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Profile of Sustainable Environmental Awareness of Primary School Students in Sorong District by Gender and School Location

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Environmental awareness, sustainability, primary school students, gender, school location.

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Abstract

Sustainable environmental awareness is essential in shaping a generation capable of facing global environmental challenges. The study aimed to map the profile of sustainable environmental awareness of primary school students in Sorong District, considering gender differences and location (urban, suburban, and rural) across three main dimensions: knowledge, attitude, and behavior. Using a survey-based quantitative approach, data were collected from 132 students through a Likert scale questionnaire. The results showed that male students demonstrated superior conceptual understanding, while female students were more consistent in sustainable behavior. In addition, students in peripheral areas showed the highest awareness across all dimensions. Students in urban areas excelled in collective attitudes, while students in suburban areas had the low awareness. These findings indicate the need for action-based approaches to improve sustainable behavior in male students, community-based engagement for female students, and locally-based programs to increase awareness in the suburban between urban and rural regions. The study highlighted the importance of integrating sustainability education in science subjects, especially in regions with high biodiversity and complex environmental challenges. The findings provide valuable insights for teachers and policymakers in developing sustainability education programs that are contextualized and applicable in regions with similar socio-environmental characteristics.

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INTRODUCTION

Awareness of the importance of sustainability is increasingly seen as a major concern in education to create a society capable of facing global environmental challenges. Education for Sustainable Development (ESD) focuses on fostering critical thinking skills, collaborative decision-making, and a long-term perspective on sustainability (Bor et al., 2023). This approach not only improves students' conceptual understanding but also builds values of environmental responsibility and wise consumption (Lewis et al., 2019).

Studies show that the integration of sustainability in the curriculum can strengthen environmental literacy and encourage more responsible behavior (Ersoy, 2023; Hasibuan & Judijanto, 2023). At the elementary school level, sustainability concepts are found in various science topics, such as ecosystems, environmental pollution, and the impact of human activities on the environment. However, how students understand and apply these concepts in real actions is still under-examined.

As global attention to environmental education increases, research trends in this field have also increased significantly. Between 2013 and 2024, 6,445 articles related to sustainable environmental awareness were published in the Scopus database, with the highest number of publications in 2024 (1,489 articles). It shows the increasing importance of this study in the current educational context (Figure 1).

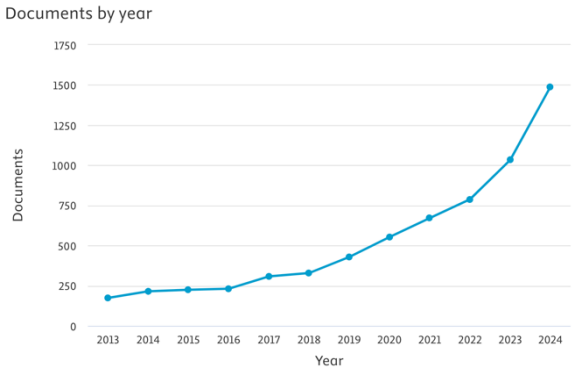

Figure 1. Research trends based on the Scopus database with the keyword "sustainability environmental awareness," retrieved on December 1, 2024. Comprehensive guidelines for obtaining bibliometric data are provided in another source (Hidayat et al., 2024).

Despite the growing attention to environmental awareness, the implementation of sustainability education in formal learning, especially at the elementary level, still has many obstacles. Several studies have shown that many students have a good conceptual understanding of environmental issues but lack in real-world application (Blumstein & Saylan, 2007; Hay & Eagle, 2020; Stevenson, 2007). The integration of sustainability concepts in the science curriculum is often not action-based enough, so sustainable behaviors are not consistently formed among students.

Sorong district has high biodiversity but faces the threat of environmental degradation. Moreover, it has tropical rainforests and rich marine ecosystems. But human activities, such as deforestation and plastic pollution, can threaten environmental sustainability. However, environmental education has yet to be fully incorporated into primary school science learning practices. Several global initiatives have tried to bridge this gap through sustainability-based programs, such as green curricula and interdisciplinary approaches that emphasize hands-on practices, such as recycling and reforestation (Qureshi, 2020; Sahidullah, 2022). But many of these approaches are not well adapted to local contexts, resulting in suboptimal impact on local communities.

Project-based methods in sustainability education have proven effective in enhancing students' awareness of environmental issues. Through hands-on activities such as environmental observation, simple experiments, and involvement in conservation projects, students can better understand the impact of their actions on the environment (Chawla & Cushing, 2007; Liefländer et al., 2013; Malik et al., 2019). Despite this, the implementation of this method in the science curriculum in Sorong has not been widely researched.

In addition, social factors such as gender and location influence how students understand and apply environmental awareness. Previous research shows that male students tend to be stronger in the knowledge aspect, meanwhile female students are more consistent in sustainable behavior (Alsaati et al., 2020). On the other hand, students in peripheral areas who are closer to nature often have higher environmental awareness compared to students in urban areas, as they more directly experience the impact of environmental degradation.

Most research on environmental awareness focuses on higher education, while studies at the elementary level are not much found. Moreover, limited research has specifically explored the impact of gender and school location on the environmental awareness of primary school students in high-biodiversity regions, including Sorong. The study tries to examine the sustainable environmental awareness profile of primary school students in Sorong Regency, considering gender and school location (urban, suburban, and rural), across three key dimensions: knowledge, attitude, and behavior. By understanding this pattern, this research can help develop more specific and contextualized educational strategies to improve the effectiveness of sustainability education at the primary school level.

Furthermore, this study contributes to the integration of sustainability education in the science curriculum through an action-based approach. By mapping how students understand and apply the concept of sustainability in their daily lives, the results of this study can serve as a foundation for designing educational intervention programs that are more community-based and relevant to local social-ecological conditions.

Thus, this study not only provides academic insights into students' environmental awareness patterns but also offers practical recommendations for teachers and policymakers in developing more effective sustainability education in elementary schools.

RESEARCH METHOD

The study employed a survey method. The data was collected through a Likert scale questionnaire, adapted from previous research (Gericke et al., 2018). Likert scale questionnaires have also been used in similar studies from previous research with favorable results (Fakhriyah et al., 2024; Tuncer et al., 2005). The questionnaire consisted of 30 statements that would measure students' confidence level about their sustainability awareness, consisting of three existing categories. The study

was conducted in schools representing 3 regions (urban, suburban, and rural) in Sorong Regency. The sample was 132 participants. The questionnaire was distributed online through a Google Form link.The respondents' statements were categorized into three, as shown in Table 1.

Table 1. Categorization of sustainable environmental awareness.

No	Sustainable Environmental Awareness Category	Statement Item Number	Number of Items
1	Knowledge of sustainable environmental awareness (Knowingness)	K-1, K-2, K-3, K-4, K-5, K-6, K-7, K-8, K-9, K-10	10
2	Attitudes of sustainable environmental awareness (Attitudes)	A-1, A-2, A-3, A-4, A-5, A-6, A-7, A-8, A-9, A-10	10
3	Sustainable environmental awareness behavior (Behavior)	B-1, B-2, B-3, B-4, B-5, B-6, B-7, B-8, B-9, B-10	10

After the data was collected, the answers of students' sustainable environmental awareness were obtained. The statements were calculated and categorized based on the Sustainable environmental awareness level, shown in Table 2.

Table 2. Level of sustainable environmental awareness.

Percentage (%)	Category
> 80	Very good
60 – 79,9	Good
40 – 59,9	Fair
20 – 39,9	Deficient
<20	Very poor

The questionnaire used a Likert scale of 1, 2, 3, and 4, with 1 being the lowest score and 4 being the highest score. Students' answers were then divided into three categories, namely (1) knowledge related to sustainable environmental awareness, (2) attitudes of sustainable environmental awareness, and (3) behavior of sustainable environmental awareness. Furthermore, the data were analyzed and described referring to scoring level in Table 2.

FINDING AND DISCUSSION

The sustainable environmental awareness of elementary school students in Sorong Regency was assessed using 30 statements, designed to capture students' perceptions across three dimensions: knowledge, attitude, and daily practices related to environmental sustainability. Table 3 illustrates the percentage and average of students' sustainable awareness of each statement.

Table 3. Students' answers related to sustainable environmental awareness in the dimensions of knowledge, attitude, and behavior.

No. Statement	Statement	Average Score	Percentage (%)
K-1	I know that saving water is very important to protect the environment.	0,92	91,86
K-2	I understand littering can make the environment dirty and unhealthy.	0,92	91,86
K-3	I know planting trees in our neighbourhood helps produce clean air.	0,93	92,99
K-4	I understand that reducing the use of plastic is important because plastic pollutes the environment.	0,88	88,45
K-5	I understand that used items can be recycled into new items.	0,87	87,12
K-6	I know keeping our rivers and seas clean is important for fish health and clean water.	0,93	92,61
K-7	I know saving energy can help reduce global warming.	0,85	85,23
K-8	I know using a bicycle or walking can help reduce air pollution.	0,90	89,96
K-9	I understand that turning off lights and electronic devices that are not in use can save electricity.	0,93	92,61
K1-0	I know using environmentally friendly products can reduce pollution.	0,88	87,88
A-1	I think it is important to always throw trash in the trash can, not on the street or in the park.	0,93	93,18

No. Statement	Statement	Average Score	Percentage (%)
A-2	I think keeping the school environment clean is everyone's responsibility.	0,93	92,80
A-3	I think reducing the use of plastic is a good way to keep the environment clean.	0,90	89,77
A-4	I think everyone should try to reduce air pollution for the sake of our health.	0,91	90,72
A-5	I think using refillable drinking bottles is better than single-use plastic bottles.	0,89	88,64
A-6	I think encouraging my friends not to litter makes me feel proud.	0,86	85,80
A-7	I think we should save water so that everyone can enjoy it in the future.	0,89	89,02
A-8	I think we should all protect the environment for a better future.	0,91	91,29
A-9	I think cutting trees carelessly can damage the environment.	0,88	87,88
A-10	I think it is important to protect the environment by reducing the use of electricity when it is not needed.	0,87	87,12
B-1	I throw plastic or paper waste into the recycling bin if available.	0,72	71,97
B-2	I turn off the lights when I leave the room.	0,85	85,42
B-3	I bring my own shopping bag when I go to the store, instead of using disposable plastic bags.	0,62	62,31
B-4	I choose to walk or cycle if the distance is short, instead of taking a motorized vehicle.	0,83	83,33
B-5	I remind my friends not to litter.	0,77	76,52
B-6	I plant or take care of plants around my house or school.	0,68	68,37
B-7	I always turn off the water tap when not in use.	0,95	94,70
K-8	I avoid throwing garbage into the river or other places where it should not go.	0,86	85,80
K-9	I reuse things that can still be used rather than throwing them away.	0,78	77,65
K-10	I like to participate in environmental cleanup activities with my friends at school.	0,80	79,73
	Total average		86,09

More clearly, the results of the analysis in Table 3 are presented in the bar chart as shown in Figure 2. The diagram illustrates the percentage distribution of the analysis results on elementary school students' sustainable environmental awareness across the dimensions of knowledge, attitude, and behavior.

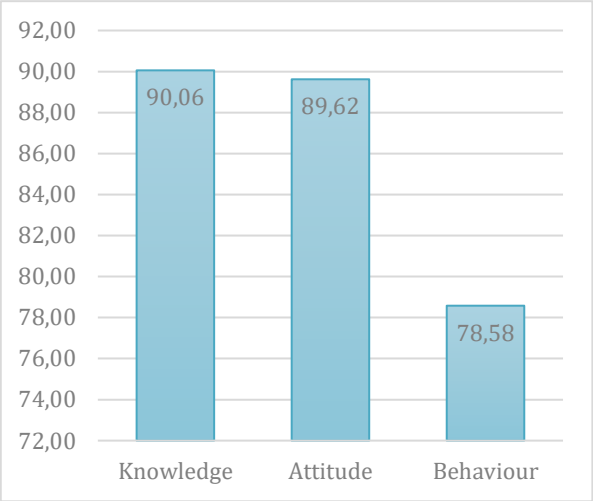

Figure 2. Percentage diagram of sustainable environmental awareness of primary school students in Sorong District.

Both Table 3 and Figure 1 show that the knowledge dimension has the highest average score of 90.06%, which is categorized as "excellent." Then, students have a strong understanding of sustainability principles, such as the importance of saving energy, recycling, and reducing pollution. Statements, such as "saving energy to reduce global warming" (85.23%) and "using environmentally friendly products to reduce pollution" (87.88%), reflect good conceptual understanding. These findings support previous studies suggesting that incorporating sustainability into education enhances students' environmental literacy (Boon, 2010; Gough, 2002; Hay & Eagle, 2020). However, it needs to analyze whether this understanding is applied in practical skills within the existing curriculum. The national curriculum in Indonesia includes an environmental education component, but its implementation varies by school. Strengthening aspects of experiential learning, such as integrating sustainability projects in Science and Civic Education subjects, can help increase student engagement in environmental issues.

The student attitude dimension also showed a high average score of 89.62% ("very good"), with the highest statement being "keeping the school environment clean is everyone's responsibility" (92.80%). This indicates that students understand the importance of collective action in protecting the environment, supporting the findings from (Collado & Corraliza, 2015; Qureshi, 2020) on the role of positive attitudes towards the environment. Nevertheless, although students' attitudes are good, their application in behavior is still inconsistent, as reflected in the scores on the behavior dimension. This discrepancy suggests the need for more structured educational interventions to transform positive attitudes into real habits. Strategies such as teacher role modeling, student-led environmental campaigns, and green school initiatives can help bridge this gap by reinforcing sustainability principles through daily practices.

The behavior dimension had the lowest average score (78.58%, categorized as "good"). It indicates that, while students understand and appreciate the principle of sustainability, their practices are not yet fully aligned with this understanding. Some behaviors, such as "bringing your own shopping bag" (62.31%) and "planting or caring for plants" (68.37%), have relatively low participation rates, indicating barriers to the implementation of sustainable behaviors. On the other hand, simple actions such as "turning off the water tap when not in use" (94.70%) and "avoiding throwing garbage into the river" (85.80%) had high scores. The score suggests that behaviors with little effort are easier to implement.

These results support Sahidullah's, (2022) findings that student behavior is more easily shaped through concrete and repeated actions. One of the barriers to more complex behaviors is the lack of supporting infrastructure and incentives. For example, the absence of a school garden or recycling facilities may limit student engagement in sustainability-related activities. Addressing these structural challenges, such as by providing compost stations in schools or initiating tree planting programs, can encourage more active participation.

This result supports the previous literature, which shows that conceptual understanding (knowledge) is often higher than practical application (behavior) in sustainability education (Alsaati et al., 2020; Hungerford & Volk, 1990; Kollmuss & Agyeman, 2002; Malik et al., 2019). A Study in Vietnam by (Tung et al., 2023) also emphasizes the importance of local context in integrating sustainability education. Sorong district, with its ecological richness, can be a foundation for more in-depth action-based learning, such as local greening programs or community-based waste management. However, students have a good awareness of sustainability principles, additional steps are needed to encourage more consistent behavior. Action-based approaches, such as recycling simulations, school greening, and simple training on plastic waste reduction, can increase student engagement in real action.

The sustainable environmental awareness of primary school students in Sorong District by region (urban, suburban, and rural) also shows little difference, as shown in Figure 3.

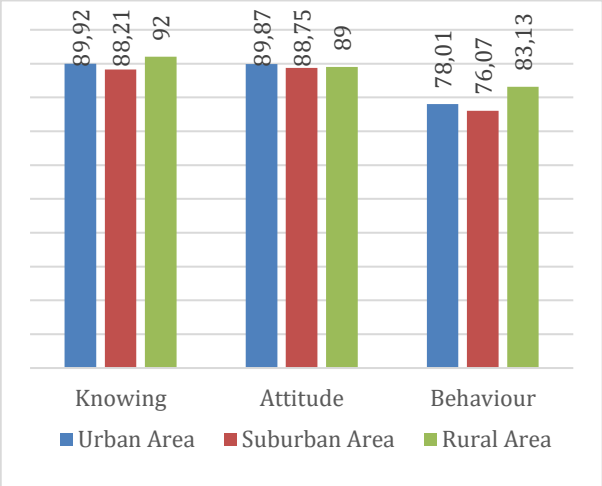

Figure 3. Percentage diagram of primary school students' sustainable environmental awareness based on location/region differences.

In terms of regional differences, Figure 3 shows how sustainable environmental awareness varies by location (urban, suburban, and rural). On the knowledge dimension, students in rural areas have

the highest average score (92.00%, excellent), followed by urban areas (89.92%) and suburban areas (88.21%). This shows the students in rural areas, despite being geographically further away from the city center, have a very good understanding of sustainability principles. Their proximity to the natural environment may provide direct exposure to ecological issues, such as river pollution and deforestation, which strengthens their awareness. Moreover, this result support Sahidullah's (2022) research, which states a direct experience of the environment contributes to sustainability literacy.

The attitude dimension showed no significant differences between regions, with an average score of around 89% (very good). Students in urban areas had the highest score (89.87%), followed by rural (89.00%) and suburban (88.75%). There are variations on certain indicators. However, students in rural areas demonstrated a more positive attitude toward the significance of environmental protection for the future (91.25%), while students in urban areas showed a higher attitude of collective responsibility towards the cleanliness of the school environment (93.88%). This confirms that social context and local experiences influence how students understand sustainability.

The behavior dimension shows the most striking difference compared to the other two dimensions. Students in rural areas had the highest score (83.13%, good), followed by urban (78.01%) and suburban (76.07%). The behaviors of students in rural areas better reflect their knowledge and attitudes, such as "turning off water taps when not in use" (92.50%) and "not throwing garbage into the river" (90.00%). In contrast, behaviors such as "bringing your own shopping bag" showed low scores in all regions, with the suburban region having the lowest score (57.14%). It suggests challenges in encouraging the adoption of certain habits that may require infrastructure support, such as providing eco-friendly shopping bags in schools.

In general, students in rural areas showed better sustainable environmental awareness on all dimensions, particularly on the behavioral dimension. This highlights the importance of local context and first-hand experience in shaping sustainable behavior. In contrast, urban areas showed excellence on the attitude dimension, which most likely influenced by school initiatives in building collective responsibility for the environment. The suburban area has the lowest average score on all dimensions, especially on behavior due to the lack of access to adequate sustainability education programs or the lack of direct exposure to significant environmental issues. In line with previous research with similar results, proximity to nature can influence students' sustainable environmental awareness (Evans, 2006; Ozburak et al., 2018).

Apart from being based on area/location, this study also analyzes how gender differences illustrate the sustainable environmental awareness of primary school students in Sorong district. The results of the analysis are presented in Figure 4.

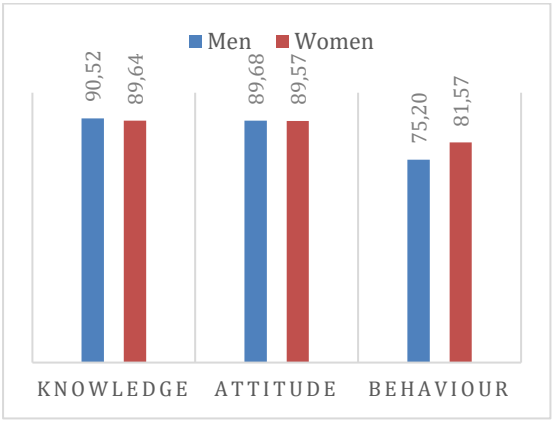

Figure 4. Diagram of the percentage of sustainability awareness of primary school students in Sorong District by gender.

Based on Figure 4, the knowledge dimension shows that male students have a slightly higher average score (90.52%) than female students (89.64%). Both groups fall into the category of "very good." Male students showed stronger understanding of statements, such as "planting trees produces clean air" (94.76%) and "reducing plastic is important for the environment" (90.73%). In contrast, female students had an advantage of statements, such as "turning off lights when not in use" (92.86%) and "the importance of keeping rivers clean" (92.86%). This difference indicates that the context of daily activities can influence students' understanding of certain topics. Female students tend to pay more attention to household-based actions. Meanwhile, male students show higher awareness of ecosystem-wide principles.

The attitude dimension showed similar results for both groups, with the average score of male students (89.68%) slightly higher than female students (89.57%). Both groups fell into the category of "very good." Female students showed more positive attitudes on statements, such as "keeping the school clean is everyone's responsibility" (94.29%) and "reducing pollution for health" (92.14%). Male students had an edge on statements, such as "saving water for the future" (89.11%) and "proud to encourage friends not to litter" (85.89%). This reflects the influence of gender on environmental responsibility preferences, with female students more likely to value collective responsibility, while male students emphasize individual action.

The behavioral dimension showed a significant difference between the two groups. Female students had a higher average score (81.57%) than male students (75.20%). Female students excelled in behaviors, such as "turning off the water tap when not in use" (95.36%) and "avoiding throwing garbage into the river" (88.21%). In contrast, male students showed lower scores on behaviors, such as "bringing own shopping bags" (59.68%) and "planting or caring for plants" (61.29%). The more consistent behavior of female students can be attributed to their involvement in household and community activities, which often emphasize responsible resource management. In contrast, male students tend to need more structured programs to actively encourage sustainable behaviors.

These results are consistent with the literature that gender differences affect certain aspects of environmental awareness. A study by Alsaati et al. (2020) & Palmer (1998) found that women tend to have more environmentally friendly behaviors than men, especially in practical daily actions. Also, these results show that male students have an advantage in conceptually understanding of sustainability principles. In line with the findings of Ratinen & Linnanen (2022), exposure to in-depth knowledge can improve environmental literacy in men. But its application in behavior still needs to be strengthened.

Overall, more specific interventions, such as community-based projects and infrastructure improvements, are needed to ensure that sustainability education can translate into long-term behavior change.

CONCLUSION

The study maps the profile of sustainable environmental awareness of primary school students in Sorong district based on gender and school location in three main dimensions: knowledge, attitude, and behaviour. The finding show that male students are superior in conceptual understanding, while female students are more consistent in sustainable behaviour. In terms of location, students in rural areas had the highest environmental awareness, students in urban areas were stronger in collective attitudes, and students in suburban areas had the lowest level of awareness. The findings emphasize the need for customized educational strategies, such as action-based approaches for male students, community-based for female students, and the integration of project-based learning in the science curriculum to connect academic concepts with real-life practices. In addition, more contextualized sustainability education in biodiversity-rich areas, such as Sorong, can strengthen the role of schools in building an environmentally-friendly generation. Also, the results provide recommendations for the development of educational policies that are more adaptive to local ecological challenges, including the provision of environmentally friendly infrastructure, teacher training, and community involvement in sustainability programs. The next step is to evaluate the effectiveness of this strategy in the long-term and further examine the social and cultural factors that influence students' environmental awareness.

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