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A Survey of the Role of Environmental Education in Biodiversity Conservation in the Greater Accra Region of Ghana

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Abstract: Biodiversity in all its forms has come under threat. The rate of biodiversity loss has attracted global attention, and most governments are trying to put measures into place to reduce the rate of loss. One way to ensure that people are conscious of biodiversity conservation is through education. However, studies on creating awareness for biodiversity conservation have received less attention in the literature. To address this knowledge gap, this study used questionnaires to investigate the role of education in biodiversity conservation in the Greater Accra Region of Ghana. The study found that environmental education, particularly an awareness of biodiversity conservation, is critical for conserving biodiversity. However, people's knowledge of biodiversity conservation is too weak or inadequate to motivate them to incorporate biodiversity conservation practices into their daily activities. Furthermore, understanding the importance of biodiversity conservation comes with an increase in age. Increasing education on biodiversity conservation at an early age can help people become more aware of biodiversity conservation as they age, and they can incorporate it into their daily activities to reduce biodiversity loss. The study calls for a revision of the environmental education syllabus at various levels, particularly the basic and SHS levels, including more practical topics to help people change their attitudes and perceptions and incorporate biodiversity into their daily activities.

Keywords: biodiversity conservation; anthropogenic activities; environmental education; livelihoods; resources

1. Introduction

Biodiversity is said to be the variety of lifeforms at different levels across different spaces and times. It includes the diversity of species, genetics, and ecosystems, and these varieties are found within the aquatic, terrestrial, and marine ecosystems [1–4]. Human survival depends on biodiversity for various needs in life [3,5]. This ranges from agrobiodiversity, which provides food for mankind, to ecosystem diversity, which sustains all life forms. Other services that biodiversity provides to man include maintenance of the nutrient cycle, flood controls, maintaining the hydrological cycle, and climate regulation [5,6]. To maintain the various forms of biodiversity, including species and genetic diversities, conservation practices are key.

It has been estimated that about 68% of biodiversity has been lost over the last five decades, and about one million plants and animal species are threatened with extinction as a result of anthropogenic activities [7,8]. Such activities are on the rise, and if efforts to reduce biodiversity loss are not intensified, it could have implications for the survival of living organisms. People's knowledge and perception of biodiversity can have implications on their ability to conserve or facilitate its loss. The actions and inactions of humans could result in the depletion of natural resources, destruction of natural habitats, environmental pollution, and climate change, among other consequences. Some authors posit that human activities can destroy the quality of the environment and natural ecosystems [9].

Environmental education is a process that allows individuals to explore environmental issues, engage in problem solving, and take action to improve the environment. Humans come into direct contact with biodiversity, and a better understanding of the importance of biodiversity and what threatens the diversity of biological resources is necessary to increase public awareness and consciousness and help them engage in local biodiversity conservation issues [9,10]. Studies have found that implementing environmental education can increase knowledge of this subject and change the attitudes of people towards biodiversity conservation [10]. Studies from China have also revealed that people's educational level has positive effects on attitudes toward conservation, and those with higher education have a broader understanding of the importance of conservation [1,5]. People's knowledge about biodiversity can influence their perceptions about biodiversity conservation and guide their daily practices. It has been reported that biodiversity conservation receives the least attention, and overexploitation and socio-economic conditions of people also undermine conservation initiatives [2,11]. As the population continues to increase, the pressure on various forms of biodiversity also increases, which has implications for biodiversity loss. Environmental resources that are threatened, such as water, air, and soil, among others, could be managed through education [1,6]. Creating awareness of biodiversity conservation can help people to better understand the effects of consumption patterns on biodiversity loss and engage in sustainable practices. Biodiversity loss has become a critical issue for many countries, and educating people on biodiversity is crucial as it could help construct attitudes and behavior towards conservation [10].

Education is highly regarded as critical for promoting sustainable development and improving people's attitudes and behavior towards issues of development and the environment [6,10]. Despite the crucial role education plays in perceptions and attitudes towards biodiversity conservation, few studies have looked into this. Even though environmental education issues have been in existence since the 19th century, including addressing issues such as nature conservation, behavioral changes, and fighting pollution, among others, it appears that little has been accomplished in the way of education on biodiversity conservation [1,6]. To address this knowledge gap, this study seeks to explore public knowledge of biodiversity and its implication for conservation issues. This can help direct policies and strategies toward biodiversity conservation.

2. Materials and Methods

2.1. Study Area

The Greater Accra Region is the capital city of Ghana and the most populated area in the country. It is bounded to the north by the Eastern Region, the Volta Region to the east, the Central Region to the west, and the Gulf of Guinea to the south. It is a low-lying area and harbors diverse biodiversity resources, including wetlands, forests, zoo, and agrobiodiversity. These biodiversity resources are threatened as a result of increased population growth with pressure on land use [12]. Most wetlands have been turned into wastelands and have become refuse dumps and cannot support living organisms. Forest resources are also becoming degraded, and their resources are exploited. Most communities in the area suffer from water shortages [13], which could be attributed to the disappearing wetland resources in the area. The study area is shown in Figure 1.



Figure 1. Map of the study area.

2.2. Profile of Respondents

Most respondents (106) had a tertiary education, which indicates that they had at least acquired some basic knowledge of environmental education in general. Environmental education is incorporated into the curriculum of basic schools. Most respondents were male (71), whereas the majority of respondents fell within the age of 18–24 (81) followed by 25–34 (24), indicating that most of the respondents were still schooling. This is shown in Table 1.

Table 1. Profile of respondents.

Item	Percentage
Highest educational level	
Tertiary	88
Senior High School	8
Junior High School	4
Age	
18–24	68
25–34	20
35–44	6
45–54	4
55 and above	2
Sex	
Female	41
Male	59

2.3. Methods

A questionnaire was designed using Google forms and sent to contacts to fill out using a link. These contacts were selected, and the link was sent to them. The contact numbers of people who were 18 years and above were written down and randomly selected. The questionnaire was shared with 400 people residing within the Greater Accra Region of Ghana. This was carried out within a space of two months, from September to October 2020, when COVID-19 restrictions were in place, and a total of 120 people were able to fill out the questionnaire. The consent of members was sought before they were asked to fill out the questionnaire and they were also informed that they could opt out at any time they felt they could not continue to respond. The fact that their responses would be used purely for academic purposes was also made clear to them. The questionnaire was undertaken online, via Google Forms, and shared with contacts on WhatsApp. Many authors have resorted to the use of Google Forms to collect views of respondents for research, especially during the COVID-19 period [14]. The content of the questionnaire was divided into three sections: (a) educational history, (b) personal perception of biodiversity and conservation, and (c) effects of biodiversity loss and conservation practices on the individual. Nine different items using a five-point Likert scale were used to solicit the views of respondents with 1 as strongly disagree, 2 as disagree, 3 as neutral, 4 as agree, and 5 as strongly agree. The Google link was attached to an Excel sheet, which was converted to Statistical Package for Social Science (SPSS) and used to analyze the data. This was analyzed using ordinal regression to predict the effects of education on biodiversity conservation. The age, sex, and educational status of respondents were used as independent variables to predict the awareness, perceptions, and effects of biodiversity conservation.

3. Results

3.1. Awareness of the Importance of Biodiversity Conservation

The majority of respondents were aware of the importance of biodiversity conservation as most of them agreed with the statement (46%), followed by those who strongly agreed with the statement (32%), with a mean of 4.025 (see Table 2). This was further analyzed using age, sex, and highest educational level of respondents using ordinal regression, and the results indicate that age is statistically significant ($p = 0.000$) and that those who are within the age groups (18–24, 23–34, and 35–44) have increased odds (21.970, 21.985, 22.073, respectively) of becoming more aware of the importance of biodiversity conservation, with Nagelkerke R^2 (0.15) explaining 15% of the variance. When people increase in age, they are likely to become aware of the importance of biodiversity conservation. Those with a higher educational level had increased odds of becoming aware of biodiversity conservation, and those in SHS had increased odds (1.362) of becoming more aware of the importance of biodiversity conservation compared to those at the tertiary level (1.270); however, this was not statistically significant.

3.2. Incorporating Biodiversity Conservation into Daily Activities

On average, respondents were neutral about the notion that they incorporate biodiversity conservation issues into their daily activities (see Table 2). This implies that although the majority of the respondents had been through or were in tertiary institutions, some of them were not sure whether they include biodiversity conservation in their daily lives. This could also mean that their knowledge of biodiversity conservation was weak or inadequate. The relationship was further tested using ordinal regression, and the results indicate that those with a senior high school education have increased odds of 1.192 of incorporating biodiversity conservation issues into their daily activities compared to those with tertiary education (1.153), even though this relationship was not statistically significant. Those who are in senior high school have the chance to acquire more education regarding biodiversity conservation and incorporate it into their daily lives. This indicates that being knowledgeable about biodiversity conservation alone is not enough to bring about conservation. Respondents also disagreed that the government is educating people

on biodiversity conservation and believed that if education on biodiversity conservation is not intensified, it could reduce the quality of living (see Table 2).

Table 2. Perception of biodiversity, importance, and effects on livelihoods.

Item	Mean	Standard Deviation
I am aware of the importance of biodiversity conservation	4.024	0.893
I incorporate biodiversity conservation into my daily life	3.417	0.740
The government is educating the people on biodiversity loss and conservation	2.600	0.965
Conservation practices slow down development	2.200	0.931
Loss of biodiversity has negative effects on my livelihood	3.708	0.934
Loss of biodiversity has positive effects on my livelihood	2.300	1.042
Effects of biodiversity loss affect the poor more than the rich	3.175	1.018
Biodiversity loss has directly affected my income	2.858	0.759
If biodiversity conservation is not intensified, the quality of living could be reduced	4.100	0.864

3.3. Effects of Biodiversity on People's Livelihoods

Most respondents believed that biodiversity loss had negative effects on their livelihoods (66%) but did not agree that biodiversity loss directly affects their income and were neutral in answering whether biodiversity loss mostly affects the poor (see Table 1). As most of them were students, they were yet able to understand the effects of biodiversity loss on various aspects of their livelihoods. This was further tested using ordinal regression with respondents' profiles (age, sex, and educational level). The results indicate that those in SHS have increased odds of 2.456 of experiencing the negative effects of biodiversity loss on their livelihoods compared to those with tertiary education (1.687), but this was not statistically significant. Furthermore, those aged 54 years and above had increased odds (1.418) of experiencing the negative effects of biodiversity loss on their livelihoods, even though this is not significant.

The awareness of respondents of general issues in biodiversity is shown in Table 3, where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. Responses varied based on respondents' perceptions of the issues. For instance, most of them (64) felt neutral about the direct effects of biodiversity on their income. Others respondents agreed that they experience negative effects of biodiversity loss (58), and (53) believed that conservation practices can slow down development. Most respondents were concerned that if biodiversity conservation is not intensified, it could reduce the quality of living, although the Cronbach's alpha coefficient was 0.44, indicating weak reliability.

Table 3. Frequencies of responses on 9 Likert Scale items.

Items	Frequency of Response				
	1	2	3	4	5
I am aware of the importance of biodiversity conservation	3	2	22	55	38
I incorporate biodiversity conservation into my daily activities	1	12	46	58	3
The government is educating the people on biodiversity loss	13	48	35	22	2
Conservation practices slow down development	28	53	27	11	1
Loss of biodiversity has negative effects on my livelihood	1	15	24	58	22
Loss of biodiversity has positive effects on my livelihood	29	48	22	20	1
Effects of biodiversity loss affect the poor more than the rich	8	23	35	48	6
Biodiversity loss has directly affected my income	4	31	64	20	1
If biodiversity conservation is not intensified, the quality of living could be reduced	0	5	24	45	46

4. Discussion

Biodiversity conservation is an issue that requires greater attention. All forms of life depend on biodiversity, and human beings, who are at the center of operations, should have a broader understanding of how biodiversity conservation issues apply to them in

their daily lives. When people are aware of the importance of biodiversity conservation, they can include conservation issues in their daily routines and help reduce the loss of biodiversity. Even though this study found that most people are aware of the importance of biodiversity conservation, they are not so sure whether they apply it in their daily activities.

Thus, this raises questions such as: how knowledgeable is the public on biodiversity conservation issues? Although most of these respondents were in tertiary and SHS institutions and may have been exposed to some form of environmental education, the level of exposure to biodiversity conservation issues may not be adequate to help them understand the link between their activities and biodiversity [1,2]. It is important to incorporate such topics into the educational curricula since most of the respondents learned about biodiversity issues during their senior high school education. Furthermore, their inability to incorporate biodiversity conservation into their daily routine also suggests that being aware of biodiversity does not necessarily correspond to practicing such conservation. Studies have found that when people are aware of biodiversity conservation, they can practice it [1–3,10]. Others also believe that including environmental topics and ecological principles in the curriculum can increase students' awareness and have positive effects on their attitudes, behaviors, and values regarding conservation [3,5–11]. However, applying one's knowledge in daily activities may require deliberate effort in educating people on the need to incorporate biodiversity conservation into their daily activities. People need to understand the effects of their consumption patterns on biodiversity conservation. The attitudes and behavior of people towards biodiversity should be an added focus for educational programs.

The perception of people about biodiversity's effects on their lives could help them to conserve these resources. Most of the respondents believed that biodiversity loss has negative effects on their livelihoods; however, it does not directly affect their income. This strengthened respondents' neutrality on the application of biodiversity conservation in their lives. Biodiversity includes food that supports people's livelihoods. Biodiversity conservation has been linked to supporting food production and reducing poverty [8]. Living a healthy lifestyle has implications for biodiversity conservation and income as well. Medicines are also products of biodiversity, and eating good food as well as buying medicine to treat illness have impacts on people's income. When there is a shortage of food, due to poor climatic conditions, food prices are likely to rise. When people practice home gardening, rear their animals in their homes, and participate in home aquaculture, they will not only be cutting down on their expenditure on agro-biodiversity but will be contributing to biodiversity conservation as well. Such awareness should be created and included in the educational curriculum to reduce biodiversity loss and enhance the quality of lifestyles. In progressing the attainment of the SDGs, people's footprints should be considered. Educating people on such issues is the first step in helping them become humanly empowered and progress the sustainable development agenda.

To conserve biodiversity, people have to engage in it [8] and make it part of their lives. People's decision to engage in biodiversity conservation and make it a daily habit could be influenced by the understanding of the benefits associated with biodiversity. The fact that respondents believed that the quality of life could be reduced if awareness of biodiversity conservation is not intensified suggests that they understand the benefits associated with biodiversity, yet incorporating it into their daily activities was not a strong option. The study found that those with an SHS education have increased odds of becoming more aware of the importance of biodiversity conservation. Furthermore, there was no statistically significant difference in those with SHS and tertiary education, which could suggest that biodiversity education at the basic level could be intensified. Increasing the education and awareness of biodiversity at the basic and SHS levels can strengthen these populations' knowledge about biodiversity and motivate them to incorporate it into their daily activities.

5. Conclusions

The study found that environmental education, particularly awareness of biodiversity conservation, is critical for conserving biodiversity. However, people's knowledge of biodiversity conservation is too weak or inadequate to motivate them to incorporate biodiversity conservation practices into their daily activities. Those in SHS are more likely to experience the negative effects of biodiversity conservation than those with tertiary education, and older people are more likely to experience the negative effects of biodiversity loss than the youth. Furthermore, understanding the importance of biodiversity conservation comes with an increase in age. Increasing education on biodiversity conservation at an early age can help people become more aware of biodiversity conservation as they age so they can incorporate it into their daily activities to reduce the effects of biodiversity loss on their livelihoods. Moreover, those in SHS are more likely to incorporate biodiversity conservation practices into their daily lives, which emphasizes the need to enhance the education on biodiversity at basic and senior high schools. The study calls for a revision of the environmental education syllabus at various levels, particularly the basic and SHS levels, that includes more practical topics to help people change their attitudes and perceptions and incorporate biodiversity into their daily activities. Since biodiversity conservation is a collective responsibility, it is recommended that private and public institutions collaborate in revising the curricula to incorporate topics that can have a better impact on biodiversity conservation. The study was conducted during the COVID-19 restrictions period, and the method employed in the study had limitations. Further studies can explore different methods. Other studies can also explore mixed methods to obtain an in-depth understanding of respondents' views on the subject.

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