for schools without internet access. Meanwhile, the collection of student perception data on biodiversity and plants was carried out on November 11-14, 2024 using a questionnaire (Pedrera, 2023) with a similar method, namely through Google Forms and paper in accordance with the availability of internet access in each school.

Challenges and Problems in the Implementation of Data Collection

In collecting student crop literacy data, challenges include student absenteeism during exams, the time needed to validate questions, and difficulties in maintaining the consistency of students' understanding due to differences in literacy levels. The solutions taken include rescheduling for absentee students, testing previous questions to ensure relevance, and preparing questions with tiered difficulty levels. In the data on students' perceptions of biodiversity and plants, challenges include the influence of mood or external factors on student responses, variations in levels of understanding, and possible dishonest answers. The solution sought is to ensure a time and atmosphere conducive to filling, the use of questions in simple language, and the emphasis that the answers are confidential to maintain the honesty of the students.

Data Processing

The processing of student plant literacy data was carried out quantitatively using question validity and reliability tests, descriptive analysis (mean, median, mode, standard deviation, variance), and normality, homogeneity, and linearity tests. Inferential analysis involves t-testing independent samples to compare the average between independent groups (e.g., males vs. females) and ANOVA to compare the averages between more than two groups (e.g., grade level or school location). The ANCOVA test is used to control for certain factors such as age or gender. For students' perception of biodiversity and plants, data were processed using descriptive statistics (mean, median, mode, standard deviation, and variance), test of normality and homogeneity assumptions, and inferential analysis through t-tests and correlation analysis using SPSS 30.

The ANCOVA (Analysis of Covariance) test was chosen because it is able to control covariate variables that can affect the results of the study, such as age or gender, so that comparisons between groups become more accurate. By combining elements from ANOVA and regression, ANCOVA allows for more precise analysis by eliminating the effects of unwanted variables. This approach is particularly useful in educational and social research, where outside factors often influence the outcomes measured. In addition, ANCOVA improves the internal validity of the study by ensuring that the differences between the groups actually stem from the independent variables being tested, not from other factors that are not controlled (Huvila, 2022).

Challenges and Problems in Data Processing

Data processing, especially in the context of research or analysis of student plant literacy, often faces various challenges and problems that can affect the quality and validity of the analysis results (Rahman, 2021). Challenges in processing student crop literacy data include data input errors (human error), abnormal data due to outliers, difficulties in validation and reliability due to the large number of samples, and statistical analysis processes that require time and in-depth interpretation. The solution if the data contains outliers, the first step that can be taken is to identify it using statistical methods such as Z-Score, IQR, or visualization with boxplots and scatterplots. Once identified, the workable solution is to remove outliers if the data is irrelevant or is a recording error. Furthermore, continue the normality test with the Monte Carlo approach, validate and reliability before the main test, and provide guidance on the interpretation of statistical results.

The Monte Carlo approach was chosen because it is able to handle complex problems that are difficult to solve with analytical or deterministic methods. This method is particularly effective in dealing with uncertainty and variability in data, especially when precise mathematical models are difficult to determine. By performing probability-based simulations over and over again, Monte Carlo can provide more accurate estimates for a variety of scenarios, including optimization, risk analysis, and predictions under uncertain conditions (Mathias et al., 2018).

In the data of students' perceptions of biodiversity and plants, challenges include bias in the interpretation of non-test results without clear guidance, inferential test results that are insignificant due to unbalanced data, and difficulties in processing qualitative data accurately into quantitative. The solutions implemented are to provide category guidance for descriptive interpretation, ensure data balance with statistical assumption tests, and use software such as Excel to help measure qualitative data.

CONCLUSION

This study successfully addresses the objectives of evaluating plant literacy among high school students in the Mentawai Islands and identifying the challenges and opportunities in data inventory, processing, and reporting within the local context. The findings reveal that students' plant literacy levels across nominal, functional, structural, and multidimensional categories remain low, influenced by limited interaction with nature, insufficient contextual learning approaches, and challenges in identifying local plant species. To overcome these issues, the study highlights the need for innovative and contextual educational strategies, such as hands-on exploration, integration of local biodiversity into the curriculum, and practical activities that engage students with their natural environment. These approaches not only improve plant literacy but also foster ecological awareness and appreciation for local biodiversity. By providing validated instruments and a replicable methodological framework, this research contributes to the development of better practices in educational research and environmental education. It offers valuable insights and practical recommendations that can be adapted for similar contexts, ensuring the improvement of students' ecological literacy and the promotion of sustainable learning approaches.

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