Undergraduate University Students' Knowledge, Attitude and Behavior towards Biodiversity

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Abstract

The purpose of this study was to assess biodiversity literacy, which includes the dimensions of biodiversity knowledge, attitudes, and behavior among Hawassa University undergraduate university students. The descriptive research method was used for the study. Results show that a majority of the students were unable to recognize fundamental concepts of biodiversity, which in turn may challenge sustainable biodiversity conservation in Ethiopia. In basic biodiversity tests, biology majors scored slightly higher than geography (mean score of 61 to 53 and standard deviation 10.7 to 9.01 respectively). In addition, the findings of the study indicate that there was a weak relationship between students' level of knowledge and attitudes (r=40) and knowledge and environmental practices (r=24). Similarly, a study between attitudes and behaviors at p<0.05, indicated a moderate correlation of r=49. Analyses of gender effect reveal that female students' environmental participatory behavior was higher than their male counterparts were. Results further pointed out that students living in the rural area scored significantly higher than the urban counterparts on environmentally responsible action. The mismatch between environmental attitudes and environmentally responsible behaviors suggests, among others, a call for redressing of teaching methodologies that would help students to see their behavior more critically.

Keywords: biodiversity, biodiversity knowledge, biodiversity attitude, biodiversity behavior, environmental education

1. Introduction

The most immediate threats to biodiversity have long been habitat loss, due to large-scale conversion of land to agricultural fields and urban centers, the growing number of new urban cores in the periphery area, the introduction of invasive alien species, overexploitation of natural resources, and pollution. Climate change is now adding its effects to the cumulative pressures (Williamson and Bodle, 2016). Furthermore, among others, a vital indirect reason for biological diversity loss in many countries is low environmental awareness. Biodiversity loss problem awareness mirrors beliefs about to what degree the environment is threatened by anthropogenic activities, and may reflect the environmental problems, such as biodiversity loss (Nordlund and Garvill, 2002; de Groot and Steg, 2008).

Ethiopia is one of the world's rich biodiversity countries, and it is worthy of attention nationally, regionally and globally. For example, EBI (2014) reported that the country posses around 6,000 species of higher plants, of which 10% are endemic. Of fauna resources, 29 wild mammals, 18 birds, ten reptiles, 40 fishes, 25 amphibian and seven anthropoid species are endemic to Ethiopia (Melaku, 2011). Ethiopia is also acknowledged as a center of agro-biodiversity that harbors 172 species in home garden and important gene pools of wild crop relatives for at least 197 species (Zemede, 2004). However, according to EPA (2012)

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report about 80,000-200,000 hectares of lands covered with forests are-being cleared per annum in Ethiopia for different reasons, resulting in adverse threats to biodiversity. Hence, to protect the richness of life forms, it is essential to raise public awareness about biodiversity issues and concerns. Mainly teaching the young generation about biodiversity loss has the potential to possess far-reaching profits by empowering them to adopt appropriate conservation and preservation activities, which may be transmitted to their families and communities. Regardless of these and other benefits, however, analysis of international studies acknowledged that students lack adequate scientific knowledge about biodiversity. Similarly, MNRT (1998) reported that one way of concerning the public at all levels in biodiversity conservation is through environmental education. In addition, UNESCO and UNEP (1978) argued that environmental education will enable students to sense out environmental problem and actively participate in pro-environment action. The dynamism of biodiversity has been expressed as complex to conceptualize not few existing studies reported poor public understanding of biodiversity and the risk associated with its loss. Hence, inevitably the attainment of biodiversity's knowledge is often limited by inadequate environmental education and public participation.

As stated above, analogous findings were reported by Bradley et al. (1999), Barrett and Kuroda (2002), Sivek (2002), Christie et al. (2006), Fischer and Young (2007), Lindemann-Matthics and Bose, (2008), the low level of apprehending of the term 'biodiversity' among high school students in Swiss, UK, Japan, USA, Netherlands and Scotland. Similarly, a study carried out by Hunter and Brehm (2003) revealed that students of all grade levels experienced little understanding of biodiversity concepts. Interestingly, studies on university students' about the understanding of genetic diversity, species diversity and ecosystem diversity by Spash and Hanley (1995) revealed that only 44-49% endorsed definitions regarding above mentioned biodiversity components. Distressingly, 37% of student participants asserted to be very strange with the definition of biodiversity. In addition, not surprisingly, Irez and Dogan (2010); found that science teacher trainees exhibited weak biodiversity knowledge. Furthermore, the study conducted by Makki, Abd-El-Khalick, and Boujaoude (2003) in Lebanon and by Gambro and Switzky (1996) in America indicated that the majority of secondary school students held poor knowledge of the environment particularly biodiversity. Nonetheless, the finding of a majority of studies reported more ecologistic and moralistic attitude towards the environment (Gambro and Switzky, 1999; Kuhlemeier et al., 1999; Lindemann-Matthics and Bose, 2008; Leather and Quicke, 2009; Cakir et al., 2010). Fischer and Young (2007) and Buijs et al. (2008) asserted that the empathy of all population structure particularly young adults needs to be appraised because protections of biodiversity are always influenced by citizen knowledge, action skills, and experience. These conceptualized imaginations highly manipulate the mechanisms of conservation strategies. Thus, increasing biodiversity loss and the above findings highlight the significance of more study about students' knowledge, concern and behavior about biodiversity to inform future policy decisions. As stated by MacDougall, McCann, Gellner, and Tur (2013); loss of biodiversity impedes the capability of an ecosystem that is needed for human survival by worsening climate change adaptation and mitigation more likely in developing countries. From this context, the understanding of biodiversity by young adults in agrarian countries such as Ethiopia is most crucial and worth exploring.

Among this group, higher institutions students are chiefly important, as future policymakers and leaders will most likely be found among them. Hence, to explore what university students understand about biodiversity; this study assesses a sample of students at Hawassa University, located in Southern Nations, Nationalities and Peoples region. Hawassa University has been purposively selected as the study site due to its long history in agriculture fields. Furthermore, young peoples' environmental knowledge, attitudes, and practices are essential as they ultimately play a crucial role in providing knowledge–based solutions to new and unforeseen environmental problems.

1.1 Statement of the problem

Biodiversity provides community just not only material welfare and livelihoods but contributes to resiliency, security, social relations, health, and freedom of choices and actions. DiFalco and Chavas (2009) found that maintaining agricultural biodiversity in the field, allow farmers to increase productivity and mitigate the negative effects of climate change. This seems to indicate that in countries like Ethiopia enhancing agricultural biodiversity is critically important to achieve food security and diminish the chronic dependence on external food aid. However, human actions are fundamentally, and to a significant extent irreversibly, changing the diversity of life on Earth, and most of these changes represent a loss of biodiversity. To be aware of the impacts of these substantial interventions and to manage their impacts wisely, we need to address critical gaps in our knowledge about biodiversity. This includes understanding the drivers of biodiversity change (including processes of biodiversity generation and loss), as well as the interactions between species, genetic and ecosystem diversity. According to Roth (1992) and Wilke (1995), developing a theoretical or practical understanding of the environment is equivalent to developing responsible environmental behavior, and individuals' behaviors reflect the level of their environmental literacy. Similarly, Hines, Hungerford, and Tomera (1987); UNESCO and UNEP (1978) argued that the cognitive strand—environmental knowledge comprises comprehending of the ecological processes basic to understand how humans affect natural ecosystems, and strategies of environmental action, including the ability to identify and critically evaluate alternatives for mitigation. Furthermore, it was also argued by Hsu (2004) and McMillan et al. (2004) that rising citizen's environmental knowledge through environmental education results in more positive attitudes towards the environment and more responsible environmental behavior. However, as stated by Hungerford and Volk (1990), in spite of that knowledge it is a crucial component of environmental literacy, but it alone is not an adequate herald for environmentally responsible behavior. Thus, it is essential to empower people with a belief in their ability to contribute to environmental solutions through personal behavior. It has been found by Olympia and Alexandros (2012) that despite positive attitudes possessed towards biodiversity students were not so devoted in taking action to improve the environment. We need to educate people on what is happening and what we stand to lose, and how rapidly we may lose it if remedial actions are not taken soon. If appropriate knowledge, attitude and willingness to take action to solve the environmental problems are nurtured in learners, they can provide knowledge-based solutions for the prevailing environmental degradation in general and biodiversity loss in particular. Furthermore, as leaders of environmental education in school, these prospective teachers need to believe in their capability to promote environmental change so they can foster that belief in their students.

Hence, to achieve in halting the environmental problems in Ethiopia through changing young generation attitudes, developing their knowledge of environment, and raising their participation at every level of education it is prudent to explore pre-service teachers' awareness, knowledge, attitude, behavior, and intention about the environment. This study, therefore, was designed to fill this gap, since education is the most powerful weapon to comprehend the complex nature of environmental degradation and the way how to rehabilitate it. Moreover, to date, to the best of the researcher's knowledge, there are no published similar studies that were found in Ethiopia that dealt with students' knowledge, attitude and participatory behavior towards the loss of biodiversity, at any level, let alone with University students. It is believed that this research will inspire more works of this kind in developing countries and elsewhere in the future.

1.2 Research questions

In order to address the research gaps, the study sought to provide answers to the following research questions.

- What is the level of students' biodiversity knowledge?

- What is the attitude of students toward biodiversity?
- What is the degree of students' biodiversity responsible behavior?
- Are there statistically significant differences among students' gender, academic stream and the residential area towards curbing the loss of biodiversity?

1.3 Significance of the study

For all level curricula designers, course developers, and policy makers, the study can contribute to demonstrate the literacy level of undergraduate students about the loss of biological diversity, which may help to fill the gap, if any, in the policy in general and curricula materials in particular. In addition, it might give information that initiates other researchers to investigate comprehensively on the problem. Furthermore, this study is important in that it can contribute a valuable source of information that may be considered by any environmental protection organizations which aim to have an interest in making learning institutions more productive to address such environmental problems.

1.4 Limitation

The study may lack external validity due to the relatively small sample size, which in return impede random statistical sampling procedures. In addition, one concern about this study is its choice of pre-selected answers for students to choose from and the very short time allotted to students to answer the inventory, which makes it very difficult to draw any meaningful implications. Moreover, the shortcoming of this study is in its sole reliance on quantitative methods of data collection and analyses. Furthermore, in the course of the study, the researcher had encountered a lack of published research outputs in the country that focused on and discussed the related study problem.

2. Methods and Materials

2.1 Method, population, sample and sampling techniques

The study employed a descriptive research design. Hawassa University was randomly selected among the public universities because all the public universities of the country are using the nationally harmonized curriculum. All the public universities are financing by the government, and they are almost similarin resources and facilities. Hence, the selection of one public university can possibly represent the rest. As the research focuses on biodiversity, the academic units that offer the programs related to biodiversity were purposively selected. Accordingly, all first-year undergraduate students in Geography and Biology were chosen as the participants of the study using censu method. The participants' age range from 19 to 21 and all coming straight from high school. The participants of the study were seventy-nine 1st year undergraduate students, 21 females and 58 males majoring biology and geography. They were targated of the study for four reasons. Firstly, they are studying environment-affiliated fields. Secondly, the newly revised geography and biology syllabi and the textbooks comprise relatively sufficient opportunities to address environmental issues in general and issues related to biodiversity in particular. Thirdly, to examine the effect of attained high school environmental education lessons on their conceptual knowledge. Fourthly, they are the only prospective teachers who are assigned to teach the environmental subject in secondary schools.

2.2 Data collection and analysis

In this study, textbooks and undergraduate modules analysis, multiple-choice knowledge tests, and attitude and performance Likert scale items were used as the main data-gathering instrument. To develop the items, the researcher assessed the current grade 9-12 geography and biology textbooks through content analysis with educational experts and biology and geography teachers as panels of an expert. This was because, in Ethiopia, environmental education is not a stand-alone subject but concepts related to

environmental issues are mentioned in different subjects (by using a multidisciplinary approach), mainly in environment-affiliated subjects such as geography and biology.

The environmental knowledge test consisted of 25 multiple-choice items divided into five themes: (a) fundamental principles of ecology) (5 questions) (b) global environmental issues (5 questions) (c) local environmental issues focused on the basic components of an ecosystem (5 questions) (d) ecological values of biodiversity (5 questions) (e) strategies for biodiversity conservation (5 questions).

The environmental attitude questions include items compatible with the NEP (New Environmental Paradigm) Scale adopted from Dunlap; Van Liere; Mertig and Jones, 2000, that is-contextualized in the Ethiopian environments as well as to the reality of student life and context. They comprise 20 items evaluating students' perception using a 5-point, Likert-type scale. The categories were: (a) the use of environmental legislation as a tool for environmental management (b) the value of the natural environment (c) human–environment interrelationship (d) priorities for national resource management policy and (e) the importance of environmental education.

The environmental behavior assessed by asking students to state the extent to which they carried out 15 environment-related activities using a 5-point; Likert-type scale ranging from 1 (*never*) to 5 (*almost always*).

After compiling the questionnaire, pilot study was conducted, on 79 first year Geography and Biology students in Addis Ababa University from these results; perfections were made so that the final questionnaire supplied only relevant and informed data. In addition, the questionnaire was examined by three experts in the field of environmental education and modified according to their suggestions for improvement. Cronbach's coefficient of the questionnaire was calculated for the sample respectively 0.69 for environmental knowledge, 0.61 for environmental attitudes and 0.58 for environmental behavior, which indicates good internal consistency of the items.

(a) Knowledge inventory

Multiple-choice knowledge inventory questions that consist of 25 items were developed in which the correct responses have weighted a score of one and incorrect responses as a score of zero. The lowest possible total score is zero, and the highest total score is 25 (25×1) which was converted into 100% for the sake of valuation convenience.

(b) Attitude inventory

The attitude inventory consists of 20 questions rated on a Likert-type of scale that ranges from strongly agree to strongly disagree with measuring the extent to which the students' environmental concerns were favorable or unfavorable with respect to biodiversity conservation and towards taking environmental action. In assigning values to favorable items, the scale was weighted going from strongly agree, agree, undecided, disagree, strongly disagree, having 5, 4, 3, 2, 1 values, respectively. But, in the case of unfavorable items these values were reversed in the scale strongly disagree, disagree, undecided, agree, strongly agree, having 5, 4,3,2,1 values respectively. The items were worded both positively and negatively to reduce the risk of obtaining false responses. A neutral score occurred if students answered primarily in the mid- range of 3.0. Thus, a score of 60 (3×20) had taken as a neutral position.

(c) Participatory behavior inventory

To weight up students' participatory behavior for the sustainable environment 15 statements were written on a five-point Likert scale. In this scale, zero was assigned for response Never; 1 to rarely, 2 to sometimes, 3 to often and 4 to always based on students' responses to each item. Hence, the highest score would be 60 (15×4) shows, the best performance of students in practical environmental actions, while the

lowest possible score zero indicates environmentally irresponsible behavior. The responses ‘’often’’ and ‘’always’’ were considered as acceptable whereas ‘’never’’ and ‘’rarely’’ response considered as unacceptable participatory actions. Since environmental knowledge and attitude assessed out of 100, for the sake of simplicity in correlation, the environmental practice score also converted to 100.

The data collected from respondents were analyzed using inferential statistics like independent sample t-test and descriptive statistics such as percentages, frequency distributions, mean scores and standard deviations. In addition, a Pearson correlation was employed to determine relationships between respondents’ environmental knowledge, attitude and participatory behavior.

3. Result and Discussion

3.1 The effect of gender on the conceptual knowledge

An analysis of gender effect was not a key to this study. This variable was included in the intention to enrich the findings of the study. As shown in Table 1, female geography and biology students scored significantly higher (M=49.80, SD=10.08) than their male counterparts (M=45.18, SD=8.98) on biodiversity conceptual knowledge; MD=9.02, t (77) 3.50, P=0.001, α=0.05. These results suggest that; sex affects the level of students’ environmental conceptual knowledge. This finding is supported by findings of Tuncer et al. (2005), Alp et al. (2006), and Fatih and Osman (2010) who came up with the result that shows female students are keener to environmental issues than male students. The probable reasons for this result are female students’ active participation in school environmental clubs, work as a member of the association of environmental and outdoor education and volunteer in tree planting campaigns. However, this finding contradicts the conclusions of Gifford et al. (1983), Gambro and Switzky (1999) and Groves and Pugh (1999) who reported that male students scored significantly better than female students did. This gender related differences could be a fertile area of future study, including the impact of student and school attributes on environmental knowledge of students.

Table 1: Analyses of gender effect on the conceptual knowledge of biodiversity.

Gender	n	Mean	Std. Deviation	df	t	Sig (2-tailed)	Mean Difference
Male	58	45.18	8.98				
Female	21	49.80	10.08	77	1.334	0.186	4.62

3.2 Analysis of place of residence effect on the biodiversity conservation practice

As shown in Table 2, students living in rural area scored significantly higher (M=54.64, SD=13.94) than their urban counterparts (M=47.19, SD=16.38) on biodiversity conservation behavior; MD=6.95, df (77) t=2.01, p=0.001, α=0.05. These results suggest that the place of residence has an effect on the act of students’ biodiversity conservation participatory behavior because environmental concern and practice were much stronger in degraded landscape rural areas than in urban. This is also probably due to many reasons like parents’ influences, continuing deforestation, habitat loss, water resource depletion, etc. This trend is mirrored in research that suggests outdoor experiences and interaction with natural environment can be mostly effective in closing gaps in pro-environmental behavior associated with place of residence (Cheng and Monroe, 2010).

Table 2: Mean and standard deviation of place of residence effect on the biodiversity conservation behavior.

Place of Residence	n	Mean	Std. Deviation	df	t	Sig (2-tailed)	Mean Difference
Urban	41	47.19	16.38				
Rural	38	54.64	13.94	77	2.01	0.047	6.95

3.3 Level of students' biodiversity conservation knowledge, attitude and participatory behavior based on academic stream.

(a) Biodiversity knowledge

The data in Table 3 reveal that biology students demonstrated a higher level of biodiversity knowledge in comparison with geography students.

Table 3: Students' mean scores for biodiversity knowledge, attitude and practices.

Department	n	Variables	Mean	Above Mean		Below Mean		Std. Deviation
				n	%	n	%	
Geography	36	knowledge	53	19	53	17	47	9.010
		Attitude	74	28	78	8	22	7.894
		Practice	56	26	71	10	29	9.355
Biology	43	knowledge	61	25	58	18	42	10.70
		Attitude	76	36	84	7	16	8.207
		Practice	59	31	72	12	28	10.073

The majority of biology students (61%) and more than half of geography students (53%) score above average which shows their biodiversity knowledge is medium and not encouraging. Even though more than half of students scored above average, the majority of students appear to have very general, fragmentary and uncritical knowledge about biodiversity. Students lacked fundamental ecological knowledge on items, such as ecological, economic and social value of biodiversity; major endemic plants of Ethiopia; intrinsic, existence and bequest value of biodiversity; direct and indirect causes of biodiversity loss in Ethiopia; impacts of biodiversity loss on perpetuation of human beings and main steps to successful biodiversity conservation. For example, regarding ecological value of biodiversity disappointingly only very few geography (13%) and biology (16%) students could give correct responses. Similarly, a large percentage of biology (70%) and geography (88%) students answered incorrectly about the crosscutting causes of biodiversity loss in Ethiopia. Distressingly, a considerable number of the biology (75%) and geography (86%) students did not recognize critically endangered mammal species in Ethiopia, a basic knowledge expected from graduates of secondary school. The conservation of endangered species seems to be least important to them. The probable reason for inadequate biological diversity knowledge might be because of listed teaching methods such as field trip, laboratory work, outdoor activities, discussion, etc. to teach environmental issues were not practically exercised by the instructors due to many constraints like time, budget and large classes size. Additionally, these findings suggest that environmental education teachers must be increasingly encouraged and supported through on-the-job training or curriculum development. This finding is supported by the conclusion of Gambro and Switzky (1996), Hunter and Brehm (2003), Makki, et al. (2003), Lindemann-Matthics and Bose (2008), and Irez and Dogan (2010) who came up with results that reveal secondary school and undergraduate University students held insufficient environmental knowledge but promising pro-environmental attitudes. Furthermore, the existence of the knowledge gap between students of biology and geography streams was observed clearly. This significant mean difference between two streams might be because of the fact in which the environmental issues more or less better integrated in biology curriculum than in geography curricula and syllabi.

(b) Biodiversity attitude

According to the attitude test score of the students (see Table 3), nearly more than half of biology students (84%) and geography students (78%) score above average (M=76 and 74), which shows their attitude is moderate. One can hence conclude that most of the students have a positive attitude towards

biodiversity conservation. The probable reason is that the attitudes of Ethiopian society toward environmental issues are changing. Issues pertaining to environmental rehabilitation are continuously gaining status in the national agenda such as reforestation and afforestation companies named ‘’Green Legacy’’ and receiving more media exposure. Hence, the public may be more realized that biodiversity is deteriorating. The integration of environmental issues in to school curriculum and syllabus may also contribute to increase awareness of the environmental crisis. Similarly, a study conducted by Kuhlemeier, Bergh et al. (1999), Aini et al. (2003), Dimopoulos and Pantis (2003), and Makki et al. (2003) revealed that the elementary school, high school, College and University students possessing favorable attitudes towards the environment, regardless of their low level of environmental knowledge.

(c) Biodiversity conservation behavior

With regard to biodiversity conservation practice, as shown in Table 3, students’ environment - friendly participatory practice mean score was 56 for geography students and 59 for biology students with a large standard deviation. This result indicated that more than half of students’ accepted that their role in biodiversity conservation is essential and they are ready to be involved in conservation effects. Popular environmental actions include having colossal interest to study issues related to biodiversity loss (88% biology and 96% geography), planting indigenous and wildlife-friendly trees (86% biology and 77% geography), participating in environmental protection club (93% biology and 92% geography), establishment of laws policies and orders for biodiversity conservation (73% biology and 82% geography). Nonetheless, only 35% of geography and 42% of biology students acknowledged that they had taken deliberate action to diminish biodiversity loss. As future teachers, they are pledged to actively teach students the concept of biodiversity, the importance of biological diversity and various methods used for sustainable conservation. However, a considerable number of participants unfortunately in this study did not show positive inclination and commitment towards pro-environmental behavior. Among others, the probable reasons for this result are a lack of activities in environmental clubs, parents’ low socio-economic and educational background, lack of environmental education field trip, and the unpopular and forced government-imposed environment rehabilitation campaign. One concern of this study is that despite the evidence exhibited regarding environmental practice, it was not identified which factor appears to be stronger in motivating students to take responsible environmental action. Skelly and Zajicek (1998), and Cheng and Monroe (2010); found that time in natural area was a key predictor of pro-environmental behavior. Similarly, Hines et al. (1987) in their study argued that knowledge alongside pro-environmental attitudes are requisites to environmentally responsible behavior.

3.4 Relationship of biodiversity knowledge, attitude and behavior

Correlation analysis results in Table 4, revealed that there were low to moderate, positive correlation among biodiversity knowledge, biodiversity attitude, and biodiversity conservation behavior.

Table 4: Pearson’s correlations among biodiversity knowledge, attitude and participatory behavior.

Variables	Attitude	Behavior
Knowledge	0.398	0.243
Attitude	-	0.491

Correlations are significant at the 0.01 level

As can be seen, the correlations showed a weak relationship between knowledge and attitude (r=0.398). The probable reason for this discrepancy may be due to that the students, regardless of their pro-environmental attitudes do not fully understand the fundamental ecological principles related to biodiversity issues. An alternative elucidation for an insignificant relationship between knowledge and

attitude may be expressed attitudes reflecting not factual value but the influence of mass media and community interest. Moreover, the attitudes demonstrated by the students in this study may mirror their desire to identify with what they instinctively accept as the right value. To this end, the relatively low correlation that was found between students' knowledge and attitude may maintain the idea that environmental knowledge does not appear to be a prerequisite for an ecocentric attitude. This is consistent with the findings of Kuhlemeier et al. (1999), Aini et al. (2003), and Dimopoulos and Pantis (2003) who reported that inadequate environmental knowledge parallels alongside with positive attitudes.

The relationship between knowledge and behavior had an overall weak correlation (r=0.243). This finding is substantiated by Kuhlemeier et al. (1999) who found a weak correlation (r=0.020) between knowledge and behavior in the study made on youth environmental knowledge, attitudes and responsible behavior. Hines et al. (1987) made a study to determine the relationship of knowledge and behavior and found an overall correlation of r=0.299 from the 17 studies that reported this data. According to Kaiser, Wolfing and Fuhrer (1999 p.4) ''factual knowledge should not be related to ecological behavior strongly because its influence is attenuated both by environmental attitude and intention''. These studies contradict Hines et al. (1987) and Ajzen et al. (1988) who argued that knowledge is a prerequisite for environment friendly behavior. Analysis between attitude and behavior at p<0.05, indicated a moderate correlation of r=0.491. This finding is supported by Hines et al. (1987), and Kuhlemeier et al. (1999) who found a moderate correlation of r=0.347 and r=0.36. Hines et al. (1987) finds a counter-intuitive result that when the behavior was actually observed rather than self-reported, the attitude-behavior correlation went up to r=0.427. The results of their study may have been enhanced because self-reported behavior is usually over-reported. On the contrary, in the Scott and Willits (1994) study of Pennsylvanians' environmental attitudes and behaviors, they found that attitudes were predictive of behaviors but a weak correlation (r=0.21). In general, results revealed that there is a weak correlation between knowledge and behavior, and moderate correlations between attitudes and knowledge and between attitudes and behavior.

4. Conclusion and Implications

Biological diversity is a vital resource as it supplies both services and goods to the community. However, in recent years, anthropogenic activities have happened to be the most dominant and persistent driving forces in biodiversity loss. In order to reduce the threats that biodiversity is facing due to human activities globally, regionally and locally, the public must have basic knowledge and demonstrate a positive attitude and behavior towards biodiversity and its worth. Nevertheless, the overall findings presented in this study are either not encouraging or very disappointing. In addition, in Ethiopia, a long phase of the exponential growth of population and poverty exacerbates the problem. These two reasons plus a limited understanding of how biodiversity regulates ecosystem functioning at a local and global scale have combined to exert enormous pressure on the natural habitats and native plants and animals. Consequently, Ethiopia faces substantial challenges concerning sustainable development, making environmental education particularly critical as a tool for attaining sustainable development. Inculcating environmental literacy in future generations requires educators who are equipped with knowledge, skills, attitude, and commitment. The Ethiopian education policy recognizes that environmental education is important for a scientifically literate citizenry. However, the environmental issues incorporated in the secondary school texts were insufficient for influencing students' environmental knowledge, attitudes, and behaviors, as environmental problems in the country are very complicated.

For these reasons, environmental education programs should be revised in detail, and the contents of the courses and classroom instructional approach should be revisited at high schools, universities, and teacher education programs. In particular, since future teachers are shapers and educators of the future generation, designed and implemented curricula must foster a coherent understanding of the fundamental

principles of the environmental. It might be also useful to link the conceptual problems to hands-on experiences when possible that could easily be illustrated through a field trip, students experiment, and teacher demonstrations. Moreover, teacher candidates who graduated from Universities and Colleges should be granted service training to dispel mismatch between environmental knowledge and environmental behaviors. Future study requires to assess appropriate teaching methods which best promote firm comprehension of these complex environmental issues. Furthermore, the actual causes of the discrepancy in the three variables namely environmental knowledge, environmental attitudes, and environmental behaviors should be further investigated to make a sound conclusion.

Competing Interests

Authors have declared that no competing interests exist.

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