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Research Article

The Role of Secondary School Education in Promoting Environmental Literacy and Sustainable Behavior Among Students in Chattogram, Bangladesh

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Abstract

Environmental education at the secondary school level is crucial for developing environmentally conscious citizens. This study examines how secondary school education shapes students' environmental attitudes and environmentally friendly behaviors in Chattogram, Bangladesh. A quantitative survey method was used with four research questions (1. What is the level of environmental knowledge among secondary school students? 2. What are the attitudes of secondary school students toward environmental protection? 3. To what extent do secondary school students practice sustainable behavior in their daily lives? 4. How does the school contribute to promoting students' environmental literacy and sustainable behavior through textbooks, curriculum, teacher support and school activities?) of 130 respondents. Students' environmental knowledge, attitude, environmentally friendly behavior, and perceived support from the school were assessed. The results showed that students had high levels of environmental awareness and positive attitudes toward conservation. However, students engaged in eco-friendly behaviors at a moderate level, indicating a significant gap between knowledge and practice. While schools are seen as strong enablers in providing access to and encouragement of environmental content, current educational systems appear to be more effective in raising awareness than in promoting habitual environmentally friendly behavior. The study concludes that a shift towards experiential, participatory, and action-oriented learning is essential to transform environmental literacy among young students into actual environmentally friendly behavior.

Keywords

Environmental Literacy, Environmental Education, Secondary School Education, Attitude Towards the Environment, Pro-environmental Behavior, Sustainable Development

1. Introduction

In today's world environmental crises like climate change, water pollution, air pollution, deforestation, misuse of natural resources is increasing steadily, which has become a major threat to the whole world and its inhabitants. To tackle these environmental issues, it is extremely important to foster environmental awareness among the people via education. Considering that secondary school students will become crucial members of society in the future, it is essential to cultivate environmental literacy and awareness in them for tomorrow. The

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objective of this research is to analyze the level of environmental knowledge and awareness, acquired through secondary school education and its practical application in their daily life.

1.1. Background of the Study

Environmental studies in schools have been recognized as playing a significant role in the development of students' awareness and understanding of the environment. Despite students obtaining knowledge about the environment in their school studies, they are noted to lack the ability to implement this knowledge in their day-to-day lives. This has been recognized as the Knowledge-Attitude-Behavior Gap. The reason for this is that there is minimal involvement of students, the lack of interest in the program, as well as the emphasis placed on learning from textbooks. If the knowledge acquired in the course of environmental education is just theoretical, without involving students in practical activities, the program will not lead to behavioral change. The program should, however, bring a behavioral change through practical activities. In a country such as Bangladesh, especially in rural and semi-urban areas like the Chittagong region, such issues are more prominent. Though issues related to the environment are being covered in secondary educational institutions, limited exposure is being provided to hands-on learning and experiences that restrict students from becoming environment-friendly. Moreover, the lack of interest and positive attitude towards the environment hinders students from effectively converting their learning into their daily lives. Unless students are actively engaged in finding solutions to environmental issues, the education will not have any long-term effect. Besides, the environmental education often fails to be implemented effectively due to social and cultural barriers. In some areas, where environmental awareness and valuation are marginalized, various obstacles arise in applying educational theories into real-world action. As a result, students often fail to apply their classroom-based environmental education into their real-life actions. Thus, the relevance of the topic emerges as there is a need to evaluate the impact of secondary schooling on the students' knowledge, attitude, and practices related to the environment in the context of Bangladesh. The topic addresses the scope of secondary schooling in developing environmental literacy among students.

1.2. Statement of the Problem

Environmental challenges such as pollution, climate change, decreasing of natural resources and biodiversity loss are increasing day by day in the present world. Dealing with these environmental challenges needs to developing a younger generation who are environmentally conscious, responsible and committed to sustainable practices. Environmental education at the secondary school level holds crucial importance, as schools serve as foundational institutions where students' knowledge, values, attitudes and behavioral tendencies are formed and strengthened. However, there is very limited research on how effectively the environmental education provided on schools enhance students' environmental knowledge, influences their attitudes and values and supports the development of environmentally responsible behavior in real life. As a result, it remains unclear to what extent school-based education is actually improving students' environmental literacy and how far they are able to apply what they learn in their everyday practices. Moreover, there is sufficient understanding of how textbooks, teaching methods and school-based environmental activities such as: tree planting, waste management and cleanliness practices actually influence students' behavior. In this context, it is essential to gain a comprehensive understanding of students' knowledge, attitudes, daily sustainable practices and the overall impact of school education on these aspects.

1.3. Objectives of the Study

The aim of the study is to examine the impact of secondary school education on students' environmental literacy and sustainable behavior including their knowledge, attitudes, practices and the role of schools in promoting environmentally responsible actions. The specific objectives of the aim as mentioned below are:

1) To assess the level of environmental knowledge among secondary school students;
2) To examine students' environmental attitudes and values regarding environmental protection;
3) To evaluate the extent of students' sustainable behavior in their daily lives; and
4) To examine the role of the school in advancing literacy and sustainable behavior through course of study, textbooks, school activities and teacher guidance.

1.4. Limitations of the Study

The study has some limitations which are important to be mentioned:

1) *Limited sample size and area:* The data were collected from 130 students across five secondary schools, which might not represent the overall students' environmental knowledge, attitudes and behaviors in the context of Bangladesh. The results of the study are therefore limited to the selected school and students and cannot be generalized due to its limitation of sample size.
2) *Limited geographical reach:* The focus group is constrained to one geographic are, which does not provide a full idea of the scope of the environmental practices and school-based initiatives in other regions and especially in urban areas.
3) *Dependence on self-reported data:* Relying on self-re-

ported students' responses might also present a limitation.

4) *Time and resources:* The study was unable to cover all classroom observations and teacher-related aspects due to the limited time and resources.

1.5. Significance of the Study

This research is significant because it highlights the essential role that secondary school education play in influencing the environmental literacy and sustainable behavior of students at a formative stage in their lives. In Bangladesh, a country increasingly affected by environmental adversity from deforestation, waste mismanagement, biodiversity loss to climate vulnerability, the building of environmentally responsible citizens through education is essential. Secondary school students are representative of a critical age group where values, attitudes and lifelong behavioral patterns begin to take shape. Accordingly, understanding how education forms their environmental knowledge and actions have great societal importance. The significance or the contribution of the current research effort lies in the widening scope of knowledge within the academic world through the assessment of the prominent factors under environmental literacy, namely knowledge, attitudes, and practices among secondary school students. Through the assessment of the subjects covered, textbooks, as well as the instructions given to the subjects, the shortcomings within the current educational system can be established. The results are also important in schools and educational institutions because they can effectively help identify the impacts of teaching methods and activities conducted at the school on environmental values and practices among students. In addition, the study supports the goals of sustainable development, especially objective 4 (Quality Education) and objective 13 (climate action), as it helps to improve environmental literacy programs conducted at rural and urban educational institutions in Bangladesh to meet the criteria of sustainable development goals.

2. Overview of Literature

Environmental degradation, climate change, biodiversity loss and the reduction of natural resources have placed sustainability at the center of global educational priorities. In response, secondary school education has increasingly been identified as a critical platform from which to foster environmental literacy shape responsible environmental behavior among young learners. Various forms of literature document the role of environmental education within institutions. There has been emphasis on research related to environment-based education initiatives, the behavioral and psychological aspect of sustainability, and the institutional factor within schools. This chapter analyzes the above topics and thereby links the current research study to existing theoretical concepts based on relevant literature.

2.1. Concept of Environmental Literacy

The concept of environmental literacy (EL) has undergone significant development in the last three decades. The landmark work of Roth [1] defined environmental literacy as a multidimensional construct comprising knowledge, attitudes, skills and behaviors that enable individuals to act responsibly toward the natural environment. Completing this perspective, Disinger and Roth [2] asserted that the principal objective of environmental education should be the production of environmentally literate citizens who are capable of making informed choices and talking action with regard to environmental issues. From these initial ideas, McBride et al. [3] described the evolution of EL and maintained that environmental, ecological, and eco-literacy represent overlapping but distinct orientations, each contributing to a subtle comprehension of human-environment relationships. Hollweg et al. [4] then extended the EL framework to demonstrate the main constitutes of EL, which are environmental knowledge, cognitive skills, affective dispositions, environmentally responsible behaviors and self-efficacy. Their widely influential work in this area provided a broad benchmark for defining environmental literacy, particularly among young people. Put together, these studies emphasize the fact that EL is not an aggregation of facts on the environment but rather a holistic and action-oriented state of mind integrating awareness, attitude and responsible behavior.

2.2. Behavioral Models and Pro-Environmental Action

The connection between environmental knowledge and behavior has been discussed. The seminal meta-analysis by Hines, Hungerford and Tomera [5] established that environmental knowledge alone cannot ensure responsible behavior but instead requires multiple factors such as attitudes, intention, locus of control and personal responsibility. This multivariable explanation was further corroborated by Bamberg and Moser [6], whose meta-analysis showed that pro-environmental behavior is the result of combination of moral norms, problem awareness and perceived behavioral control. A coherent theory of environmentally significant behavior was developed by Stern [7], suggesting that such behavior stems from personal values, beliefs, norms and contextual factors. His value-belief-norm theory is still one of the most used framings when describing why people behave along lines that might be described as being environmentally responsible. Kollmuss and Agyeman [8] emphasized and continuing "attitude-behavior gap'', saying that on account of positive environmental attitudes, people may fail to act due to external constrains, a lack of opportunities or habitual behavior. Social-psychological factors also shape environmental behavior. For instance, Gifford and Nilsson [9] showed that personal values, cultural influences, social norms and demographic

factors significantly contribute to environmental concern behavioral outcomes. Bandura's Social Cognitive Theory [10] explains pro-environmental action through the interaction of personal factors, behavior patterns and environmental influences. His concept of self-efficacy that is belief in one's ability to act has been particularly influential in understanding why some individuals engage in sustainable behavior while others do not. These models of behavior, taken together, emphasize that environmental literacy cannot be simply related to learning new knowledge but also related to developing attitudes, motivations and competence.

2.3. Role of Secondary Education in Promoting Environmental Literacy

The secondary school is an important stage in building adolescents' awareness, attitudes, and actions towards their environment. Rickinson [11] argued that pedagogical approaches, outdoor education, and teacher knowledge were all important variables affecting adolescents' awareness of their environment. Both Hungerford and Volk [12] argued that quality environmental education was required, rather than just conveying facts through instruction. The Action Competence Approach Jensen & Schnack, [13] emphasizes students' capacity for identifying environment-related concerns, for critical reflection, and for acting-on these concerns in environment-related projects, increasing the scope of learning from awareness to action-oriented development engagement. Ernst & Theimer [14] argued school-based environment-related projects increase students' feelings of being connected to nature, which was recognized as one of the most influential predictors of pro-environmental behavior. This was also brought out under the Eco-Schools scheme since students participating in real environment-related projects showed greater action competence of Cincera & Krajhanzl, [15] in comparison to conventional schools of Boeve-de Pauw & Van Petegem, [16]. Teacher attitudes/competencies were emphasized once again under this aspect by Ozden [17]. Social and peer influences also shape environmental attitudes. Family values, social groups, as well as an individual's own perceptions, highly influence climate concerns among those studied Stevenson et al., [18]. Chawla & Cushing [19] explained how there should be environmental education enabling strategic action capabilities like problem-solving, decision-making, or planning, in order to ensure sustainable behaviors. In a broad manner, it has been asserted how secondary education plays a pivotal role in spreading sustainability.

2.4. International Policy Frameworks Supporting Environmental Education

International declarations and policy documents have influenced the development of environmental education worldwide. First of all, the Belgrade Charter of UNEP & UNESCO [20] took a first step towards formulating a worldwide framework for EE and focused on developing a world population that is environmentally conscious and has a desire to work towards solutions. Two years later, UNESCO issued the Tbilisi declaration in [21] and presented the most authoritative guidelines in EE, defining its objectives, guiding principles and expected learning outcomes. Tilbury [22], contended that in the 1990s, environmental education transitioned to sustainability education against a backdrop of a global shift toward the use of sustainable development discourse. Further, Fien and Tilbury [23], extended this view by suggesting that for sustainability globally, there needs to be transformative learning approaches where environmental, social and economic concerns intersect. Most recently, UNESCO [24] launched the Education for Sustainable Development Goals Learning Objectives that stress the need for learners to acquire knowledge, values and skills that can help them contribute towards sustainable societies. This policy framework identifies the key role schools play in developing the requisite cognitive, socio-emotional and behavioral competencies to deal with contemporary environmental issues. Collectively, these studies point to the importance of secondary school education as a key site for developing environmental literacy and sustainability.

2.5. Recent and Regional Empirical Studies

Recent empirical studies across different cultural contexts offer important insights into students' environmental literacy levels and behavioral tendencies. Zsoka et al. [25] studied Hungarian students and found strong correlations between environmental knowledge, attitudes and sustainable consumption behavior. Their findings highlight the curriculum design and strengthen the role of schools in promoting pro-environmental behavior among students. Ballantyne, Connell and Fien [26] emphasized the intergenerational effect of environmental education, where students can often act as agents of change in providing environmental knowledge and attitudes their family units. This outcome places added importance on the communal impact of school-based environmental learning. Hsu's [27] work showed that direct experiences in the environment can significantly improve environmental attitudes and behavior, further justifying the inclusion of experiential earning opportunities during secondary schooling. Reviewing global research on ESD, Ardoin et al. [28] found that long-term behavioral change happens when educational program integrates participatory approaches, experiential activities and community engagement. Similarly, Malone [29] found that when children act as environmental researchers and community planners, their sense of action and sustainable behavior is built up. These regional and global studies constantly illustrate that environmental literacy is formed by a complex interaction of knowledge, attitudes, experiences, social influences and educational environments.

2.6. Research Gaps

Although a considerable amount of research has been conducted in regards to environmental literacy, pro-environment behavior and sustainability education at school level, there are still significant areas with respect to secondary education in Bangladesh that received little attention.

First, most studies have been focused on measuring students' environmental knowledge, attitudes or behavior one by one. These factors have been studied together only in few researchers in a unified framework. Consequently, little is known about the interrelationship between knowledge, attitudes and behavior among secondary school students.

Second, a number of international studies have emphasized the importance of schools (i.e., curricula and textbooks; teacher skill; extracurricular activity) in promoting environmental literacy. Nevertheless, there is a lack of research findings in Bangladesh concerning these school-level standardized factors. There is indeed a dearth of studies which explore the impact of curriculum content and pedagogical practices on students' environmental literacy and sustainable behavior in secondary schools, in particular.

Third, much of the body of literature in Bangladesh has been centered around environmental education at the tertiary level or general awareness about environment rather than being comprehensive enough to cover both secondary and higher secondary level. This is a crucial void since values and habits of behavior are increasingly being developed at the adolescent age.

Final, little is known about how students' environmental literacy and the school environment are associated when viewed from an integrated theoretical perspective. Research that integrates Environmental Literacy Theory, Behavioral Models and the Action Competence Approach to measure the efficiency of schools is virtually nonexistent.

These gaps justify the present study, which seeks to holistically examine students' environmental knowledge, attitudes and behavior. While also exploring the specific contributions of secondary schools in promoting environmental literacy and sustainable behavioral practices.

2.7. Research Question

1) What is the level of environmental knowledge among secondary school students?
2) What are the attitudes of secondary students toward environmental protection?
3) To what extent do secondary school students practice sustainable behavior in their daily lives?
4) How does the school contribute to promoting students' environmental literacy and sustainable behavior through textbooks, curriculum, teacher support and school activities?

3. Theoretical Perspectives

This study lies on three foundational theoretical perspectives: Environmental Literacy Theory, Behavioral Models of Pro-Environmental Action and the Action Competence Approach. These three along with provide a full framework for exploring the role of secondary education in enhancing environmental literacy and sustainable behavior in students. The theory of Environmental Literacy, represented by Roth [1]; and further developed by Hollweg et al. [4], was used as the basic foundation for defining and assessing students' environmental knowledge, attitudes and skills/behaviors. It fits the goal of the present study to assess the students' level of environmental literacy and to identify the school factors contributing to its development. Behavioral models include the model of responsible environmental behavior by Hinesnet al. [5], the Value-Belief-Norm theory by Stern, [7] and the Social Cognitive Theory by Bandura, [10]. All these provide valuable insights into the formation of environmental attitude and behavior. These frameworks clarify the psychosocial factors of sustainable behavior, putting an importance on personal norms, perceived control, self-efficiency and social influences. They support the interpretation of the relationship between attitudes and actual environmental practices of students. The action Competence Approach of Jensen and Schnack [13] briefs the school-based actions examined in this study. The emphasis herein is on empowerment, participation and critical thinking, focusing on how schools empower students not only to perceive but also to act meaningfully against environmental challenges. This theoretical position becomes highly relevant since, ultimately, environmental literacy needs to be translated into responsible behavior, a core concern of the present study.

4. Methodology of the Study

4.1 Research Design

This study adopts a quantitative research approach to analyze the environmental knowledge, attitudes and behaviors of secondary school students in the Chittagong region. The research aims to provide statistical evidence on how environmental education influences students' environmental literacy and sustainable behaviors.

4.2. Study Area

Data collection was done for a total sample size of 130 students from five secondary schools of grade 9 & 10 within the Chittagong region. The schools were randomly selected to ensure a diverse and representative sample from the secondary school students.

4.3. Sampling

The schools and students were selected randomly using the

stratified random sampling method. The five schools were randomly selected from the area and it represents a variety of the sample. Within schools, students were randomly sampled to achieve a representative sample of the secondary school population in the area. The environmental knowledge, attitudes and behavior questionnaires were applied to all students. This standard procedure was used to provide a uniform approach across the sample.

4.4. Data Collection Method

The data were collected using structured questionnaire and included the following categories:

1) *Knowledge on Environment:* A number of items of questions to assess students' knowledge of environmental issues such as pollution, climate change, and life demography;
2) *Environmental Attitudes:* Questions that are designed to capture how students feel about the environment, sustainability and the importance with regard to taking action in their local communities;
3) *Environmental Behaviors:* A group of questions about the practices linked to environmental knowledge, which included the students' sustainable habits, waste management and energy saving and their participation in the school public affairs in connection with environmental issues; and
4) *Roles of Secondary School Education:* These questions are designed to understand the school's role in fostering environmental literacy and promoting sustainable behaviors.

The survey was piloted on a few students to test its comparability and reliability.

4.5. Data Analysis Techniques

For data analysis, mean and standard deviation were calculated manually, and the results were presented in tabular form. As the study did not aim to differences between schools or classes, inferential statistics such as t-tests and ANOVA were not performed.

4.6. Data Organization

The data were classified into four subgroup levels:

1) Environmental Knowledge;
2) Environmental Attitudes;
3) Environmental Behaviors; and
4) The role of Secondary School Education.

The data were analyzed and organized as statistical charts in an effort to give a transparent account on students' environmental awareness, attitudes practices and the role of secondary education in promoting environmental literacy.

4.7. Descriptive Statistics

Descriptive statistical analyses were used to assess students' level of environmental literacy overall and in regard to the contribution secondary education was considering:

Mean (Average): The mean scores of environmental knowledges, attitudes, behaviors and the role of secondary education were calculating using AVERAGE function.

Standard Deviation: The STDEV.P function was used to quantify the scatter of students' responses in all four categories.

Distribution: The scores were put into bins or pre-defined ranges using the FREQUENCY function to help provide a visualization on how students responses distributed across each category.

4.8. Ethical Consideration

All participants were given detailed explanations of the aims of the study and reasons for the measurement. Responses was voluntary and answers were anonymous to students. The study adhered to ethical standards for research involving children.

5. Data Analysis and Interpretation

In this study, data were analyzed using descriptive statistical techniques, specifically the arithmetic mean (M) and standard deviation (SD), to examine students' levels of environmental knowledge, attitudes, sustainable behavior, and perceptions of the role of secondary school education. Responses were collected using a five-point Likert scale, where Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, and Strongly Disagree = 1. For each individual statement, the mean and standard deviation were calculated to determine the average level of agreement and the variability of responses among students. In order to provide clarity and readability for understanding the premier chapter, item-wise mean and standard deviation values have been provided in Appendix B. In this chapter, only overall mean and overall standard deviation for each part is provided to give a rough idea of students' response trend for each environmental sector. The mean score of each section was determined by taking the average of the mean scores of all the statements in the section. The standard deviation is generally utilized as an indicator of the amount of variation of students' responses. With this approach, it is possible to have a clear interpretation of general responses while ensuring transparency is maintained with the inclusion of results in the appendices.

5.1. Environmental Knowledge

Environmental Knowledge is referred to students' knowledge of environmental ideas, concerns, and sustainability practices.

Overall Mean of Environmental Knowledge:

Table 1. Overall Mean of Section One.

Statement	Mean
Pollution	4.35
Climate Change	4.06
Energy	3.90
Tree Importance	4.18
Sustainability	4.18

$$Overall\ Mean = \frac{4.35+4.06+3.90+4.18+4.18}{5} = \frac{20.67}{5} = 4.13$$

Overall Interpretation: Overall mean for Environmental Knowledge is 4.13, showing a great awareness of the environment among students. This shows that respondents demonstrate extensive knowledge about pollution, climate change, sources of energy, role played by trees, as well as using natural resources sustainably,

Environmental Knowledge Overall Standard Deviation:

Table 2. Overall SD of Section One.

Statement	Standard Deviation
Pollution	0.49
Climate Change	0.78
Energy	0.82
Tree Importance	0.62
Sustainability	0.65

$$Overall\ SD = \frac{0.49+0.78+0.82+0.62+0.65}{5} = 0.67$$

Overall Interpretation: The total standard deviation of 0.67 represents moderation consistency in students' environmental knowledge. This implies that although the school curriculum is effective in instilling a collective mentality, while more focused efforts may be required to normalize environmental knowledge and bridge the gap between "having the right attitude" and "taking consistent action."

5.2. Environmental Attitudes and Perceptions

Environmental attitudes encompass the beliefs, feelings, and values that students hold regarding environment protection and sustainability.

Environmental Attitudes and Perceptions Overall Mean:

Table 3. Overall Mean of Section Two.

Statement	Mean
Environmental Responsibility	4.62
Conservation & Economic Development	4.58
Environmental Knowledge & Life Values	4.55
Emotional Response to Environmental Harm	3.45
Willingness to Change	4.45
Sum of Means	21.65

$$Overall\ Mean: \frac{21.65}{5} = 4.33$$

Overall Mean Interpretation: An overall mean of 4.33 suggests that the students are average. They possess strong positive attitudes towards the environment. This means that a majority of students are likely positive beliefs, values, and attitudes to act on regarding protecting the environment, indicating a strong attitude of preparedness for sustainability.

Environmental Attitudes and Perceptions Overall Standard Deviation:

Table 4. Overall SD of Section Two.

Statement	Standard Deviation
Environmental Responsibility	0.50
Conservation & Economic Development	0.51
Environmental Knowledge & Life Values	0.49
Emotional Response to Environmental Harm	0.53
Willingness to Change	0.53
Sum of SD	2.56

$$Overall\ Standard\ Deviation: \frac{2.56}{5} = 0.51$$

Overall SD Interpretation: The small standard deviation (0.51) suggests that there is strong There is a high degree of agreement among students on environmental attitudes, with a minimum variation in their responses. This highlights that the students possess similar appreciative thoughts regarding towards environmental protection and sustainability.

5.3. Environmental Behaviors / Sustainable Practices

Environmental behaviors concern the actual practices and behaviors of students concerning environment protection and

sustainability.

Environmental Behaviors / Sustainable Practices Overall Mean:

Table 5. Overall Mean of Section Three.

Statement	Mean
Use of reusable items	2.47
Proper waste Disposal	3.25
Participation in environmental activities	3.28
Conservation of water & electricity	3.34
Encouraging family & friends	2.32
Community-level promotion	2.82
Sum of Means	17.48

$$Overall\ Mean = \frac{17.48}{6} = 2.91$$

Interpretation: The environmental practices within Section Three had a total mean of 2.91. This suggests a moderate or fair level of engagement among the respondents. Though because individuals are consciously aware of conservation, there is an important need to improve personal behavior and community influence.

Environmental Behaviours / Sustainable Practices Overall Standard Deviation:

Table 6. Overall SD of Section Three.

Statement	Standard Deviation
Use of reusable items	0.50
Proper waste Disposal	0.51
Participation in environmental activities	0.55
Conservation of water & electricity	0.52
Encouraging family & friends	0.48
Community-level promotion	0.60
Sum of SD	3.16

$$Overall\ SD = \frac{3.16}{6} = 0.53$$

Overall SD Interpretation: SD of 0.53 suggests that there is moderate variation in students' environmental behaviors, indicating that there are differences in the practices of behavioral orientations especially among students.

What it means: It demonstrates that the practices of students are not the same; there is a difference: variation in how people dispose of waste, conserve water resources, or promotes environmental awareness.

Consistency: Although the majority of students exhibit the same trend, the data is distributed. enough to show that commitment levels to the environment differ among individual students.

5.4. Role of Secondary School Education

In this section, the study explores the students' views regarding the role of secondary education within the context of promoting environmental literacy and awareness.

Role of Secondary School Education Overall Mean.

Table 7. Overall Mean of Section Four.

Statements	Mean
Environmental topics in textbooks	4.72
Real-life relevance of curriculum	4.73
Sufficiency of environmental information	4.78
School environmental activities	4.71
Administrative encouragement	4.78
Teaching with real-life examples	4.75
Total	28.47

$$Overall\ Mean = \frac{28.47}{6} = 4.75$$

Overall Mean Interpretation: A mean score of 4.75 is an index of a very strong role perceived in secondary school education in enhancing environmental literacy. Students appreciate the curriculum subject matter, approaches to instruction, and institutional relating to environmental education support.

Role of Secondary School Education Overall Standard Deviation.

Table 8. Overall SD of Section Four.

Statements	Standard Deviation
Environmental topics in textbooks	0.45
Real-life relevance of curriculum	0.44
Sufficiency of environmental information	0.41

Statements	Standard Deviation
School environmental activities	0.45
Administrative encouragement	0.42
Teaching with real-life examples	0.43
Total	2.60

$$Overall\ SD = \frac{2.60}{6} = 0.43$$

Overall SD Interpretation:

The overall Standard Deviation (SD) of 0.43 indicates a strong consensus and high level of agreement among the students. This low SD value means that students' opinions regarding the school's role in environmental literacy are very similar to one another. It shows that most students consistently agree that the environmental topics in textbooks, curriculum relevance, and school activities are effective. There is very little disagreement or "spread" in the data, suggesting the school's environmental education impact is perceived uniformly across the group.

Overall Mean & Standard Deviation of all Section.

Table 9. *Overall Mean & Standard Deviation of all Section.*

Component	Overall Mean	Overall Standard Deviation	Interpretation
Environmental Knowledge	4.13	0.67	High + moderate consistency
Environmental Attitudes	4.33	0.51	Very high + strong agreement
Sustainable Behavior	2.91	0.53	Moderate + some variability
Role of School	4.75	0.43	Very high + strong consensus

Results indicate the existence of variations in the levels of the respondents' environmental literacy in the various components. Environmental knowledge obtained the highest mean score of 4.13 with a SD of 0.67. This indicates that the entire group of respondents exhibits a good command of environmental knowledge. In fact, a moderate variability was indicated in the responses. Environmental attitudes scored a very high mean of 4.33 with a low SD of 0.51. However, when coming to sustainable behavior, there was a moderate score with a mean of 2.91, along with a deviation of 0.53, thereby denoting that students' actual performance regarding sustainable practices is moderately lower, despite their fairly consistent responses. The observed inconsistency between higher scores on sustainable practices and moderately lower behavior highlights a clear indication of a knowledge-practice gap. Moreover, the role of the school domain achieved the highest mean value (M = 4.75) with the lowest standard deviation (SD = 0.43), indicating a strong consensus among the respondents about the important mediating role of schools to ensure environmental literacy. This indicates that there is consensus about the supportive role of schools for environmental education with the best possible outcome in the form of students' sustainable behavior.

Nevertheless, although the students show high levels of awareness and attitudes towards the environment with relatively low variability, the moderate awareness of sustainable behavior indicates an important gap between levels of awareness and behavior.

5.5. Support for Research Questions

5.5.1. Research Question 1

RQ1: What is the level of environmental knowledge among secondary school students?

Support from Findings

The findings of the study provided strong support for this research question. The overall mean score for Environmental Knowledge was M = 4.13, with a standard deviation of SD = 0.67, indicating a high level of environmental knowledge among secondary school students. The mean score on these areas of knowledge related subjects is high. These include pollution, climate change, energy resources, the use of trees, and the sustainable use of natural resources. A majority of the students selected "Agree" or "Strongly Agree" for these questions. This indicates the conceptual comprehension of students with regards to these environmental matters. The moderate value of the standard deviation tells us that the results were relatively consistent, indicating that students' knowledge about the environment is relatively equal. It highlights the effectiveness of the secondary school curriculum in developing "students' environmental knowledge."

5.5.2. Research Question 2

RQ2: What are the attitudes of secondary school students toward environmental protection?

Support from Findings

This research question is highly justified from the findings of this research. The average score for Environmental Attitudes was M = 4.33, and a very low standard deviation was SD = 0.51, which shows a very positive attitude towards it. There was also overwhelming evidence that students felt a responsibility to protect the environment, understood the significance of conservation efforts in economic development, and realized the impact that knowledge of the environment had on values. High levels of readiness to change their lifestyle for the sake of the environment was also observed. Low standard deviation signifies that there is a high level of consensus among the respondents. The results confirm that secondary education has a major impact on students' Attitude and ideologies correlated to the environment.

5.5.3. Research Question 3

RQ3: To what extent do secondary school students practice sustainable behavior in their daily lives?

Support from Findings

The results partially support the research question. The total mean score For Environmental Behavior, M = 2.91 with a Standard Deviation SD = 0.53, suggesting a moderate degree of involvement in sustainable practices by students. Although students reported relatively better engagement in conserving water and electricity and participating in school-based environmental activities, lower mean scores were observed for practices such as using reusable items, encouraging family members, and promoting environmentally friendly behavior at the community level. The mean is accompanied by a considerable standard deviation, indicating noticeable variation in behavioral practices. This means that students do not practice on a uniform level in translating environmental awareness into daily actions. This is an explicit indication of the knowledge-practice gap.

5.5.4. Research Question 4

RQ4: How does the school contribute to promoting students' environmental literacy and sustainable behavior through textbooks, curriculum, teacher support and school activities?

5.6. Support from Findings

The results provide very strong support for this research question. The overall mean score for the Role of Secondary School Education was M = 4.75, with a very low standard deviation of SD = 0.43, indicating a highly positive perception and strong consensus among students. The students are in strong agreement that environmental issues discussed in textbooks are adequate, topics are relevant to everyday life, examples from everyday life are used, and school-arranged environmental activities are supported by school administrators. The standard deviation is low and indicates little variation in the results, implying that the students firmly believe that secondary institutions play a vital role in shaping the literacy level of the environment. However, despite the strong role being played by the institutions, the result shows that they are moderate in promoting behavioral change.

5.7. Overall Supporting Statement

Within this briefly, it is noted that students at the secondary school level are found to have a strong knowledge score regarding their environment (Mean = 4.13, SD = 0.67), and a significantly high attitude score (Mean = 4.33, SD = 0.51). The influence of secondary school education is found to be highly effective to gain environmental literacy outcomes (Mean = 4.75, SD = 0.43). The sustainability actions demonstrated by students were found to be moderate (Mean = 2.91, SD = 0.53). On the basis of these findings, there appears to be a need to move away from traditional learning and focus on learning by doing and becoming more action-oriented.

6. Findings and Analysis

The study shows that there are considerable gaps between what students know and how they behave for a range of environmental issues. The study's purpose is to assess the effectiveness of secondary education in developing environmental literacy, through an empirical investigation of students' knowledge on environmental issues and their level of involvement in sustainable practices as well as attitudes towards the protection of the environment. Results reveal both positive and negative aspects in the performance of environmental education with students and provided valuable indications towards further development. The Empirical Research: The evidence of students' environmental knowledge, attitudes, and behaviors the following are the major findings in empirical studies addressing students' environmental knowledge, attitudes and behaviors as well as aspects related to schools which contribute toward ELS. These results set the basis of the following discussion and offer a critical perspective on Environmental Education's present situation in this region. The main finding of the research data is the existence of the Knowledge-Attitude-Behavior Gap that prevails among the respondents, where the respondents have shown strong, optimistic, as well as moderate, outcomes. The discussion of this chapter focuses on the explanations of the determinants of such a Knowledge-Attitude-Behavior Gap.

The findings obtained from the questionnaire administered to 130 secondary school students. The results have been categorized depending on the main sectors of the questionnaire: Demographic Information, Environmental Knowledge, Environmental Attitudes & Perceptions, Environmental Behaviors, Role of Secondary School Education. Data are presented using frequencies, percentages, and diagrams, followed by descriptions in words.

Each item in the questionnaire items contains 5 points, using a scale of 1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree.

6.1. Demographic Characteristics of the Respondents

Consent to Participate

A hundred percent response rate was attained, as all the 130 respondents showed their willingness to take part in the survey. This assures voluntary participation and adherence to ethics.

1) *Grade Level of Respondents:* Out of 130 respondents**:** 50% students were from Grade 9, 65 and 50% students were from Grade 10.
2) *Gender of Respondents:* 73 students (56.2%) were female and 57 students (43.8%) were male.

6.2. Environmental Knowledge

This section assessed students' understanding of environmental concepts.

1) *Knowledge of Pollution:* A large majority of respondents selected Strongly Disagree: 0 (0%) Disagree: 0 (0%) Neutral: 1 (0.8%) Agree: 82 (63.1%) Strongly Agree: 47 (36.2%) regarding their ability to explain causes of air, water, and soil pollution. The majority of students demonstrated strong knowledge regarding pollution-related issues.
2) *Understanding of Global Warming & Climate Change:* Responses were concentrated in the higher agreement categories.

Students selected Strongly Disagree: 0 (0%) Disagree: 2 (1.5%) Neutral: 30 (23.1%) Agree: 56 (43.1%) Strongly Agree: 42 (32.3%). Most students showed a clear understanding of climate-related concepts.

3) Knowledge of Renewable and Non-renewable Energy:

Students selected Strongly Disagree: 0 (0%) Disagree: 4 (3.1%) Neutral: 39 (30.0%) Agree: 53 (40.8%) Strongly Agree: 34 (26.2%). Students generally possess good knowledge of energy sources, though some variation exists.

4) Role of Trees in Environmental Balance:

Students selected Strongly Disagree: 0 (0%) Disagree: 0 (0%) Neutral: 16 (12.3%) Agree: 75 (57.7%) Strongly Agree: 39 (30.0%). There is an awareness among the students about the need for trees.

5) *Sustainable Use of Natural Resources:* Students selected Strongly Disagree: 0 (0%) Disagree: 2 (1.5%) Neutral: 12 (9.2%) Agree: 76 (58.5%) Strongly Agree: 40 (30.8%). The great majority of students understand sustainable resource use.

6.3. Environmental Attitudes and Perceptions

This section examined students' beliefs and values about the conservation of environment.

1) *Environmental Protection as a Responsibility:* Students selected Strongly Disagree: 0 (0%) Disagree: 0 (0%) Neutral 1 (0.8%) Agree: 47 (36.2%) Strongly Agree: 82 (63.1%). A vast majority of the students think that protection of the environment is the responsibility of everyone.
2) *Environmental Conservation and Economic Development:* Students selected Strongly Disagree: 0 (0%) Disagree: 0 (0%) Neutral: 1 (0.8%) Agree: 52 (40.0%) Strongly Agree: 77 (59.2%). Strong agreement exists on the link between conservation and development.
3) *Environmental Knowledge and Life Values:* Students selected Strongly Disagree: 0 (0%) Disagree: 0 (0%) Neutral: 0 (0%) Agree: 58 (44.6%) Strongly Agree: 72 (55.4%). All students agreed that the knowledge of the environment affects their value system.
4) *Emotional Responses to Environmental Harm:* Students selected Strongly Disagree: 0 (0%) Disagree: 1 (0.8%) Neutral: 71 (54.6%) Agree: 57 (43.8%) Strongly Agree: 1 (0.8%). Concern for damage to the environment has been shown to be emotionally expressed by many students.
5) *Willingness to Change Lifestyle:* Students selected Strongly Disagree: 0 (0%) Disagree: 0 (0%) Neutral: 2 (1.5%) Agree: 68 (52.3%) Strongly Agree: 60 (46.2%). There is a strong intention amongst students to lead an eco-friendly lifestyle.

6.4. Environmental Behaviors / Sustainable Practices

This section captured data on students' real environmental behavior.

1) *Use of Reusable Items:*

Students selected Strongly Disagree: 0 (0%) Disagree: 69 (53.1%) Neutral: 61 (46.9%) Agree: 0 (0% Strongly Agree: 0 (0%). The use of reusable items does exist, though consistency levels are very poor.

2) *Proper Waste Disposal:* Students selected Strongly Disagree: 0 (0%) Disagree: 5 (3.8%) Neutral: 87 (66.9%) Agree: 38 (29.2%) Strongly Agree: 0 (0%). Students display moderate interest in practicing appropriate garbage disposal.
3) *Participation in Environmental Activities:* Students selected Strongly Disagree: 0 (0%) Disagree: 6 (4.6%) Neutral: 81 (62.3%) Agree: 43 (33.1%) Strongly Agree: 0 (0%). Participation is present but not consistent among students.
4) *Conservation of Water and Electricity:* Students selected Strongly Disagree: 0 (0%) Disagree: 3 (2.3%) Neutral: 80 (61.5%) Agree: 47 (36.2%) Strongly Agree: 0 (0%). Students are commonsense enough to save resources.
5) *Encouraging Family and Friends:* Students Selected Strongly Disagree: 1 (0.8%) Disagree: 87 (66.9%) Neutral: 42 (32.3%) Agree: 0 (0%) Strongly Agree: 0 (0%). The encouragement of others is also present but minimal.
6) *Promoting Environmentally Friendly Behavior in the Community:* Students selected Strongly Disagree: 0 (0%)

Disagree: 38 (29.2%) Neutral: 78 (60.0%) Agree: 14 (10.8%) Strongly Agree: 0 (0%). Community-level promotion: Moderately promoted.

6.5. Role of Secondary School Education

This section has dealt with the role of secondary schooling in advancing environmental literacy.

1) *Environmental Topics in Textbooks are sufficient:* Students selected Strongly Disagree: 0 (0%) Disagree: 0 (0%) Neutral: 0 (0%) Agree: 36 (27.7%) Strongly Agree: 94 (72.3%). The findings clearly reveal a high level of consensus amongst students regarding their textbooks adequately cover environmental and sustainable living issues.
2) *Real-Life Relevance of Environmental Topics in Curriculum:* Students selected Strongly Disagree: 0 (0%) Disagree: 0 (0%) Neutral: 0 (0%) Agree: 35 (26.9%) Strongly Agree: 95 (73.1%). A vast majority of students felt that classes on the environment were very applicable to real life.
3) *Sufficiency of Environmental Information on Textbooks:* Students selected Strongly Disagree: 0 (0%) Disagree: 0 (0%) Neutral: 0 (0%) Agree: 28 (21.5%) Strongly Agree: 102 (78.5%). Students expressed high satisfaction with the depth of environmental content.
4) *School Environmental Activities Held:* Student selected Strongly Disagree: 0 (0%) Disagree: 0 (0%) Neutral: 0 (0%) Agree: 37 (28.5%) Strongly Agree: 93 (71.5%). This reflects strong institutional commitment to sustainability beyond classroom instruction.
5) *Administrative Encouragement:* Students selected Strongly Disagree: 0 (0%) Disagree: 0 (0%) Neutral: 0 (0%) Agree: 29 (22.3%) Strongly Agree: 101 (77.7%). Students overwhelmingly acknowledged administrative support for environmental action.
6) *Teaching with Real-Life Examples:* Students selected Strongly Disagree: 0 (0%) Disagree: 0 (0%) Neutral: 0 (0%) Agree: 33 (25.4%) Strongly Agree: 97 (74.6%). The data indicate highly effective teaching practices.

7. Interpretation of Results

This section discusses in detail the quantitative findings of the study through the examination of each domain of environmental literacy with respect to mean scores and standard deviations, keeping a glance over their implications in environmental education among secondary school students.

7.1. Environment Knowledge: High Level of Comprehension with Varying Depth

The overall mean score for Environmental Knowledge was M = 4.13 (SD = 0.67). Notably, this is a very positive reaction, as it is placed between “Agree” and “Strongly Agree” on the 5-point scale, which means that on average, students' understanding of Environmental concepts is very good. Furthermore, it seems that the curriculum is very successful in transmitting concepts associated with pollution, climate change and sustainability. In any event, it should also be noted that the standard deviation, at 0.67, indicates that there is quite a bit of variation among the students. To elaborate further, it should be noted that understanding of pollution concepts was very high and homogenous (M = 4.35, SD = 0.49), while understanding of energy concepts was somewhat low and heterogeneous (M = 3.90, SD = 0.82). Such a gap indicates that even as the educational foundation has been established with strength, its efficacy has remained patchy with subjects, leading to some gaps in understanding in particular areas.

7.2. Environmental Attitudes: Extremely Positive but Intellectually Motivated

The students were found to have strongly positive attitudes towards the environment, with a mean of M = 4.33 (SD = 0.51). The fact that this was a strong near-consensus, being very close to the boundary of "Strongly Agree," and the correspondingly small standard deviation, is a major achievement of the existing education system. A telling analytical clue can, however, be provided by the sub-domain assessing the involvement of the emotional reaction towards any kind of environmental damage, where the result was slightly lower, M = 3.45, SD = 0.53. This suggests that students’ pro-environmental attitudes are primarily cognitive. The students mentally believe in conservation, but emotionally, their concern about the environment is not so direct. This is a critical factor, as often people feel about an issue in ways that precede actions based on mental beliefs.

7.3. Sustainable Behaviors: The Defining Gap Between Knowing and Doing

The most important result, however, is the large gap between awareness and action. The average sustainable behaviors score was M = 2.91 (SD = 0.53), which reflects a moderate level of agreement, falling between "Neutral" and "Agree." This is starkly contrasted with the high knowledge (M=4.13) and attitudes (M=4.33) scores, representing a significant gap of 1.22 points for knowledge and a very large gap of 1.42 points for attitudes. Both are significant gaps in a pedagogical setting. The behaviors, too, were not equally moderate. A definite level of difficulty was related to a definite level of performance. The easy, personal behaviors (conserving water, electricity) were the highest (M=3.34), while the behaviors representing habit modification (reusing items, M=2.47) or interpersonal performance (urging others, M=2.32) were significantly lower. However, the standard deviation of 0.53 indicates this was not a standard experience but one with a large degree of individual variation. The interpretation is that the educational model is highly capable of developing concerned

citizens but not nearly so skilled at developing loyal practitioners or loyal community advocates.

7.4. Perceived Role of School: A Paradox of Excellence

The impact of the students' perception of the role of the school in promoting environmentally literate individuals was almost exemplary, with a mean score of M = 4.75 (SD = 0.43). This is the highest score in all areas. This very small standard deviation means virtually unanimous agreement that textbooks, relevance, teaching practice, and administration support are all very effective. However, it also creates a paradox in that it finds that despite there being an outstanding perception of support from these the positive tendencies in the students' sustainable behavior remain only moderate. The implication of this paradox is extremely important. It implies that schools are extremely effective in the transmission and support of environmental values (inputs) but are less successful in enabling the experiential application as well as habituated integration of these values with everyday experience (outcomes). There is a disconnect between the quality of instruction and the opportunity for empowered actionable learning.

8. Comparison with Existing Literature

The findings of this study strongly support existing international research on environmental literacy, while also highlighting some context-specific issues relevant to Bangladesh.

8.1. The Persistent Knowledge-Attitude-Behavior Gap

One of the key findings of this study is the clear gap between students' high environmental knowledge (M = 4.13) and positive environmental attitudes (M = 4.33), compared to their moderate level of sustainable behavior (M = 2.91). These results are consistent with earlier research in environmental education. For instance, Hines, Hungerford, & Tomera [5] postulated that a knowledge factor alone cannot be used as a prediction criterion of environmentally responsible action. In a similar manner, a "value-action gap" has been depicted by Koll muss, Agyeman, [8] as a problem whereby, although people, such as university students, possess positive values, still, because of external factors like infrastructure, socialization, habit, among others, those people cannot have positive actions.

8.2. Consistency with Behavioral Theories

The high values on attitudes are consistent with Stern's (2000) Value-Belief-Norm Theory, where people are said to form personal norms to save the environment as a result of high values towards the environment. But the moderate values on behaviors indicate that although high values and personal beliefs are experienced, the values are not entirely converted to behaviors, and this might occur when there are low levels of self-efficacy and perceived control, important factors in Social Cognitive Theory by Bandura (1986). Additionally, the very low value on persuasion of family and friends (M=2.32) gives evidence that students do not perceive high levels of influence on environmental actions among others.

8.3. Differences Between Private and Public Behavior

As suggested above, there the results also demonstrate a trend discussed in some literature studies, whereby there is a higher level of involvement in private sphere activities, such as saving water and electricity (M = 3.34), compared to public sphere activities, such as community involvement or protecting the environment (M = 2.82). This accedes to Stern's (2000) theory, which classifies involvement in conservation activities, asserting that private sphere activities have fewer social and structural obstacles involved.

8.4. The Role of Schools: High Support, Limited Behavioral Impact

Despite the students' positive perception of support in the schools regarding the implementation of environmental education (M = 4.75), this support has not improved much in terms of the students' sustainable behavior. This inconsistency has been noted in previous research concerning the implementation of the Eco-School scheme [15, 16]. These results indicate the effectiveness of the schools in facilitating students' knowledge regarding the environment, while the effectiveness in developing students' action competence is limited. The persistence in textbook learning and conventional teaching practices adheres to the traditional model instead of the participatory model as envisioned by Jensen & Schnack [13].

8.5. Contextual Relevance: Bangladesh

These results contribute to the literature of regional studies from developing countries that highlight the gap presented in this study. Even though there are studies that highlight the importance of experiential learning (Ardoin et al., 2013), there are further challenges in Bangladesh, especially in Chittagong, compared to other countries due to resource constraints. For instance, students are taught to recycle at school. However, in some places within the city of Chittagong, recycling may not be possible because the recycling facilities may not be available. Therefore, students may not be able to implement the recycling lesson at school. Similarly, students are also encouraged to reduce the use of plastics. However, the classroom lesson may not be applicable because effective alternatives may not be available.

8.6. Bridging the Gap through Action-Oriented Education

In conclusion, this study confirms international findings that environmental literacy is a multi-dimensional concept that cannot be attained exclusively by cognitive learning processes. Its results emphasize once again the importance of action-based learning approaches, such as the Action Competence Approach, and point out that without reform and development within educational institutions, a connection cannot be made between knowledge and practice for a sustainable future.

9. Discussion of Implications of the Study

The results of this study indicate the existence of a Knowledge-Attitude-Behavior gap in the provision of environmental education for secondary school students. Although the current strategies work effectively to increase students' knowledge and attitudes towards the environment, they are not very effective in bringing about sustainable behaviors. To fill this gap, curricula for environmental education should have more experiential and practice-focused components like gardening, waste segregation, recycling, saving water, and tree-planting. Environmental actions can also be incorporated into the daily routine of the school through conserving energy, cleaning programs, and the formation of environment clubs by the students themselves. Also, teacher education programs should focus on action-oriented teaching methods since teachers themselves act as a model for sustainable behavior and are supposed to lead students to behavioral change. Besides, there exist contextual and structural challenges while intervening in rural areas: a lack of appropriate waste management facilities, as well as ecological alternatives. In this light, it is generally expected that there is a higher placement of emphasis on behavioral outcomes from environmental education policies. The inclusion of mechanisms for monitoring and evaluating environmental behavior among students, coupled with knowledge and attitudes, in a more holistic manner, can indeed narrow the gap between awareness and practice. This requires not only curriculum reform but also teacher development, community involvement, and supportive infrastructure in order to increase the scope for sustainable practices among students in secondary schools.

Summary of Key Findings:

The study results contribute to several significant outcomes. These are as follows:

First, is that secondary school students have a high level of environmental knowledge. For the majority of students, important environmental topics such as pollution, climate change, types of energy sources, how trees help the Earth and environmentally sustainable consumption were well understood. This suggests that environmental content embedded in the secondary education curriculum is contributing effectively to raise students' cognitive awareness of the environment. Second, it is revealed that environmental attitudes of the students are strongly positive. Agreement was high on environmental responsibility, conservation and a preparedness to adopt eco-friendly lifestyles and how environmental knowledge impacts personal values. This demonstrates the importance of secondary school education in influencing students' environmental values and beliefs. Third, results of the research showed that environmental behavior scores of the students were moderate when compared to their knowledge and attitudes. Although some positive behavior reported by students included behaviors about saving water and energy and participation in environmental activities, percentile rankings were low for the use of reusable items, encouraging others to recycle or dispose of waste appropriately, and community level action towards environment. This indicates the presence of a knowledge-attitude-behavior gap. Finally, the research demonstrated that secondary education has a very strong and positive influence on environmental literacy. The proportion of students who believed the following factors were adequate is so high: environmental content in textbooks; relevance of curriculum content to everyday life, teaching methods, administrative and school informal encouragement, and school-based activities on environment. These results provide support to secondary schools as ideal places for environmental and sustainability education. Although a positive attitude about the environment was shown by the students, a less strong connection with emotions related to the environment has been indicated. Conclusion of the research reveals that though the secondary school curriculum is effective in the provision of environmental knowledge, however, a certain Knowledge-Attitude-Behavior Gap exists amongst the students. Hence, future educational policies would require more emphasis on environmental activities to bridge the gap.

10. Conclusion

The objective of this study was to examine the role of secondary school education in shaping students' environmental literacy in terms of knowledge, attitude and action. From the results, it is clear that the students have a good awareness of the environmental challenges and learn to value the need to protect the environment, their actual behavior may not necessarily be compatible with the above understanding and consciousness. The gap existing between awareness of environment and commitment is a challenge to holistic, action-oriented environmental education. For the purpose of completion, a summary of major findings, implications for education practice and policy, and contributions to the field are provided. It also concludes with suggested directions for future research to enhance the efficacy of environmental education within young people's attitude and behavior towards sustainability. These introductions should ground the sections that follow in a larger context and integrate the results with other discussions and

conclusions. This study proposes that secondary education could influence environmental literacy in a positive way by increasing knowledge and attitude towards the subject. But to instill behavioral changes towards the environment and to raise conscious and sustainable citizens in the process, action-oriented and participatory approaches must be adopted.

10.1. Contributions to the Field

Environmental education and sustainability studies: a farewell note this study has some significant contributions to the field of environmental education as well as sustainability. First, there is an empirical contribution from evidence generated by the Bangladeshi secondary school context, which we argue remains under-represented in environmental literacy research. An important gap highlighted in the previous literature was addressed in this study, which is explained by the integration of environmental knowledge, attitudes and behaviors within a single model. Second, the research adds theoretically by integrating Environmental Literacy Theory, Behavioral Models of Pro-Environmental Action and the Action Competence Approach. The combined theoretical application advanced understanding of the processes through which EE affects not just awareness and attitudes but also behaviors in adolescents. In the third place, results have a practical contribution by showing that both as regards contents and didactic of curriculum is effective for crucial in terms of promoting sustainable behavior at second level education, and limitations experienced in 'top down' based know- ledge approaches. This has implications for educators, curriculum developers and policy-makers interested in increasing the effectiveness of environmental education.

10.2. Recommendations for Future Research

There are also some suggestions for future research according to the results and limitations of this study. First, mixed-methods or qualitative research (e.g., via interviews or focus group discussions) could be used in future studies to obtain a more in-depth understanding of students' motivations, barriers and lived environmental experiences. Second, longitudinal study design is proposed to test whether the environmental knowledge and attitudes acquired during secondary education have an impact on students' behavior over time. Third, it would be interesting for future work to consider the contribution of experiential and community-based environmental programs (Eco-Schools projects, outdoor learning, service-learning programs) to enhancing students' action competence and sustainable behavior. Lastly, comparative investigation within regions or across different types of schools and other educational settings might offer a wider picture on the implementation effectiveness of EEP in Bangladesh and countries with similar educational systems.

Abbreviations

M	Mean
SD	Standard Deviation
ELS	Essential Letters and Sounds

Author Contributions

Golam Mohiuddin: Conceptualization, Data curation, Methodology, Project administration, Software, Validation, Writing – original draft, Writing – review & editing

Kazal Baran Nath: Conceptualization, Data curation, Methodology, Project administration, Validation

Jukta Chakma: Conceptualization, Data curation, Investigation, Resources, Validation

Conflicts of Interest

The authors declare no conflicts of interest.

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