Sustainability Literacy among Secondary Students: Awareness, Attitudes, and Action

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Article Info	Abstract

This study examined the awareness, attitudes, and likelihood of action on sustainability among 130 secondary students in the southern Philippines. Grounded in Social Cognitive Theory and Transformative Learning Theory, the research utilized a 51-item SDG-based survey aligned with UNESCO's (2017) learning objectives for Education for Sustainable Development (ESD). Descriptive statistics revealed high levels of awareness in familiar sustainability issues such as waste reduction, mental health, and water conservation. In contrast, lower awareness was observed in more technical and abstract domains, such as ICT infrastructure and economic growth. Attitude responses were positive, particularly concerning empathy, education, and environmental responsibility. Action-related items showed variability, with stronger intentions linked to education and climate-related topics, and weaker intentions in areas requiring technical knowledge or leadership. Pearson correlation analysis indicated significant, positive relationships among awareness, attitudes, and actions, with the strongest correlation between attitudes and actions. The findings underscore the need for sustainability education that builds knowledge and empowers students through experiential, skill-based, and values-driven learning to turn awareness into transformative action.

Introduction

Sustainability education has emerged as a global priority after the United Nations adopted the Sustainable Development Goals (SDGs) to guide humanity toward a more equitable, prosperous, and environmentally responsible future by 2030. At the heart of this effort lies SDG 4, which emphasizes quality education as a foundation for achieving all other goals (Kioupi & Voulvoulis, 2019; Žalėnienė & Pereira, 2021). Educational institutions are increasingly called upon to foster sustainability competencies that integrate ecological, economic, and social dimensions, enabling learners to critically engage with complex global challenges (Ferrer-Estévez & Chalmeta, 2021). Schools, particularly at the secondary level, play a crucial role in shaping future citizens' values, attitudes, and behaviors who will inherit and address sustainability challenges.

Despite these growing efforts, studies reveal that secondary students often possess limited and fragmented understandings of sustainability, even as they express concern for environmental and social issues (De Rivas et al., 2024; Walshe, 2008). While sustainability is gradually being integrated into curricula through interdisciplinary themes such as green chemistry and renewable energy, many learners still struggle to grasp its multi-faceted nature or translate their awareness into meaningful action (Jackson et al., 2023; Okonkwo, 2024). These patterns suggest a disconnect between knowledge acquisition and behavioral intention—a gap that has proven resistant to conventional pedagogical approaches (Chen et al., 2022).

The complexity of nurturing authentic sustainability engagement is further heightened in developing countries, where educational frameworks must navigate local socioeconomic constraints, resource limitations, and cultural contexts. Promising innovations—such as participatory approaches and whole-school sustainability models—are emerging in these settings, yet evidence remains limited and geographically skewed (Brandišauskienė et al., 2021; Koulougliotis et al., 2024). Particularly in Southeast Asia, empirical studies on how cultural and developmental factors shape sustainability literacy among youth remain scarce.

This study seeks to address these critical gaps by examining secondary students' overall awareness of, attitudes towards, and likelihood of action on sustainability in the southern Philippines. Understanding these three dimensions is vital because sustainability education is about transferring knowledge, shaping values, and inspiring responsible behavior. Assessing students' awareness provides insight into what they know, their attitudes reflect their emotional and moral alignment with sustainability goals, and their likelihood of action reveals the extent to which they are prepared to engage in real-world solutions. Educators and policymakers risk implementing programs that inform but fail to inspire meaningful participation without a clear understanding of how these components interact.

Using a validated SDG-based assessment tool, this study determines students' sustainability literacy on the domains – awareness, attitude, and action, and the relationship of these domains. The findings will offer empirical evidence to inform the design of more effective, context-responsive sustainability education programs, particularly in Global South settings. By contributing to the limited body of research in Southeast Asia, this study supports broader efforts to develop pedagogical strategies that foster deep, action-oriented engagement with

sustainability among youth, empowering them as informed, capable agents of change in their communities and beyond.

Statement of the Problem

1. What is the secondary students' awareness of, attitudes towards, and likelihood of action on sustainability?
2. Is there a relationship between secondary students' awareness of, attitudes towards, and likelihood of action on sustainability?

Framework of the Study

This study is grounded in Social Cognitive Theory (Bandura, 1986) and Transformative Learning Theory (Mezirow, 1991). It provides a robust framework for examining how high school students develop sustainability awareness, form related attitudes, and articulate their likelihood of action. These theories offer complementary insights into the cognitive, behavioral, and contextual processes shaping sustainability engagement, shedding light on the enabling conditions and persistent barriers students face as they move from awareness to action.

Social Cognitive Theory (SCT) emphasizes the interplay between personal, environmental, and behavioral factors in learning. Within this framework, sustainability awareness is not passively acquired but actively shaped through observational learning from role models such as teachers, peers, and public figures who embody pro-environmental values. This theory explains how students form attitudes through social reinforcement, internalizing behaviors affirmed within their social contexts. Importantly, SCT introduces the concept of self-efficacy—the belief in one's capacity to act—which helps explain the often-observed disconnect between concern for sustainability and actual behavior. Even when students possess knowledge and positive attitudes, a lack of confidence in their ability to contribute meaningfully can suppress action.

Complementing this, Transformative Learning Theory (TLT) focuses on the deeper cognitive and emotional processes that facilitate lasting change in perspective. The theory posits that learning begins when students encounter disorienting dilemmas, experiences that challenge their assumptions about environmental and social norms. These dilemmas trigger critical reflection, encouraging learners to question prior beliefs and engage in dialogue, leading to more nuanced understanding and personal commitment to sustainability. TLT highlights the role of experiential learning and structured reflection in helping students move from passive awareness to empowered, action-oriented engagement. However, it also warns that such transformation may remain incomplete without supportive educational environments that guide students toward practical application.

This study adopts a holistic lens for interpreting the data by integrating these two perspectives. Social Cognitive Theory clarifies how sustainability knowledge and attitudes are socially constructed, while Transformative Learning Theory explains the processes that deepen engagement and develop agency. They underscore the need for learning environments beyond information delivery, offering students opportunities to reflect critically,

develop self-efficacy, and engage in meaningful, real-world problem solving.

This theoretical framework is essential for understanding whether students are aware of sustainability issues and how they are prepared to act on them. It reinforces the idea that effective sustainability education must integrate cognitive, emotional, and behavioral components, supported by reflective pedagogy and social modeling. Ultimately, this dual-theory approach offers a strategic guide for educators and policymakers seeking to design programs that empower youth as informed, confident, and committed agents of sustainable change.
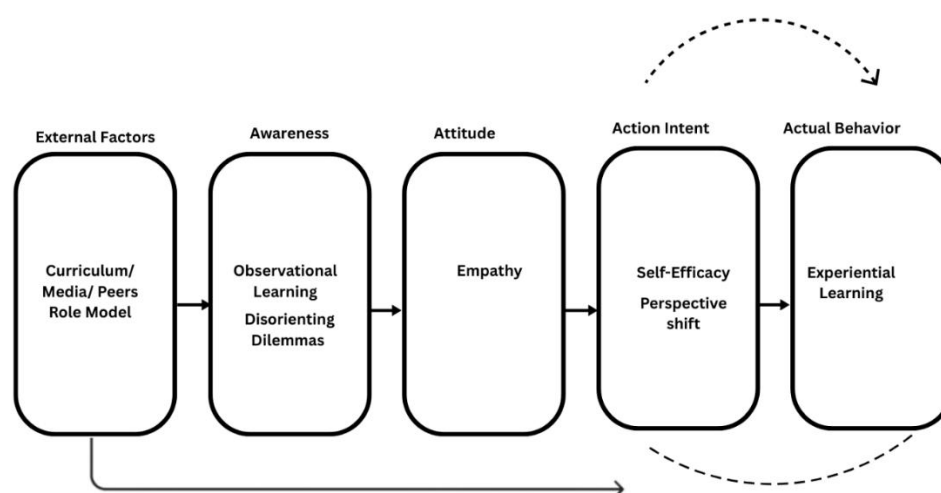
Figure 1. Schematic Diagram of the Study

Review of Related Literature

Research consistently shows that sustainability competencies among secondary students can improve through targeted educational interventions. For instance, a study in Germany observed that while students' sustainability-related knowledge increased over a school year, their affective-motivational attitudes declined, suggesting that content-based instruction alone may not sustain student engagement (Scharenberg et al., 2021). Similarly, factors such as gender, socioeconomic status, and time spent in nature have been shown to influence sustainability attitudes—female students and those from higher socioeconomic backgrounds tend to express more positive views. In contrast, experiential contact with nature is linked to stronger pro-environmental attitudes (Bucht et al., 2024). These findings highlight the need for holistic, emotionally engaging, and inclusive educational strategies.

The role of teachers is critical in fostering sustainability competencies. Educators with strong self-efficacy in Education for Sustainable Development (ESD) and supportive school cultures tend to produce better student outcomes in knowledge and behavioral intentions (Scharenberg et al., 2021). Pedagogies that empower students, such as student-led sustainability projects, can also promote deeper learning and agency, creating participatory environments that move beyond traditional top-down models (Vare, 2021). However, translating awareness into action remains challenging, with studies pointing to a persistent gap between students' cognitive understanding of sustainability and their behavioral follow-through (Chen et al., 2022; Olsson et al., 2022).

In the Philippine context, secondary students generally demonstrate promising levels of awareness and engagement with sustainability. Research in Surigao City reported that Grade 12 students exhibited very high environmental awareness and sound environmental practices (Escatron et al., 2023), while findings from another study indicated a positive correlation between awareness and students' willingness to address environmental concerns (Galorio & Naling, 2024). Educational context and moral frameworks also play influential roles. In Cebu City, for example, Catholic Life Formation embedded in religious instruction enhanced environmental consciousness among students (Baring et al., 2024). Context-based approaches, such as localized ESD content, further contribute to improved competencies, though the effectiveness of such methods across variables like grade level or school type remains underexplored (Quimat & Picardal, 2024).

Despite these positive developments, challenges persist in fully embedding sustainability into the Philippine education system. The K to 12 Science Curriculum includes objectives on environmental literacy, but implementation gaps—particularly in experiential and localized learning—limit its effectiveness (Espinola, 2024). While initiatives such as developing sustainability-themed learning modules in Grade 8 ecology have shown promise in enhancing literacy and problem-solving skills, these are not yet systematically scaled (Espinola, 2024). Moreover, the lack of longitudinal and comparative studies restricts insights into how students' understanding evolves across educational stages.

At the regional level, studies from Southeast Asia point to similar concerns. For instance, Taiwan's Green School Partnership Project revealed minimal differences in sustainability consciousness between participating and non-participating schools, underscoring issues such as gender disparities and declining pro-sustainability behaviors during adolescence (Olsson, 2019). In Pakistan, many students were unfamiliar with sustainability concepts, primarily due to limited curriculum integration (Malik, 2019). Hallinger (2024) emphasizes the need for more empirical research using robust methodologies to evaluate pedagogical effectiveness and cultural relevance in ESD. Recent work calls for developing localized frameworks, improved curriculum coverage, and equitable access to sustainability education across Southeast Asian high schools (Chotibuddin et al., 2025).

Methodology
Research Design

This study investigated the levels of sustainability awareness, attitudes, and actions among secondary school students. A quantitative research design, specifically, a descriptive-correlational approach, was employed in the study. This methodological choice is well-supported in educational and environmental psychology research, as it systematically measures variables while examining potential relationships between them (Creswell & Creswell, 2018). The descriptive component determined the secondary students' awareness of, attitudes towards, and likelihood of action on sustainability. At the same time, the correlational aspect will assess the relationship between secondary students' awareness of, attitudes towards, and likelihood of action on sustainability.

The study utilized a survey method widely recognized for its efficiency in gathering large-scale responses from diverse populations (Fowler, 2014). This approach aligns with previous research on sustainability education, such

as the work of Zeegers and Clark (2014), who used surveys to assess adolescent environmental awareness. The structured questionnaire will enhance reliability, while stratified random sampling will ensure representation across different academic levels, minimizing selection bias (Bryman, 2016).

Research Locale

This study was conducted at a public educational institution in Malaybalay City, Bukidnon, Philippines. As a laboratory school, it serves as a training ground for future educators while providing quality secondary education to its students. The school follows the K-12 curriculum and emphasizes holistic development, integrating academic excellence with values formation and community engagement. Its student body consists of diverse socioeconomic backgrounds, making it an ideal setting for assessing awareness, attitudes, and actions related to sustainability and socioeconomic issues. The school's location within Bukidnon, a province with rich agricultural resources but also facing challenges such as poverty, environmental degradation, water supply shortage, and inequality, further enhances the relevance of this study in understanding youth perspectives on sustainability.

The choice of the school as the research locale allows for an examination of how formal education and community exposure shape students' understanding of sustainability. Being part of a state university, the school has access to research-based teaching methods and extension programs that may influence students' awareness and engagement with social and environmental issues. Additionally, the school setting provides opportunities for innovative pedagogical approaches, which could serve as a model for integrating sustainability education into the curriculum. By focusing on this institution, the study captures insights from a youth population that is both academically engaged and situated in a region where sustainability challenges are directly observable, offering valuable implications for educational policy and practice.

Participants of the Study

The participants of this study consisted of 130 secondary students representing various grade levels (Grades 7 to 12). The student body comprises learners from diverse socioeconomic backgrounds, including those from urban and rural communities within Bukidnon. This diversity ensures a broad perspective on sustainability issues, as students bring different lived experiences related to environmental concerns and social inequality. The participants were selected through random sampling, ensuring a fair representation of age, gender, and academic standing. Their responses provide valuable insights into how young individuals perceive and engage with sustainability challenges in local and global contexts.

The students are particularly relevant to this study due to their exposure to laboratory-based and research-integrated education, which encourages critical thinking and problem-solving. Additionally, adolescents in a rapidly developing region are at a crucial stage of forming attitudes and behaviors toward social responsibility. Their perspectives reflect their educational background and their awareness of Bukidnon's environmental and socioeconomic realities, making them key stakeholders in shaping future sustainability efforts. By analyzing their responses, this study captures the readiness of youth to contribute to sustainable development.

Grade Level Distribution

One hundred thirty secondary students participated in the study, comprising 37 males (28.46%) and 93 females (71.54%), indicating a significantly higher representation of female respondents. The participants were distributed across six grade levels from Grade 7 to Grade 12.:

Grade Level	Male	Female	Total	Percentage
Grade 7	10	11	21	16.15%
Grade 8	6	5	11	8.46%
Grade 9	3	8	11	8.46%
Grade 10	2	8	10	7.69%
Grade 11	7	21	28	21.54%
Grade 12	9	40	49	37.69%
Total	37	93	130	100%

The largest group came from Grade 12, with 49 students (37.69% of the total), followed by Grade 11 with 28 students (21.54%). This higher representation of senior high school students may reflect their greater availability and maturity to engage in research-related activities. Grades 7 to 10 had comparatively fewer participants, with Grade 7 accounting for 16.15%, Grade 8 and Grade 9 each contributing 8.46%, and Grade 10 comprising 7.69% of the sample. Sex distribution across levels also showed a consistent trend of female predominance, particularly in Grade 12, where females made up 40 out of 49 students. The relatively balanced representation across lower grades and the strong participation from upper-grade students provide a diverse perspective across developmental stages, which is valuable for analyzing trends in sustainability awareness, attitudes, and actions.

Research Instruments

The study employed a 51-item survey questionnaire adapted from Sunthonkanokpong and Murphy (2019). Part 1 of the instrument provided participants with ethical information, including the study's purpose, voluntary participation, and assurance of anonymity. Part 2 collected basic demographic data, specifically the participants' grade level and sex. Part 3 comprised the main survey, developed in alignment with UNESCO's (2017) learning objectives for the 17 Sustainable Development Goals (SDGs), covering three domains: awareness, attitudes, and likelihood of action. Since UNESCO outlines 255 learning objectives across all SDGs, using all items would risk participant fatigue. One representative item per domain was selected for each SDG to ensure manageability, resulting in a 51-item survey. The items were adapted to the local context by referencing UNESCO's "suggested topics" for each SDG. In refining the language, the survey avoided double-barreled questions and reduced reading complexity to accommodate high school respondents more effectively.

To ensure the instrument's reliability in the Philippine context, a pilot test was conducted among 60 secondary students in Malaybalay City, Bukidnon. Internal consistency was assessed using Cronbach's alpha (Cronbach, 1951), with high reliability across domains: 0.886 for awareness, 0.907 for attitude, and 0.905 for action. The total scale reliability across all 51 items was 0.950, indicating excellent internal consistency. According to Taber (2017), an alpha value of 0.70 or higher is acceptable. As Gardner (1995) noted, high reliability is expected when items within a scale share sufficient common variance. Each domain used distinct item phrasing and response scales. Awareness items began with "My knowledge of… is," rated on a four-point Likert scale: very low, low,

high, and very high. Attitude items began with "I feel" or "I do not feel," with response options: very untrue of me, untrue of me, true of me, and very true of me. Action items started with "I will teach students…" (either about or how to), rated as very unlikely, unlikely, likely, and very likely.

Scoring Procedure

To interpret student responses across the three domains—awareness, attitudes, and likelihood of action—Likert-scale scores were converted into mean values and classified using clearly defined intervals. Each range was assigned a corresponding level, qualitative description, and interpretation statement.

Awareness Domain

Score Range	Level	Qualifying Description	Qualifying Statements
3.51-4.00	Very High	Highly Aware	Demonstrates a deep understanding of sustainability concepts
2.51-3.50	High	Moderately Aware	Understands key sustainability principles
1.51-2.50	Low	Somewhat Aware	Has a basic understanding of sustainability
1.00-1.50	Very Low	Minimally Aware	Has limited knowledge of sustainability

Attitude Domain

Score Range	Attitude Level	Qualifying Description	Qualifying Statements
3.51-4.00	Very true of me	Very Positive	Strongly values sustainability
2.51-3.50	True of me	Positive	Believes in sustainability
1.51-2.50	Untrue of me	Negative	Shows limited concern for sustainability
1.00-1.50	Very untrue of me	Very Negative	Lacks interest in sustainability

Actions Domain

Score Range	Attitude Level	Qualifying Description	Qualifying Statements
3.51-4.00	very likely	Very Positive	Actively and consistently adopts sustainability practices
2.51-3.50	Likely	Positive	Frequently takes sustainable actions, though not always consistently
1.51-2.50	Unlikely	Negative	Rarely engages in sustainable actions, but sustainability is not prioritized.
1.00-1.50	Very unlikely	Very Negative	Almost never takes action towards sustainability and shows little interest in sustainability efforts.

To examine the relationships between the three domains, Pearson product-moment correlation coefficients were interpreted using the following scale based on Riduwan & Sunarto (2007):

Interval coefficient	Interpretation
0.80-1.000	Very strong
0.60-0.7999	Strong
0.40-0.5999	Moderate
0.20-0.3999	Weak
0.00-0.199	Very weak

Analysis of Data

The data were analyzed using both descriptive and inferential statistics. Frequency counts and percentages were used to summarize students' levels of awareness, attitudes, and likelihood of action across the 17 Sustainable Development Goals (SDGs). These descriptive statistics provided a clear picture of the distribution of responses and identified the most and least understood or acted upon sustainability concepts.Pearson product-moment correlation was employed to examine the relationships among the three dimensions—awareness, attitudes, and likelihood of action. This allowed for identifying statistically significant associations between students' knowledge, affective responses, and behavioral intentions.For attitude items that were negatively worded, reverse scoring was applied to ensure consistency in interpreting higher scores as more positive attitudes. This step was essential to maintain the validity and reliability of the data analysis. All statistical analyses were conducted to support the study's objective of understanding how cognitive, affective, and behavioral domains interact in shaping sustainability engagement among secondary students.

Results and Discussion

This section presents and interprets the study's findings on secondary students' awareness of, attitudes towards, and likelihood of action on sustainability, as aligned with the 17 Sustainable Development Goals (SDGs). Data were gathered through a 51-item survey and analyzed using descriptive statistics and Pearson correlation to identify patterns and relationships across the three domains. The results are organized to reflect students' cognitive (awareness), affective (attitude), and behavioral (action) engagement with sustainability issues. Each domain is examined for specific SDG indicators to highlight strengths and gaps in students' sustainability literacy. The discussion further explores implications for curriculum development, instructional strategies, and future research in education for sustainable development.

Secondary Students' Awareness of, Attitudes Towards, and Likelihood of Action on Sustainability

Table 1 presents the results of students' self-reported awareness of 17 sustainability indicators aligned with the Sustainable Development Goals (SDGs). Students reported high levels of awareness of sustainability issues closely linked to everyday experiences, such as waste management (SDG 11), mental health (SDG 3), and water access (SDG 6). This strong familiarity was reflected in student reflections. One student noted, *"I understand*

sustainability as using resources in a way that does not harm the environment and ensures that future generations have enough resources." Another shared, *"I learned about sustainability in school and from watching videos about the environment. I also participated in community cleanups and saw how pollution affects our world."*

Table 1. Secondary Students' Awareness of Sustainability Concepts

SDG # and Indicators	Very High	%	High	%	Low	%	Very Low	%
11. My knowledge of the need for waste reduction, recycling, and reuse.	73	56.2	55	42.3	2	1.5	0	0
3. My knowledge of the importance of mental health	72	55.4	51	39.2	6	.46	1	0.8
6. My knowledge of the consequences of a lack of water.	67	51.5	57	43.8	6	4.6	0	0
5. My knowledge of the role of education in ensuring the equality of males and females.	53	40.8	73	56.2	4	3.1	0	0
13. My knowledge of which human activities contribute most to climate change.	53	40.8	63	48.5	11	8.5	3	2.3
10. My knowledge of how inequality is a major cause of societal problems.	48	36.9	72	55.4	8	6.2	2	1.5
16. My knowledge of the injustice in my country.	42	32.3	69	53.1	19	14.6	0	0
4. My knowledge of the importance of education as a driver of sustainability.	42	32.2	72	55.4	16	12.3	0	0
12. My knowledge of how individual lifestyle choices influence environmental development.	40	30.8	81	62.3	8	6.2	1	0.8
15. My knowledge of how unsustainable production of technologies can harm the habitats of wildlife.	37	28.5	74	56.9	17	13.1	2	1.5
1. My knowledge of the consequences of poverty.	36	27.7	85	65.4	9	6.9	0	0
14. My knowledge of how renewable energies such as wind turbines can promote sustainability.	35	26.9	64	49.2	28	21.5	3	2.3
7. My knowledge of the health impacts of energy production.	34	26.2	71	54.6	25	19.2	0	0
2. My knowledge of the consequences of malnutrition	33	25.4	86	66.2	10	7.7	1	0.8
9. My knowledge of the need for sustainable ICT infrastructures.	25	19.2	56	43.1	43	33.1	6	4.6
17. My knowledge of the importance of global cooperation to ensure access to technology.	25	19.2	82	63.1	21	16.2	2	1.5
8. My knowledge of the relationship between employment and economic growth.	22	16.9	62	47.7	46	35.4	0	0
Qualifying Description	Highly Aware		Moderately Aware		Somewhat Aware		Minimally Aware	

These findings support previous research indicating that secondary students tend to exhibit higher awareness of environmental sustainability issues, obvious and relatable ones (Agirreazkuenaga & Martinez, 2021). Likewise, over 90% of respondents reported "high" or "very high" awareness for SDG 5 (gender equality through education), SDG 1 (poverty), and SDG 12 (responsible consumption and production), which often intersect with students' direct experiences. These trends reinforce that sustainability awareness is more robust when learners connect it to personal or local relevance.

In contrast, although students expressed awareness of more complex goals such as inequality (SDG 10), climate action (SDG 13), and the role of education in sustainability (SDG 4), responses suggest that this may be general rather than deeply conceptual. This echoes findings by Keramitsoglou et al. (2023), who observed that students' understanding of broader sustainability concepts—such as the circular economy or systems thinking—often remains superficial. They attributed this to gaps in formal curricula and the limited use of experiential or interdisciplinary learning strategies. Educational theory supports this, asserting that scaffolded, reflective learning is essential to help students develop a nuanced understanding of interconnected sustainability issues.

Moreover, awareness levels were lower for goals that require a grasp of abstract or global systems, such as sustainable infrastructure (SDG 9), economic growth and decent work (SDG 8), and partnerships for global development (SDG 17). Only 16.9% of respondents reported "very high" awareness of SDG 8; many indicated only moderate familiarity. These patterns suggest curricular blind spots where technical and policy-level aspects of sustainability are underexplored. Despite this, it is significant that across all SDGs, responses in the "low" or "very low" categories were minimal. This may indicate that students have at least a foundational awareness, even if deeper conceptual understanding is lacking.

Overall, the findings align with the literature, indicating that while secondary students are increasingly aware of sustainability, especially in environmental domains, this awareness does not always translate into a comprehensive understanding or informed action (Agirreazkuenaga & Martinez, 2021; Keramitsoglou et al., 2023). This highlights the need for curricular and pedagogical innovation. Project-based learning, interdisciplinary case studies, and simulations can help deepen engagement with complex sustainability challenges. Teachers should also bridge global issues with students' realities to enhance relevance and foster critical reflection. As such, these results highlight the importance of evolving sustainability education to go beyond awareness and foster critical, systems-oriented thinking among youth.

Table 2 reveals overwhelmingly positive student attitudes toward sustainability. More than 95% expressed empathy and support for key social and environmental issues, including climate justice, inequality, and sustainable consumption. Students do not merely view sustainability as a societal goal, but as a value system to which they subscribe. One student reflected, *I believe humans should practice sustainability for the greater good."* Another remarked, *"It is about taking care of the planet so that everyone, now and in the future, can have a good life."*

The data show that most participants responded with "very true of me" or "true of me" across all 17 SDG-related indicators. This high effective alignment suggests that sustainability is not only cognitively acknowledged but

emotionally internalized. For instance, 67.7% of students strongly agreed that education for sustainable development (SDG 4) is important. In comparison, more than 90% expressed empathy for vulnerable populations, including the sick (SDG 3), the poor (SDG 1), and victims of marginalization or injustice (SDGs 10 and 16). Such responses underscore a strong sense of moral responsibility and alignment with the social dimension of sustainability.

Table 2. Secondary Students' Attitude Towards Sustainability

SDG # and Indicators	Very High	%	High	%	Low	%	Very Low	%
4. I feel that education for sustainable development is important.	88	67.7	42	32.3	0	0	0	0
3. I feel empathy for people who are suffering from illness.	83	63.8	45	34.6	1	0.8	1	0.8
16. I feel empathy with people suffering from injustice in my country.	83	63.8	46	35.4	1	0.8	0	0
1. I feel empathy for people in poor and vulnerable situations such as child laborers.	80	61.5	50	38.5	0	0	0	0
10. I feel empathy for people who are discriminated against.	80	61.5	49	37.7	1	0.8	0	0
15. I feel empathy with non-human life such as wild animals in the forest.	79	60.8	46	35.4	4	3.1	1	0.8
7. I feel that sustainable energy use is important.	76	58.5	54	41.5	0	0	0	0
11. I feel responsible for the environmental impacts of my own lifestyle.	68	52.3	62	47.7	0	0	0	0
2. I feel empathy for people in the world who are malnourished.	67	51.5	61	46.9	2	1.5	0	0
6. I feel responsible for my own water use.	66	50.8	60	46.2	4	3.1	0	0
8. I feel that labor rights for migrant workers are necessary.	65	50	63	48.5	2	1.5	0	0
17. I feel that global access to the Internet is important.	64	49.2	63	48.5	3	2.3	0	0
12. I feel responsible for the environment.	62	47.7	65	50.0	3	2.3	0	0
9. I feel that access to basic Information and Communications Technology (ICT) infrastructure is important.	61	46.9	67	51.5	2	1.5	0	0
5. I feel empathy with people who are different from what is normally expected in the community regarding gender.	57	43.8	69	53.1	4	3.1	0	0
13. I feel that we need to do something about industry-related greenhouse gases.	57	43.8	71	54.6	2	1.5	0	0
14. I feel empathy with people whose lives are affected by changing fishing practices.	51	39.2	73	56.2	6	4.6	0	0
Qualifying Description	Very Positive		Positive		Negative		Very Negative	

Similarly, students demonstrated notable concern for environmental well-being, with 100% indicating a sense of personal responsibility for waste management (SDG 11), water conservation (SDG 6), and broader ecological impact (SDG 12). High agreement was also observed in support for non-human life (SDG 15) and advocacy for renewable energy (SDG 7), indicating a broad and inclusive sustainability mindset.

Interestingly, positive attitudes extended to areas that are typically underrepresented in secondary education, such as ICT infrastructure (SDG 9), labor rights (SDG 8), and global partnerships (SDG 17). More than 95% of students considered these issues important, suggesting a growing awareness of sustainability as a systemic and interconnected framework. This aligns with global education goals that promote a holistic understanding of the SDGs and signals that learners may be internalizing sustainability as more than an environmental concern.

However, while attitudinal responses were overwhelmingly positive, the near absence of disagreement raises critical questions. Few students selected "untrue of me" or "very untrue of me," which may indicate strong social desirability or normative influences within school settings. De Rivas et al. (2024) observe that students tend to exhibit stronger emotional and attitudinal identification with sustainability than actual behavioral follow-through. Likewise, Agirreazkuenaga and Martinez (2021) noted that although students may express empathy and value alignment, these attitudes do not always translate into sustained pro-sustainability practices.

These findings suggest that while learners are ethically and emotionally aligned with sustainability goals, they need to deepen their reflective engagement. Schools can build on this strong attitudinal foundation by integrating critical thinking, ethical reasoning, and civic participation into the curriculum. By encouraging students to explore dilemmas, debate sustainability issues, and engage in service-learning or advocacy, educators can help transform empathy into informed action. Ultimately, fostering attitudinal depth and critical agency may better equip students to navigate and address the complexities of global sustainability challenges.

Table 3 presents the students' self-reported likelihood of engaging in actions related to sustainability. While the overall responses remained highly positive, this dimension showed slightly more variability than awareness and attitudes. A large proportion of students indicated they were either "very likely" or "likely" to engage in sustainability-related behaviors, particularly in areas such as climate change education (SDG 13), biodiversity protection (SDG 15), and gender equality (SDG 5). For instance, 97.7% of students reported being likely or very likely to learn how technology threatens biodiversity, while 96.9% expressed intent to learn how to identify gender discrimination. These results reflect a strong readiness to engage in personal learning and advocacy, especially in topics that intersect with social justice and environmental preservation.

Students also demonstrated high intent to develop 21st-century skills (SDG 4), practice sustainable residential energy use (SDG 11), and learn about new technologies for sustainability (SDG 8). These responses indicate that students are aware of sustainability issues and motivated to take practical steps to address them. However, a downward trend is observable in actions requiring more technical knowledge or abstract application, such as ICT recycling and disposal (SDG 9), using technology to calculate water footprint (SDG 6), or empowering marginalized populations through technology (SDG 1). For example, only 23.1% of students reported being "very

likely" to calculate their water footprint, and only 19.2% indicated strong intent to use technology to empower poor communities. These findings suggest a perceived lack of confidence, skills, or access to the tools necessary to engage in more complex sustainability actions.

Table 3. Secondary Students' Actions on Sustainability

SDG # and Indicators	Very High	%	High	%	Low	%	Very Low	%
15. I will learn about how technology can threaten biodiversity (e.g. habitat loss, deforestation, etc.)	69	53.1	58	44.6	3	2.3	0	0
5. I will learn how to identify gender discrimination.	65	50.0	61	46.9	4	3.1	0	0
13. I will help promote knowledge of climate change.	58	44.6	67	51.5	5	3.8	0	0
4. I will improve the basic skills needed for the 21st century.	54	41.5	71	54.6	4	3.1	1	0.8
8. I will learn about new technologies for sustainable development.	53	40.8	71	54.6	6	4.6	0	0
11. I will practice sustainable residential energy use.	51	39.2	75	57.7	4	3.1	0	0
7. I will learn about renewable energy technologies.	49	37.7	75	57.7	6	4.6	0	0
12. I will learn about environmental impact of technology production.	49	37.7	68	60.0	3	2.3	0	0
3. I will use technology to promote health.	48	36.9	74	56.9	7	5.4	1	0.8
14. I will learn about sustainable marine energies.	47	36.2	68	52.3	15	11.5	0	0
10. I will not use technology to contribute to inequality in society.	45	34.6	59	45.4	22	16.9	4	3.1
16. I will use technology to connect with groups that are experiencing injustice.	42	32.3	75	57.7	12	9.2	1	0.8
9. I will do ICT recycling and disposal.	40	30.8	70	53.8	20	15.4	0	0
17. I will use technology to create partnerships to promote sustainability.	40	30.8	80	61.5	9	6.9	1	0.8
2. I will change my own lifestyle to fight against hunger.	39	30.0	80	61.5	11	8.5	0	0
6. I will how to use technology to calculate my water footprint.	30	23.1	83	63.8	16	12.3	1	0.8
1. I will use technology to empower poor people.	25	19.2	80	61.5	18	13.8	7	5.4
Qualifying Description	Very likely		Likely		Unlikely		Very Unlikely	

Nevertheless, students showed strong interest in using technology for collective impact. High percentages agreed they would use digital platforms to create sustainability partnerships (SDG 17) and connect with marginalized groups (SDG 16), with combined positive responses above 90%. This indicates that students recognize the power of technology in advancing social and environmental goals and are willing to participate in digital advocacy and

collaboration. Moreover, the willingness to change personal behaviors, such as altering one's lifestyle to fight hunger (SDG 2) or learning about marine sustainability (SDG 14), demonstrates a growing sense of individual responsibility and ethical engagement.

Despite the generally encouraging results, the slight decline in "very likely" responses for more demanding or abstract actions reveals an important area for educational development. While students are motivated, they may lack the technical proficiency, leadership experience, or real-world practice necessary to transform intent into consistent, impactful action. These findings suggest that students need structured opportunities to build technical competence and action-oriented skills while the intent is present. Schools can address this by embedding sustainability projects into classroom learning, providing opportunities for community involvement, and integrating digital literacy into environmental education.

The results suggest that high school students are willing and prepared to act on sustainability, especially when actions are concrete, relatable, and values-driven. To support their transition from intention to implementation, educational interventions should focus on building practical skills, nurturing self-efficacy, and connecting classroom content with real-world applications. School policies and the integration of environmental education also play a crucial role; students with robust sustainability programs and supportive teachers tend to develop more positive attitudes and are more likely to engage in sustainable behaviors (Olsson et al., 2022). Doing so can empower students to think sustainably and lead sustainability efforts in their communities and beyond.

Relationship between Secondary Students' Awareness of, Attitudes towards, and Likelihood of Action on Sustainability

Table 4 presents that the Pearson correlation coefficients show significant positive relationships among the three domains. The strongest correlation was between attitude and action ($r = .676$), followed by awareness and attitude ($r = .632$), and then awareness and action ($r = .557$). These findings are consistent with the idea that knowledge nurtures positive dispositions, but ultimately, students' values and emotional engagement most strongly drive behavior.

Table 4. Correlation among Awareness, Attitudes, and Actions

Dimensions	r	Interpretation
Awareness vs Attitude	.632[**]	Strong
Awareness vs Actions	.557[**]	Moderate
Attitude vs Actions	.676[**]	Strong

**. Correlation is significant at the 0.01 level (2-tailed).

Student reflections reinforce this dynamic. Many describe their journey from information to action: *"I learned about sustainability through social media, where I saw posts about eco-friendly practices. That helped me understand how small actions matter."* Another adds, *"Learning this concept in school made me more aware of how our lifestyle causes climate change."* These narratives suggest that affective engagement, combined with

accessible learning opportunities, supports behavioral readiness.

These results confirm that while awareness is important, attitudes play a more direct role in shaping behavioral intentions, reinforcing the value of affective and reflective learning strategies in sustainability education. These findings support both Social Cognitive Theory and Transformative Learning Theory: awareness and modeling influence attitudes (Bandura, 1986), and it is through reflection and perspective shifts through exposure to environmental or social dilemmas that students become agents of change (Mezirow, 1991). Nevertheless, the lack of follow-through in behavior indicates that transformation remains incomplete without structured, experiential opportunities to apply learning. Thus, there is a global consensus on the need for a holistic approach that integrates cognitive, affective, and behavioral competencies and a call for more diverse and regionally inclusive research (Sposab & Rieckmann, 2024).

Conclusion

The study's findings across awareness, attitude, and action dimensions reveal that secondary students possess a strong foundational understanding of sustainability, particularly on issues that directly affect their daily lives, such as waste reduction, mental health, water conservation, and environmental protection. High levels of empathy and positive attitudes indicate that students are ethically conscious and inclined toward sustainable behaviors. This suggests that sustainability values are internalized early, especially when reinforced through school curricula and media exposure.

However, awareness of complex and systemic sustainability issues such as economic inequality, governance structures, and global cooperation remains relatively limited. This points to the need for more structured, interdisciplinary educational strategies that address these abstract topics in accessible and relatable ways. Furthermore, while students show high intent to act, their confidence in initiating, organizing, or leading sustainability efforts is less pronounced. This gap between intention and execution highlights the need to move beyond knowledge acquisition, toward capacity-building that empowers students to become effective agents of change. The results suggest that students are ready and willing to contribute meaningfully to sustainability efforts. With appropriate support through targeted instruction, real-world engagement, and leadership development, schools can nurture a generation of youth who are informed and equipped to drive long-term, sustainable change.

Recommendations

Schools may strengthen interdisciplinary approaches such as case studies, debates, and real-world problem-solving exercises to enhance students' understanding of complex sustainability issues. Topics like economic policies, systemic inequality, and global sustainability challenges may be presented relatable way, connecting abstract concepts to students' lived experiences. Additionally, partnerships with local organizations and sustainability experts could provide students with practical insights, promoting a deeper, more nuanced comprehension of these issues. To strengthen students' ability to act on their sustainability attitudes, schools may implement leadership development programs, peer collaboration projects, and community-based initiatives

involving the students. Encouraging student-led sustainability campaigns, technology-driven advocacy, and service-learning opportunities can help build confidence in mobilizing change. Furthermore, educators may emphasize the intersection of individual actions and systemic solutions, ensuring students recognize their role as responsible citizens and advocates for policy and institutional reforms. By combining knowledge-building with skill development, schools can empower students to become effective change-makers in the sustainability movement.

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