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Building Sustainable Minds: The Role of ESD Integration in Ninth-Grade on Environmental Issues

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Abstract

Education for Sustainable Development (ESD) is an integral part of achieving the three pillars of human development: social development, economic growth, and environmental preservation. ESD is a global initiative that encompasses broader issues than those addressed solely by the Indonesian Government. It involves a collective responsibility to foster ESD as a fundamental value for current and future generations. This study employed a descriptive research method, using a sustainability awareness questionnaire adapted from Hassan et al. The study aimed to comprehensively assess sustainability awareness among 53 ninth-grade students at SMPN 17 Medan. The primary objective was to outline and categorize the profile of sustainability awareness, focusing on emotional, behavioral, and practical dimensions, while also examining gender differences. Data were systematically analyzed using a Likert scale and validated instruments, aligned with sustainability awareness indicators. The results indicated a high level of sustainability awareness, with emotional awareness at 89.6%, followed by behavioral and attitude awareness at 82.1%. However, practical awareness was at 66.4%, indicating a potential area for improvement.. Female students demonstrated higher awareness (85.7%) compared to male students (73.0%). These findings highlight the need for targeted educational interventions to enhance practical sustainability awareness and ensure equitable participation among all students.

Keywords: Profile Students, Sustainability Awareness, ESD, Secondary School, Environmental Issue.

Membangun Pikiran Berkelanjutan: Peran Integrasi ESD di Kelas IX dalam Isu Lingkungan

Abstrak

Pendidikan untuk Pembangunan Berkelanjutan (ESD) merupakan bagian integral dalam mencapai tiga pilar pembangunan manusia: pembangunan sosial, pertumbuhan ekonomi, dan pelestarian lingkungan. ESD adalah perhatian global, melampaui fokus pemerintah Indonesia. Melibatkan tanggung jawab kolektif setiap individu untuk menjunjung tinggi ESD sebagai aset berharga baik untuk generasi saat ini maupun masa depan. Penelitian ini menggunakan metode penelitian deskriptif, menggunakan kuesioner *sustainability awareness* yang diadaptasi dari Hassan et al. Populasi yang dituju adalah 53 siswa kelas IX sekolah menengah di SMPN 17 Medan, dengan tujuan memahami secara komprehensif kesadaran keberlanjutan. Tujuan utamanya adalah

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untuk menguraikan dan mengkategorikan profil kesadaran keberlanjutan, berfokus pada dimensi emosional, perilaku, dan praktis, sambil juga memeriksa perbedaan berdasarkan gender. Pengolahan data dilakukan secara sistematis dengan skala Likert dan penggunaan instrumen yang sudah tervalidasi serta disesuaikan dengan indikator sustainability awareness. Hasil menunjukkan kesadaran keberlanjutan secara keseluruhan yang cukup baik, dengan kesadaran emosional memimpin sebesar 89,6%, diikuti oleh kesadaran perilaku dan sikap sebesar 82,1%. Namun, kesadaran praktis sebesar 66,4%, menunjukkan potensi area yang perlu diperbaiki. Menariknya, siswa perempuan menunjukkan kesadaran yang lebih tinggi (85,7%) dibandingkan dengan siswa laki-laki (73,0%). Temuan ini menekankan perlunya intervensi pendidikan yang ditargetkan untuk meningkatkan kesadaran praktis keberlanjutan dan memastikan partisipasi yang adil di kalangan semua siswa.

Kata Kunci: Profil Siswa, *Sustainability Awareness*, ESD, Sekolah Menengah Pertama, Isu Lingkungan.

INTRODUCTION

The rapid advancements of the 21st century industrial revolution prompted Japan to introduce Society 5.0 in 2019, as outlined by Fukuda (2021). Society 5.0 represents a human-centered, technology-driven society where internet-linked systems support key infrastructure, including energy management and transportation. This approach seeks to address and mitigate pressing local and global challenges, notably those related to environmental pollution (Rojas et al., 2021). Society 5.0 envisions technology as a tool to augment human productivity across physical and digital realms. A major transformation in human life, particularly in the education sector, has been brought about by today's rapid technological development (Auliyak et al., 2023; Ayu et al., 2023). The demand for quality facilities to support educational goals reflects the need to keep pace with advancements in science and technology (Gao et al., 2020; McDiarmid & Zhao, 2023). This effort is expected to produce graduates who are competent and ready to compete in the global arena (Rani & Wusqo, 2021; Kaylan-Fadlelmula et al., 2022; Muzianti et al., 2023). 21st century skills are very important for today's learners.

The rapid technological developments of the current era exert both positive and negative impacts on society. Such advancements positively impact both humans and the environment, as sophisticated equipment enhances daily productivity (Meena, 2020; Vinuesa et al., 2020). Conversely, technological advancements also introduce negative repercussions for human life and the environment. These include misuse of technology, moral disruption, e-waste accumulation, environmental degradation, carbon emissions, resource exploitation, and pollution (Dwivedi et al., 2022; Meena, 2020). A dynamic concept that can solve these problems is Education for Sustainability Development (ESD) (Das et al., 2014; Fitriandari & Winata, 2021; Kioupi & Voulvoulis, 2022).

The aim of Education for Sustainable Development (ESD) is to integrate principles, values, and sustainable practices into all facets of education (Kemendiknas, 2010; Kioupi & Voulvoulis, 2019; UNESCO, 2018) . ESD is expected to foster attitudinal shifts toward a sustainable future, promoting environmental integrity, economic development, and social justice for both present and future generations (Kemendiknas 2010; UNESCO, 2018; Žalėnienė & Pereira, 2021).

. The integration of ESD aspects focusing on the environment into the learning process at school is expected to give learning deeper meaning and promote students' awareness of sustainability values. This aligns with the findings of previous research conducted by (Kaur & Kaur, 2022; Michael et al., 2020; Ridwan et al., 2021), which demonstrated that students who engaged in learning with an ESD approach saw increased awareness of sustainability, including awareness of sustainability practices, behaviors, attitudes, and emotional aspects.

Education for Sustainable Development (ESD) is an integral part of achieving the three pillars of human development: social development, economic growth, and environmental preservation. These pillars, collectively termed the ESD pillars, are elaborated as follows. The social-cultural pillar addresses issues such as human rights, peace, gender equality, understanding cultural diversity, health, HIV&AIDS, and governance. The environmental pillar deals with issues such as natural resource management (water, energy, agriculture, biodiversity), climate change, sustainable rural development, urbanization, disaster prevention, and mitigation. The economic pillar is associated with poverty reduction, corporate responsibility, accountability, and the reorientation of market economies.

Integrating ESD programs into the curriculum to enhance the learning process presents a complex challenge.To date, many educators in schools still have an inaccurate understanding of the concept of “sustainability” (Rini & Nuroso, 2022; Wilhelm et al., 2019). This finding is also reinforced by the research results from Hamwy et al. (2023) and Mulyadi et al. (2023), indicating that educators frequently encounter challenges while incorporating ESD into the educational process due to a deficiency in understanding ESD, insufficient training on ESD integration into teaching practices, and divergent levels of interest in the concepts being conveyed (Manurung et al., 2021; Panggabean et al., 2023; Sihombing et al., 2023). Educators' creativity plays a pivotal role in achieving learning objective (Octavia, 2022; Simatupang et al., 2023).

This study presents significant differences compared to previous research conducted at the high school level. For instance, studies by Irawan et al. (2024), Khoiri et al. (2023), Pengestuti et al. (2024), Rini & Nuroso (2022), and Zulkarnaen et al. (2023) primarily focus on sustainability awareness at the senior high school (SMA) and vocational high school (SMK) levels, with specific environmental issues such as food waste and energy. In contrast, this research is conducted at the junior high school (SMP) level and specifically compares sustainability awareness between male and female students, an aspect that has not been extensively covered in previous studies. Additionally, the questionnaire in this study was adapted to address environmental issues within the Merdeka Curriculum, setting it apart from prior research which emphasized more specialized high school topics. These adaptations offer a new perspective on understanding sustainability awareness among junior high school students, particularly with regard to the potential influence of gender on their environmental awareness. Therefore, this study provides a novel approach that has not been extensively explored in earlier studies. The exploration of environmental issues is well-suited for investigation through this approach. Examining the environmental concepts aligns with the cognitive domain of scientific literacy, thereby fostering an understanding of the implications of sustainable environmental issues (OECD, 2023; UNESCO, 2018). Moreover, the notion of the "environment" intricately connects with various aspects of our lives, encompassing environmental, social, and economic dimensions. This research is crucial not only to bridge the gaps in the implementation of ESD in schools but also to prepare future generations to effectively tackle global sustainability challenges by fostering informed behaviors and practices. The study aims to describe and categorize the sustainability awareness profiles of ninth-grade students who have been exposed to education on environmental issues. Additionally, the research seeks to explore gender differences in sustainability awareness, focusing on three key categories as identified by Hassan et al. (2010): (1) sustainability emotional awareness, (2) sustainability behaviors and attitudes awareness, and (3) sustainable practices awareness.

RESEARCH METHOD

This study utilized a descriptive research method, employing a Likert-scale questionnaire adapted from Hassan et al. (2010) to measure sustainability awareness among ninth-grade students. The aim was to assess the level of sustainability awareness

among ninth-grade students in secondary school. The population for this study encompassed all ninth-grade students at SMPN 17 Medan. A sample of 53 participants comprising 16 male and 37 female students was selected using simple random sampling. This sampling approach was employed to gather comprehensive into sustainability awareness within the target student population.

Data collection in this study involved a Likert-scale questionnaire adapted from Hassan et al. (2010). This scale provided a structured framework for participants to express their perspectives on sustainability awareness. The questionnaire allowed for the systematic gathering of responses, for an analysis of the different categories of sustainability awareness among the students. In this research study, sustainability awareness will be classified into three categories, as previously mentioned and represents in Table 1.

Table 1. Sustainability Awareness Statements Items for Each Aspects

Sustainability Awareness Aspects	Indicators	Items
Sustainability emotional awareness	Expressing opinions on various environmental issues that are occurring.	2, 4, 5 and 15
Sustainability behavior and attitude awareness	Supporting positive actions for the environment	6, 7, 8, 11 and 12
	Reading environmental issues	1
Sustainability practice awareness	Implementing sustainable environmental maintenance practices	9, 10 and 14
	Discussing environmental issues	3 and 13

Table 1 represents the items in the questionnaire used to assess each of these categories, which consist of (1) sustainability emotional awareness, (2) awareness of sustainability behaviors and attitudes, and (3) awareness of sustainable practices, with a total of 15 questions. The Likert scale used is presented in the form of a checklist. For data processing purposes, many choose to tally the "Agree" responses in each category, which are then totaled and presented as a percentage as follows.

$$Percentage = \frac{Number\ of\ respondents\ (A)}{Total\ number\ of\ respondents} x100\% \qquad (1)$$

Notes:

Number of respondents (A): number of respondents who chose the "Agree" option.

A questionnaire consisting of binary (yes or no) questions is employed in the survey. Subsequently, data analysis is conducted by calculating the mean and percentages, with reference to the levels of sustainability awareness as outlined in Table 2.

Table 2. Level of Sustainability Awareness

Mean	Category
1 – 2,33	Low
2,34 – 3,66	Moderate
3,67 – 5,00	High

Hassan et al. (2010)

After obtaining the percentage, the Sustainability Awareness profile based on percentage in each category is classified, i.e. emotional awareness related to sustainability, behavioral sustainability, attitude awareness, and awareness of sustainable practices. These statements are then elucidated with regard to Table 3.

Table 3. Categories of Sustainability Awareness Levels

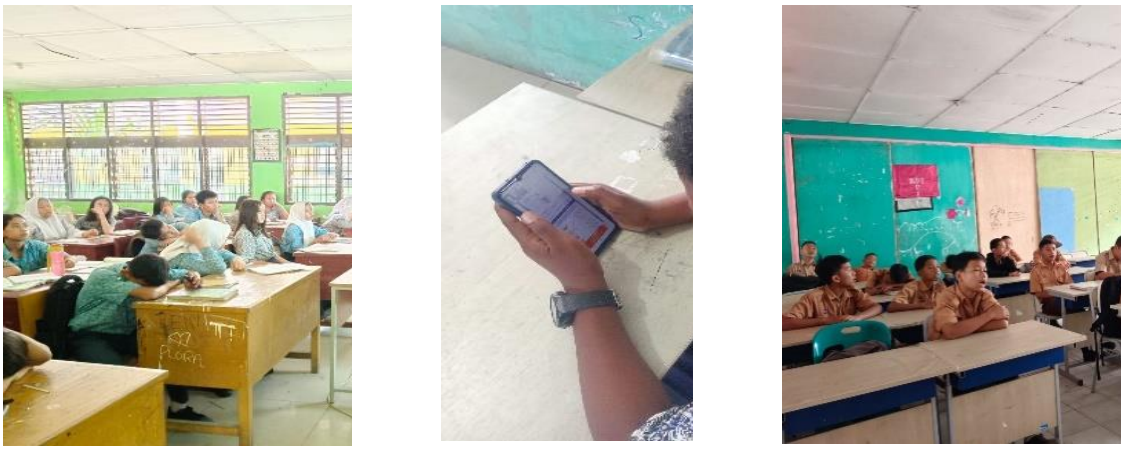
Sustainability Awareness (%)	Meaning
0,00 – 39,9	Practices that seldom or dislike to be done
40,0 – 69,9	Practices that are done/happened moderate/medium
70,0 – 100,0	Practices feelings that are most likely done/happened

Hassan et al. (2010)

Table 3 displays the categories of sustainability awareness levels as measured in percentages. A range of 0.00 – 39.9% indicates sustainability practices that are seldom performed or are generally unpreferred. The range of 40.0 – 69.9% indicates that sustainability practices are done or occur moderately. Meanwhile, the range of 70.0 – 100.0% signifies sustainability practices that are most likely to be done or occur. These categories help to understand the tendency of individuals or groups towards sustainability practices, as explained by Hassan et al. (2010). The use of a Likert scale provided a consistent framework for measuring respondents' attitudes, while the random sampling method helped to obtain a representative sample of ninth-grade students. Furthermore, the systematic classification of data into defined categories facilitated a comprehensive analysis of students' sustainability awareness.

RESULTS AND DISCUSSION

The assessment of students' sustainability awareness utilizes a set of 15 items designed to gauge their comprehension of sustainability emotional awareness, behavioral and attitude awareness, and awareness of sustainability practices in daily routines. Here is the documentation of data collection from the ninth-grade students of SMPN 17 Medan, as presented in Figure 1.



(a) (b) (c)

Figure 1. (a) Giving instructions to class A, (b) Filling out the questionnaire instrument and (c) Giving instructions to class B

Figure 1 illustrates the data collection process from ninth-grade students at SMPN 17 Medan. The process begins with providing instructions to Class A, followed by the students completing the questionnaire. The same instructions are then given to Class B, ensuring a consistent procedure across both groups. These steps represent a systematic approach to gathering responses from the participants. The responses from the ninth-grade students for each item are presented in Table 4.

Table 4. Mean Score and Total Percentage "Agree" Based on Gender

Aspects	Indicators	Item	Male		Female	
			Mean	Total (%) Agree	Mean	Total (%) Agree
Sustainability Emotional Awareness	Expressing opinions on various environmental issues that are occurring	I really care about environmental issues in my place.	0.93	93.7	1.00	100.0
		I sense disappointed with air pollution.	0.87	87.5	0.97	97.2
		I sense disappointed with river pollution.	0.75	75.0	0.97	97.2
		I realize the importance of being responsible for the environment.	0.81	81.2	1.00	100.0

Aspects	Indicators	Item	Male		Female	
			Mean	Total (%) Agree	Mean	Total (%) Agree
Sustainability behavior and attitude awareness	Supporting positive actions for the environment	I appreciate biodiversity.	0.93	93.7	1.00	100.0
		I concern about smoke that is omitted by vehicles.	0.62	62.5	0.81	81.9
		I try to decrease amount of waste at home by collecting things that can be recycled.	0.81	81.2	0.78	78.3
		I save the use of electric energy at home.	0.50	50.0	0.86	86.4
		I save the use of water supply.	0.81	81.2	1.00	100.0
Sustainability practice awareness	Reading environmental issues	I examine environmental issues within the mass media.	0.81	81.2	0.89	89.1
	Implementing sustainable environmental maintenance practices	I compost the food residue to useful items such as fertilizer	0.33	33.3	0.43	43.2
		I don't use plastic bags to wrap things.	0.56	56.2	0.64	64.8
		I am involved in the various environmental awareness activities in school.	0.50	50.0	0.81	81.0
	Discussing environmental issues	I continuously discuss about environmental problems with my friends.	0.81	81.2	0.86	86.4
		I convey the importance of protecting the environment to my family members.	0.81	81.2	1.00	100.0
Overall (Level of sustainability awareness)			0.87	87.5	0.81	81.0

* Level indicators: Means: 0.00-0.33 (low); 0.34-0.67 (moderate); 0.68-1.00 (high)

Table 4 presents the mean scores and total percentages of agreement on sustainability awareness, categorized by gender. The data reflects various aspects of sustainability awareness, including emotional awareness, behavior and attitude awareness, practice awareness, and discussion on environmental issues. The study results indicate that students exhibit a high level of sustainability awareness, with an average score of 0.72 for male students and 0.85 for female students. This reflects a strong understanding of sustainable development concepts (Agusti et al., 2019).

However, a challenge arises in connecting broader dimensions, such as social, economic, and environmental aspects, to tangible actions aimed at environmental protection. The findings indicate that, while students exhibit strong emotional awareness regarding environmental issues, their understanding of sustainable practices such as recycling or reducing plastic waste, remains relatively low. This suggests a gap between

awareness and the actual implementation of sustainable behaviors in their daily lives (Kim & Lee, 2023). Figure 2 present the interpretations for each category based on the percentage of responses within the three sustainability awareness categories.

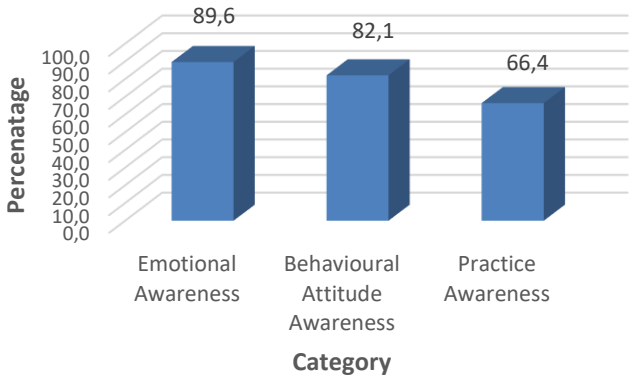


Figure 2. Percentage of Sustainability Awareness by Category

Figure 2 illustrates the percentage of sustainability awareness across three categories: Emotional Awareness, Behavioral Attitude Awareness, and Practice Awareness. Emotional Awareness stands at a high percentage of 89.6%, indicating that students possess a strong emotional connection to environmental issues, demonstrating significant concern and care for their surroundings. This is followed by Behavioral Attitude Awareness at 82.1%, reflecting a positive inclination towards engaging in behaviors that support sustainability. Lastly, Practice Awareness has the lowest percentage at 66.44%, suggesting that despite understanding the importance of sustainability, students may not consistently translate their awareness into practical actions (Ridwan et al., 2021).

This phenomenon can be logically attributed to the distinction between cognitive and emotional awareness and the implementation of more structured, practical actions. For example, while students may comprehend the significance of environmental protection and feel disturbed by pollution, without targeted guidance or encouragement to actively participate in environmental practices, this awareness does not always translate into concrete actions (Abdurroman et al., 2024). The findings reveal that students demonstrate the highest awareness in the emotional dimension, with a significant 89.6% of respondents expressing strong concern for environmental issues. This high emotional engagement is vital, as it reflects a profound sensitivity to environmental conditions, such as air and river pollution, which students find disheartening. However, this emotional

awareness does not always result in sustained actions, as evidenced by the lower scores in behavior (82.1%) and sustainability practices (66.4%).

This disparity can be explained by the fact that emotional awareness, while important, does not always translate into consistent environmentally-friendly behaviors or active participation in sustainability practices. Although students feel strongly about environmental issues, they may lack the practical knowledge, tools, or motivation to transform these concerns into habitual actions, such as composting or reducing plastic use. This finding is supported by previous studies (Agusti et al., 2019; Ridwan et al., 2021), which also report that emotional awareness tends to be higher than practical engagement in sustainability practices.

The relatively low participation in sustainability practices, at 66.4%, suggests that while students are aware of environmental challenges, they are less inclined to take proactive steps to address them. The gap between emotional concern and actual practice could stem from several factors, including a lack of access to resources, insufficient encouragement from educational programs, or even social and cultural influences that do not prioritize action-oriented environmental behaviors. Furthermore, the gender-based comparison reveals that female students consistently exhibit higher levels of sustainability awareness compared to their male counterparts, as shown in Figure 3. This trend could be attributed to differences in socialization, where females may be more encouraged or inclined toward nurturing roles, including environmental stewardship. This observation aligns with studies by Gökmen (2021), and Yilmaz & Erkal (2017), which indicate that female students generally show greater involvement in environmental protection activities.

The research indicates that while students exhibit strong emotional awareness, there is a critical need to bridge the gap between emotional concern and sustainable practices. Enhancing practical environmental education and cultivating supportive frameworks that encourage students to adopt actionable steps will be pivotal in translating their awareness into consistent behaviors. Closing this gap is crucial for fostering not only emotionally engaged but also practically active environmental stewards (McLeod et al., 2024). The comparative graph of sustainability awareness by gender is presented in Figure 3.

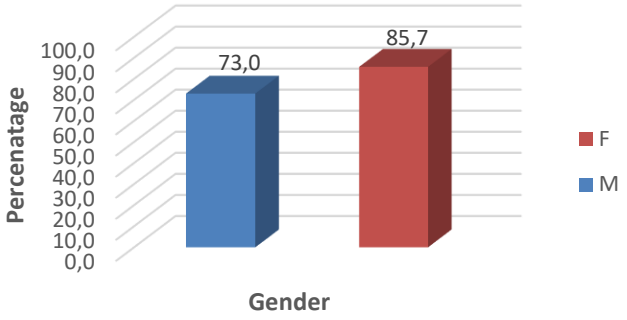


Figure 3. Comparison of Sustainability Awareness based on Gender

Figure 3 show that female students demonstrate a higher level of sustainability awareness, with 85.2% compared to 73.0% in male students. This significant gender difference suggests that female students pay more attention to environmental issues and are more engaged in practices and attitudes related to sustainability. This finding aligns with previous studies by Gökmen (2021), Nurhidayati et al. (2023), and Yilmaz & Erkal (2017), which similarly indicate that females generally outperform males in environmental knowledge, attitudes, and behaviors.

However, these results must be interpreted cautiously. While the data suggests a clear trend, there could be underlying factors influencing the gender disparity in sustainability awareness. Social, cultural, or educational differences may contribute to why female students are more conscious of environmental issues. For instance, societal norms might encourage females to adopt more nurturing roles, which can extend to environmental stewardship (Zhao et al., 2021). Alternatively, differences in how environmental education is delivered or perceived by different genders could also account for this variance.

Furthermore, the detailed comparison of sustainability awareness categories between male and female students helps identify where these differences are most pronounced. The graphical representation highlights specific areas where female students may excel, such as emotional awareness or behavioral practices, while also indicating areas where male students might need further encouragement or education. This breakdown allows for a more targeted approach to improving sustainability education, focusing on closing the gender gap by identifying where males might lag in awareness or practice (Setiawan et al., 2023).

While the data points to female students having higher sustainability awareness, it is essential to investigate the root causes behind this difference. Factors such as gender roles, educational approaches, and cultural expectations might all contribute to this gap, and addressing these could lead to more balanced and comprehensive sustainability awareness across both genders. Further research could help clarify the extent of these influences and suggest strategies to engage both male and female students equally in sustainability efforts. The graph illustrating the mean sustainability awareness based on category and gender is presented in Figure 4.

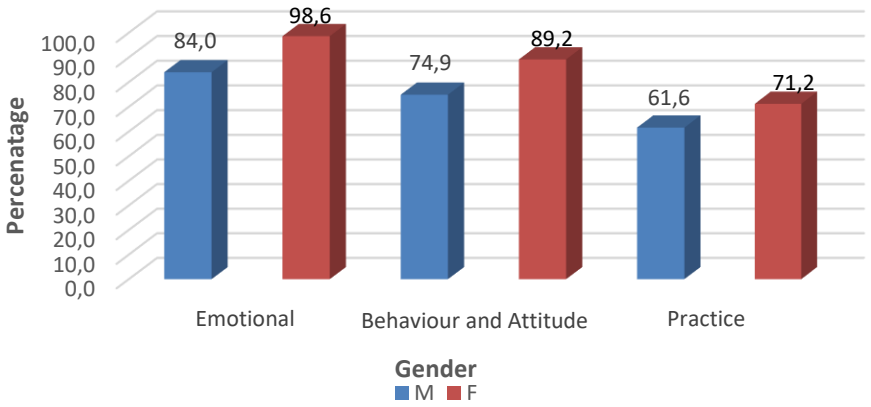


Figure 4. Mean of Sustainability Awareness based on Category and Gender

Figure 4 illustrates the mean scores of sustainability awareness by category and gender. Female students consistently score higher across all areas: Emotional Awareness (98.6 for females compared to 84 for males), Behavioral and Attitude Awareness (89.2 for females versus 74.9 for males), and Practice Awareness (71.2 for females against 61.6 for males). These findings indicate that female students exhibit a stronger emotional connection to environmental issues and are more proactive in engaging in sustainable behaviors and practices. The results, supported by previous research, highlight the need for targeted efforts to enhance male students' involvement in sustainability initiatives (Nurhidayati et al., 2023). Specifically, the research reveals that female students show a higher level of sustainability awareness than their male counterparts across various categories. This heightened awareness is particularly evident in their emotional concern for environmental issues, appreciation of biodiversity, and attitudes toward environmental stewardship. Notably, the statements "Environmental issues in my area are genuinely cared about by me" and "Biodiversity is appreciated by me" received the highest levels of agreement, with 96.85% of students affirming their concern for these topics.

However, the study also identifies a significant gap in practical sustainability actions, with only 38.25% of students actively engaging in composting food residue into useful items like fertilizer. This low engagement in composting, despite its environmental benefits, highlights a discrepancy between students' emotional concern for the environment and their actual sustainable practices. This result could be attributed to the fact that while students may understand the importance of environmental preservation, they may lack the practical skills or knowledge to implement actions like composting. This discrepancy suggests that while environmental education has effectively raised awareness, it may not have fully equipped students with the tools to practice sustainable behaviors.

The key takeaway from this research is the necessity for education programs that go beyond fostering awareness and focus on hands-on activities. By equipping students with practical knowledge and opportunities to engage in sustainable practices such as composting, schools can help bridge the gap between environmental concern and actionable behavior. This approach can significantly enhance students' contributions to sustainability efforts, supporting both environmental protection and natural resource management, as highlighted by Altassan (2023), Mpuangnan et al. (2023), and Nallapaneni et al. (2023).

The findings show that while students, especially females, have a strong emotional and cognitive connection to environmental issues, there is a clear need to increase their participation in practical sustainability activities. The findings of this study carry several important implications for educational institutions and policymakers. First, the high level of sustainability awareness, particularly in emotional dimensions, suggests that students are highly concerned about environmental issues. However, the lower levels of sustainability practices highlight a gap between awareness and action, indicating the need for more practical education that encourages active participation in sustainability initiatives. This could be addressed by integrating sustainability practices, such as composting and waste reduction, into the curriculum to reinforce hands-on engagement (Irawan et al., 2024; Khoiri et al., 2023). Furthermore, the gender disparity observed, with female students showing higher levels of awareness across all categories, underscores the necessity of tailored interventions to engage male students more effectively in environmental education. By addressing these gaps, schools can contribute significantly to fostering a more environmentally responsible generation, aligning with global

sustainability goals (Hassan et al., 2010; Sihombing et al., 2024). The results of this research highlight the importance of integrating sustainability education into daily practices, ensuring that students not only understand the importance of environmental protection but also actively engage in sustainable behaviors.

CONCLUSION

The assessment of ninth-grade students' sustainability awareness indicates an overall "high" level, with emotional sustainability awareness showing the highest agreement at 89.6%, followed by awareness of sustainability behaviors and attitudes at 82.1%. However, sustainability practice awareness lags behind with the lowest percentage at 66.4%, indicating a need for improvement in students' understanding and implementation of sustainable practices. The study also reveals that female students display higher sustainability awareness (85.7%) than male students (73.0%), implying that female students may be more attuned to sustainable development. Such disparities in awareness could be attributed to variations in learning strategies, prior experiences, or individual predispositions. To address this, it is crucial to promote consistent engagement regardless of gender, enhancing students' sustainability practice awareness through curriculum strategies that foster comprehension and application. Acknowledging gender differences and integrating diverse perspectives can foster a more inclusive understanding, ensuring that sustainability education transcends gender biases and promotes equitable learning outcomes.

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