Primary Versus High School Students' Environmental Attitudes and Pro-environmental Behavior: The Case of Embu County, Kenya

Daniel M. Nzengya and Francis Rutere

Contents

Introduction	2
Literature Review	4
Concept of Environmental Attitudes and Pro-environmental Behavior	4
Empirical Review	5
Materials and Methods	7
Results and Discussion	8
Perceived Prevalent Environmental Problems	8
Students Environmental Attitudes (NEP Questions)	9
Environmental Knowledge: <i>Perceived Seriousness of the Environmental Problems</i>	9
Pro-environmental Behavior: <i>Self-Reported Willingness to Support the Government's Pro-environmental Conservation Policies</i>	12
Pro-environmental Behavior: <i>Students' Self-Reported Willingness to Participate in Community-Organized Environmental Conservation Activities</i>	17
Relationship Between Environmental Attitudes, Environmental Knowledge, and Pro-environmental Behavior and Participant's Gender and Level of Schooling	20
Conclusion	21
References	22

This chapter was previously published non-open access with exclusive rights reserved by the Publisher. It has been changed retrospectively to open access under a CC BY 4.0 license and the copyright holder is "The Author(s)". For further details, please see the license information at the end of the chapter.

D. M. Nzengya (✉)

Faculty of Social Science, St Paul's University, Limuru, Kenya

e-mail: dmuasya@spu.ac.ke; dnzengya@yahoo.com

F. Rutere

Faculty of Social Sciences, St. Paul's University, Limuru, Kenya

e-mail: francisrutereone@gmail.com

Abstract

Degradation of natural resources exacerbates a country's vulnerability to the effects of climate change. IPCC projections suggest that countries within the horn of Africa, which include Kenya, will suffer most from extreme climate change events, particularly more frequent and prolonged droughts. Women and children suffer disproportionately from the consequences of environmental degradation. Public participation is one of the strategies governments pursue to combat environmental degradation; however, there has been limited research to better understand students' environmental attitudes and pro-environmental behavior to better inform student-led participatory designs. Students comprise a significant proportion of the population in Kenya. This research conducted in 2018 at Nginda Ward, Embu County, comprised a survey of 121 students: 58 high school and 63 primary school students. The research investigated students' environmental knowledge, environmental attitudes, and pro-environmental behavior. Qualitative data were analyzed thematically. Multivariate statistics (MANOVA) were used to examine the relationship between the dependent variables and the participant's gender and level of schooling. From the results obtained, the top five most frequently mentioned *local* environmental problems by the students sampled included water pollution, deforestation, air pollution, scarcity of safe sources for water for domestic use, and soil erosion. Inferential statistical results revealed that there is a significant relationship between students' level of schooling and environmental attitudes, $F = 11.79$, (1, 120), $p < 0.01$. In addition, there is a significant relationship between students' level of schooling and environmental knowledge, *that is, perceived severity of environmental problems*, $F = 5.33$, (1, 120), $p < 0.05$. Research findings further revealed a significant relationship between gender and environmental knowledge, $F = 9.62$, (1, 120), $p < 0.01$. However, gender differences in pro-environmental behavior were not statistically significant. Also, differences between primary and high school students' pro-environmental behavior were insignificant.

Keywords

Environmental degradation · Environmental attitudes · Pro-environmental behavior · Student-led participatory environmental conservation · Primary and high school students · Embu County · Kenya

Introduction

The sub-Saharan Africa (SSA) region is among the regions of the world experiencing severe environmental degradation and deterioration. Environmental degradation exacerbates the region's vulnerability to the effects of climate change. IPCC projections suggest the SSA particularly countries within the horn of Africa are most the parts of the world that will suffer most from extreme climate change events, particularly more frequent and prolonged droughts (IPCC 2014). While forest

cover has improved remarkably in industrialized nations, the majority of the developing nations experienced severe deforestation during the last two decades. Other pervasive environmental problems in the SSA include species depletion and extinction, poor solid waste disposal, overpopulation, wide-spread soil erosion, desertification, and wide-spread pollution of surface water resources. There are many direct and indirect drivers of environmental degradation and changes in the SSA. These include rapid urbanization, overexploitation of land resources, wide-spread invasive alien terrestrial and aquatic alien species, and climate change.

There are many push-pull factors that drive urbanization in the SSA. This includes rural-urban migration driven by a mix of factors. The productivity of small-scale agriculture which was the main economic mainstay for majority of SSA residents have been declining dramatically due to poor land-husbandry practices, climate change, and environmental degradation forcing people to opt for urban life to pursue alternative economic opportunities (MEA 2005). Because of poor urban planning, pervasive urban poverty, and poor governance, urbanization in most of SSA towns and cities takes the form of proliferation of crowded informal settlements. With poor solid waste management practices and limited or lack of sewerage, most urban wastewater, stormwater runoff ends in rivers and lakes untreated or partially treated, further polluting the region's dwindling surface water resources. Rising population further drives demands for firewood for cooking, the basic energy sources for cooking for the majority of the region's rising rural population. Deforestation in the SSA has been attributed to rising demands for farmlands, rising demand for grazing land, timber, as well as places for settlement.

Environmental degradation poses a threat to efforts by governments and donor agencies towards achieving many of the SDGs by 2030. Deforestation, for instance, worsens the scarcity of firewood, increasing the time women and girl children spent in the search of the commodity. The scarcity of water, firewood, and food is reducing time for productive work among women who are generally breadwinners among the families in the region. The loss of biodiversity threatens domestic and foreign tourism which employs thousands, further threatening the socioeconomic development and livelihood of millions (Shandra et al. 2008). Rising population drives increasing demands for fodder and fuel (MEA 2005). Arid and semiarid areas (ASALs) comprise a significant proportion of land for many of the countries with the SSA region. Thus, desertification has risen during the last decade as shortages of land forced millions of people to migrate to these ecologically fragile areas for settlement and cultivation. Consequently, desertification sets in due to over-cultivation and deforestation pose threats to biodiversity and livelihood of millions of people living in drylands. Extreme droughts associated with extreme climate change events have become commonplace in the ASALs in Kenya leading to massive livestock losses.

In Embu County, drivers of environmental degradation include the Kathangariri Tea Factory located in Nginda ward. According to some reports, the tea factory is estimated to consume 1,200,000 m³ of wood fuel to process tea leaves per year. This fuelwood is purchased from the local community. Because many of the rural residents are poor, the majority are involved in the sale of firewood and charcoal

for livelihoods. Rising trends in urban centers and towns in Embu County have further accelerated the use of wood since they use charcoals and wood fuel for cooking. It is estimated that biomass usage accounts for over 92.2% of energy sources in Embu County. All these degradations remain pervasive despite efforts by the national environmental management authority to educate people on the need to conserve the environment. A multi-institutional approach is necessary to combat environmental degradation. Young people comprise an important constituent in the fight against the degradation of natural resources; thus, understanding youth attitude, perception, and conservation behavior is crucial for current and future generation.

Kenya is among the world nations facing severe environmental degradation posing a huge threat to Kenya's socioeconomic development and growth. For instance, human encroachment in the country's water catchments, among them the Mau water catchment, has been blamed for the drying of springs and streams that feed river Mara. On the other hand, Mara River that waters the park is drastically reducing threatening livelihood in the park (Mango et al. 2011). Women and children suffer disproportionately from the consequences of environmental degradation. There has been a rise in efforts to mainstream environmental education. The number of nongovernmental organizations working to address environmental degradation has risen significantly over the last 10 years. Public participation is envisaged as a core strategy for combating environmental degradation; however, there has been limited research to better understand students' environmental attitudes and pro-environmental to better inform participatory environmental conservation models. Students comprise a significant proportion of the population in Kenya. The goal of this study was to primary and high school students' environmental knowledge, attitudes, and pro-environmental behavior.

Literature Review

Concept of Environmental Attitudes and Pro-environmental Behavior

Ajzen and Fishbein (1980) have attempted to provide theoretical explanations on the links between environmental attitudes and pro-environmental behavior. The researchers provided ways to overcome the challenges encountered by measuring attitude and behavior, which posed challenges to previous scholars. According to Ajzen and Fishbein, for one to measure the relationship between behavior and attitude, he/she must measure attitude toward a specific behavior. According to the authors, human beings adapt behavioral practices based upon the available information and not necessarily by unconscious drive or influential desires. Behavior is not determined by attitude directly, but rather attitude influences behavioral intention which leads to actions. Actions are influenced not only by attitude but also by social pressure. Behavioral outcomes are shaped or mediated by normative beliefs (Ajzen and Fishbein 1980).

This theory by Ajzen and Fishbein (1980) has been used in the analysis and explanation of factors leading to pro-environmental behavior. According to this theory, selfish competitive oriented people are less likely to behave proactively on environmental issues. Therefore, it is unlikely that selfish competitive integrated people consider environmental stewardship in their day-to-day decisions but rather are driven by greed to exploit resources for their gain. Thus, this theory sheds light on how to understand the pro-environmental behavior of different social groups within society.

Empirical Review

Several authors have argued that environmental degradation is a human behavior problem. Siefer et al. (2015) works on human-environment system knowledge framework attempted to demonstrate a correlation between attitudes and pro-environmental behavior among adults and graduate students in Chile. The authors posited that more knowledge of the environment translates to more awareness of problems associated with environmental degradation and thus change of attitude and pro-environmental behavior. The researchers discovered that the more aware individual was on global environmental problems created guilty upon him or her thus changing the behavior toward conservation. The authors also reported that environmental knowledge is the level of a personal feeling that his or her actions have led to degradation thus enhancing pro-conservation behavior. The authors did not find significant correlations between an individual's income and pro-environmental behavior, despite income level enhancing the individual's formal educational attainment.

Mifsud (2011) has examined the relationship between environmental knowledge, attitudes, and behavior, among Maltese Youth. The authors' findings suggested that Maltese Youth had enough global environmental knowledge but very little of the local environmental situation. This was found to harbor their change of behavior toward the local environment that was under degradation. Mifsud (2011) found that the use of radio, television, journal, and new paper was limited which could have portrayed the environmental situation on Maltese thus creating pro-environmental behavior. The authors' findings suggested that environmental knowledge enhances pro-environmental behavior.

There are several reasons why students may be more knowledgeable about the global environment than about the local environment. Mifsud (2011) attributed the predicament to the lack of textbooks on the Maltese environment. This situation may be exacerbated by market demands and forces that force book writers to publish books that sell, especially where there is a limited market for books, as is the case in Malta. The study further revealed the important interplay between media, family and friends, and local context and knowledge in influencing students' attitudes and pro-environmental behavior.

Measurement of environmentally relevant attitude and behavior is important for serious evaluation of environmental education programs. The clear environmental education program will only spring from proper measurement instruments that will

take care of believing, attitude, values, and world view. This may depend on the pool of instruments used ranging from attitude measure, preservation, and utilization. It will allow persons to endorse environment protection and usage of natural resources. However, the author used one order; lack of measurement corresponding instrument will reduce attitude behavior consistency, which means the behavior is measured at a given level. On the other hand, the ecological situation at a given time will reduce attitude, making behavior measure either too easy or difficult. The socioeconomic status of parents was not measured; thus, little is known whether a household's socioeconomic status affects the social desirability of the youth.

Several other researchers have reported a relationship between education level and environmental attitude. According to Ugulu et al. (2013), pro-environmental behavior is influenced by many factors which include and not limited to norms, values, culture, education levels, gender customs, prevailing circumstances, and personal beliefs. Various theories that had been put forward to indicate how environmental attitude and pro-environmental attitude is influenced were put into consideration. The researchers reported gaps in the development of data collection tools to collect environmental attitudes and pro-environmental behavior data. The researcher found that female attitudes are higher than those of males, while the female student had a higher positive attitude than males (Gaye et al. 2005).

Environmental education is one way a country can prepare its youth to be responsible citizens of the environment. This will equip students to comprehend information on environmental issues; the more youth have a positive influence on conservation behavior. This is likely to enhance the required participation by students in environmental conservation and hence the positive behavioral change. Ugulu et al. (2013) has pointed out that science subjects tend to inspire desire and enlightenment amongst youth about environmental problems and knowledge on solving these problems. Ugulu et al. (2013) further argued that when youth lack knowledge on environmental issues, there is a corresponding lack of environmental stewardship. Education, therefore, seems to shape a critical positive conservation-related attitude and ecosystem conservation. Johnson-Pynn and Johnson (2010) have further examined explored environmental education among the East African Youth. The authors discovered that young people were aware of the many threats to local people and ecosystems in Tanzania and Uganda. A related study by Kioko and Kiringe (2010) on effects of education level on change of attitude and conservational behavior among Maasai Youth of Loitokitok District of southern Kenya reported that educational attainment influenced young people's actions toward the environment. The authors further reported that the gender of individuals influenced attitude toward conservation of environment and wildlife. To them, more males than females felt that wildlife and the environment should be conserved.

The level of schooling was found to enhance environmental knowledge and attitude toward wildlife and environmental conservation. Results from comparisons among formally educated youth and informally educated *moran* indicated statistical differences. High school students were higher than lower primary, while lower primary had higher attitudes than informally educated *moran*. Further, environmental clubs and visiting protected areas enhanced more coverage of wildlife and environmental topics.

The level of schooling enhanced the scope of understanding. On the other hand, the economic benefit increased levels of conservation because moran who benefited from tourism money had no problems with elephants using private land, while those who rely on crops had problems because of damage caused by elephants on their crop, and they had problems with them using private land. On the other hand, children whose parents were working in wildlife conservation had higher knowledge, awareness, and attitude than those whose parents were not working. Those who benefit from bursaries were for the idea that elephants should be protected. Females generally had a low attitude on conservation wildlife conservation because they associated the animals with danger. However, females showed more environmental concern than males. Based on the results of this study, the most prevalent method of practically engaging the Youth in environmental education appears to be participation in wildlife club activities. While all the schools had clubs, lack of funds limited club activities to gardening and tree planting within the school. Nevertheless, the clubs played an important role in environmental education. Membership increased the likelihood of students visiting protected areas such as Amboseli. However, Kioko and Kiringe's work (Kioko and Kiringe (2010) focused on the influence of the benefit of the conservation of wildlife on environmental education.

Materials and Methods

The research used a survey design to collect and analyze both qualitative and quantitative data. The sample constituted 121 primary and high school students. The researchers administered the surveys face to face with the help of teachers. All the responses were filled by the researcher according to the participants' answers. Additional data collected included the gender of the participant and also whether or not a participant had visited any conservation area.

Measurement variables are environmental attitudes, environmental knowledge and pro-environmental behavior. Students' environmental attitude was measured according to the level of agreement or disagreement on (9) statements from New Environmental Paradigm (NEP) scale (Dunlap 2000). Participants were required to rate their level of agreement/disagreement with each statement based on a scale of 5 = *strongly agree* to 1 = *strongly disagree* (overall score range, 9–45). The Cronbach's alpha value for the nine statements was 0.63. A high score means an individual had a higher agreement on items related to a particular statement. Students' environmental knowledge was measured using nine statements. Participants were required to rate their environmental knowledge according to a scale of 5 = *completely agree* to 1 = *completely disagree*. The Cronbach's alpha value for the nine statements were 0.72; a high score means a particular problem was perceived to be serious. Student's pro-environmental behavior (*self-reported willingness to support potential/actual government's pro-environmental environmental conservation policies*) was measured using response to nine statements posed on willingness to support current or potential government conservation policies, based on a scale of 5 = *completely willing* to 1 = *not willing at all*. Cronbach's alpha for nine statements was 0.73. Finally, students' participant pro-environmental behavior (*self-reported willingness to*

participate in community-organized conservation activities) further measured using the response of nine statements posed on willingness to support community conservation activities, based on a scale of 5 = *completely willing* to 1 = *not willing at all*. The Cronbach's alpha value for the nine statements was 0.82.

Qualitative data were content analyzed and summarized the most frequently mentioned environmental problems by both primary and high school students. Quantitative data was analyzed using cross-tabulations to examine responses by primary and high school students. Inferential statistics, one-way MANOVA, was used to examine the relationship between environmental attitudes, environmental knowledge, and pro-environmental behavior and participant gender and schooling category.

Results and Discussion

Perceived Prevalent Environmental Problems

Study participants were asked to list what they perceived as the top three environmental problems in the local area. The lists of mentioned problems were entered in an Excel spreadsheet, and a tally was done to summarize the top five frequently mentioned environmental problems. Results obtained showed that the top five frequently mentioned environmental problems, in order of the most to least frequently mentioned problems included water pollution, deforestation, air pollution, scarcity of water, and soil erosion. Figure 1 summarizes the frequency of mention of

Fig. 1 Top five frequently mentioned environmental problems (N = 121). (Source: Survey data 2018)

the different environmental problems by category of the respondent (primary versus secondary). Water pollution was more frequently mentioned as a problem by the majority of high school students. Also, more high school than primary students perceived deforestation to be a priority environmental problem in the local area. Surprisingly, however, more primary than high school students perceived air pollution to be an environmental problem of concern. Also, more primary than high school students perceived soil erosion to be an environmental problem prevalent in the local area. However, water shortage was mostly mentioned many times by high school students compared to the number of times the same was mentioned by primary school students.

The pattern for different perceptions of prevalent environmental problems in the area is unclear. Deforestation is, however, a prevalent problem in the study area, and also the media in Kenya has sustained a campaign about deforestation as a priority environmental problem. Both student's daily experiences and also media publicity may explain the high mention of deforestation as a priority environmental problem.

Students Environmental Attitudes (NEP Questions)

Table 1 summarizes students' environmental attitudes according to the nine (NEP) statements posed. The majority of high school students (85%), compared to 63% of the primary students sampled, were strongly agreeable that the Earth has plenty of adequate natural resources if we just learn to develop them. The majority of the high school students (60%), compared to 58% of the sampled primary school students, were agreeable that "despite our special ability, humans are still subject to the law of nature." Most primary school students (59%), compared to 51% of the sampled high school students, were agreeable that with the statement that "plants and animals have as much right as humans to exist." Close to 60% of the high school students, compared to 46% of the primary school students sampled, were agreeable with the statement that "if things continue as they are present, we will soon experience a major environmental catastrophe." Only 14% of the high school students compared to 14% of the primary school students sampled were agreeable that "the Earth is like a spaceship with very limited room." Only 39% of the high school students sampled compared to 25% of the primary school students were agreeable with the statement that "we are approaching the limit of the number of people the Earth can support."

Environmental Knowledge: *Perceived Seriousness of the Environmental Problems*

Table 2 summarizes students' ratings related to the level of agreement/disagreement on the nine statements concerning the perceived seriousness of environmental problems. The majority of primary school students (66%) and 55% of high school students perceived that deforestation was a serious problem in the locality.

Table 1 Environmental attitudes of primary and high school students (NEP questions) (N = 121)

	Category	Strongly agree (%)	Somewhat agree (%)	Unsure (%)	Somewhat disagree (%)	Strongly disagree (%)
We are approaching the limit of the number of people the Earth can support	High school	39	12	3	29	17
	Primary school	25	4	9	27	36
When humans interfere with nature, it often produces disastrous	High school	55	20	6	10	8
	Primary school	38	7	11	7	38
Humans are seriously abusing the environment	High school	59	20	6	2	14
	Primary school	46	9	2	5	38
The Earth has plenty of natural resources if we just learn to develop them	High school	85	8	2	5	2
	Primary school	63	20	4	2	13
Plant and animals have as much as a human right to exist	High school	51	23	5	6	15
	Primary school	59	13	9	4	16
Despite our special abilities, humans are still subject to the law of nature	High school	60	28	6	2	5
	Primary school	59	13	9	7	13
The Earth is like a spaceship with very limited room	High school	43	11	8	20	36
	Primary school	14	7	7	14	57
The balance of nature is very delicate and easily upset	High school	28	29	12	12	19
	Primary school	25	9	2	13	52
If things continue on their present, we will soon experience a major environmental catastrophe	High school	59	22	3	8	9.2
	Primary school	54	4	9	5	29

Source: Survey Data 2018

Table 2 Students' environmental knowledge: *perceived seriousness of environmental problems* (N = 121)

		Completely agree (%)	Partly agree (%)	Unsure (%)	Partly disagree (%)	Completely disagree (%)
Deforestation is a serious problem in our local area	High school	55	5	5	11	17
	Primary school	66	5	4	4	21
Soil erosion is a serious problem in our local area	High school	46	9	2	6	37
	Primary school	59	5	11	5	20
Pollution of streams and rivers is a serious problem in our local area	High school	48	9	8	9	26
	Primary school	61	7	13	4	16
Pollution of water springs is a serious problem in our local area	High school	35	12	8	8	37
	Primary school	59	8	4	2	29
Cutting trees to burn charcoal is a serious problem in our local area	High school	45	12	9	14	20
	Primary school	62	5	4	2	27
Siltation of streams and small dams (meaning streams and small dams are filling up with sand due to soil erosion) is a serious problem in our local area	High school	34	15	3	15	32
	Primary school	50	5	4	7	34
Degradation of swamps and marches is a serious problem in our local area	High school	40	11	8	12	29
	Primary school	45	9	13	14	20
Spreading of towns and cities over more and more rural land is a serious problem in our local area	High school	43	2	3	11	31
	Primary school	41	11	5	9	34
Degradation of local stream and rivers due to sand harvesting is a serious problem in our local area	High school	42	11	8	8	32
	Primary school	21	11	14	9	45

Source: Survey data 2018

According to Kamweti (2009), Kenya is among the countries in Africa with the highest loss of vegetation cover, with 90% of the country's indigenous forests having been lost. Drivers of deforestation in Nginda Ward include Kathangariri Tea Factory which consumes an estimated 1,200,000 m³ of wood fuel to process tea leaves per year.

60% of the high school students, compared to 48% of the primary school students, completely agree that pollution of streams and rivers is a serious problem in locality.

Majority of primary school students (59%) compared to 46% of high school students sampled agreed that soil erosion is a serious problem in locality. The findings are very consistent with the previous statement because where there is deforestation, soil erosion is becoming a prevalent phenomenon.

Half of the primary school students (50.0%), compared to 34% of high school students, completely agreed that siltation of streams and small dams is a serious problem in locality. Streams are very visible in the area being on the slopes of Mount Kenya. The coloration of the water, especially during the rainy season, was very visible.

Less than half of the high school students' (43%), compared to 41% of the primary school sampled, completely agreed that the spreading of towns and cities over more and more rural land is a serious problem in the locality. This perception may be probably a result students' awareness of the current trends of the rapid spread and growth of towns and urban centers in Embu County.

Less than half of the primary school students (45%), compared to 41% of high school students sampled, completely disagree that the degradation of local streams and rivers due to sand harvesting is a serious problem at the locality. Previous studies (Mango et al. 2011) have suggested a disconnect in which students were aware of global environmental problems confronting humanity today but not local issues. This is probably a manifestation of this problem at the study site.

Pro-environmental Behavior: Self-Reported Willingness to Support the Government's Pro-environmental Conservation Policies

Table 3 summarizes students' pro-environmental behavior measured according to respondent's self-reported willingness to support the government's environmental conservation policies on the nine statements posed.

Willingness to Support a Government's Ban on the Use of Plastic Bags

Plastic packaging of goods at shopping malls is a huge source of solid waste generation in cities and towns. In 2017, the Kenya government enforced a ban on plastic packaging. Participants were asked about their willingness to support the government ban on plastic packaging. Results showed that 84% of the primary school students were willing to support government ban compared to 66% of high school students.

Table 3 Pro-environmental behavior: *students' self-reported willingness to support potential government conservation pro-environmental policy* (N = 121)

	Category	Completely willing (%)	Partly willing (%)	Neither willing nor unwilling (%)	Not willing (%)	Completely unwilling (%)
Willingness to support a government's ban forbidding the use of plastic bags	High school	66	11	3	5	1
	Primary school	84	0	2	9	5
Willingness to support a government's ban forbidding cutting trees for charcoal	High school	57	23	2	6	12
	Primary school	43	4	5	9	4
Willingness to support a government's policy requiring factories and industries that pollute streams and rivers pay charge toward cleaning our rivers and streams	High school	72	8	8	8	5
	Primary school	74	7	9	2	9
Willingness to support a government's policy to cancel the licenses of factories and industries that pollute streams and rivers	High school	43	20	0	15	22
	Primary school	60	9	9	5	16
Willingness to carry eco-friendly bags during shopping	High school	57	14	3	8	16
	Primary school	70	13	2	4	13
Willingness to support a government's policy to charge people who wash their	High school	37	31	8	8	17
	Primary school	64	7	5	2	2

(continued)

Table 3 (continued)

	Category	Completely willing (%)	Partly willing (%)	Neither willing nor unwilling (%)	Not willing (%)	Completely unwilling (%)
clothes in streams						
Willingness to support a government's policy to charge people who wash vehicles in streams/rivers	High school	48	28	5	3	17
	Primary school	63	5	5	4	23
Willingness to support a government's policy to charge people who pump water from rivers for irrigation without permits	High school	48	28	5	3	17
	Primary school	67	13	4	4	20
Willingness to support a government's policy to charge construction companies who obtain huge amounts of water for construction from streams without permits	High school	48	12	9	11	20
	Primary school	61	13	4	4	20

Source: Survey data (2018)

Willingness to Support a Government's Ban Forbidding Cutting Trees for Charcoal

Kenya has a policy that regulates charcoal burning. According to this policy, selling charcoal without a permit is prohibited. Although there are policies that require charcoal burning to obtain permits, this regulation is rarely enforced because the government lacks sufficient policing resources. Also, corruption in Kenya is pervasive further undermining the regulation of illegal charcoal burning. Participants were there asked if they were completely willing or unwilling to carry eco-friendly bags during their shopping. Results showed 57% of the high school students were

completely willing to support the regulation compared to 43% of the primary school pupil.

Willingness to Support County Government's Policy Requiring Factories and Industries That Pollute Streams and Rivers Pay Charge Toward Cleaning Our Rivers and Streams

Kenya has a policy that regulates the quality of wastewater discharge into surface water bodies, streams, rivers, and lakes (GoK 2013). Polluter pay principle requires factories and other people caught discharging wastewater and other effluents in water sources to pay for the consequent cleaning. Participants were asked if they were willing to support county government's policy requiring factories and industries that pollute streams and rivers pay charge toward cleaning our rivers and streams. Results showed that 74% of primary school students and 72% of the high school students sampled were completely willing to support this hypothetical pro-environmental government policy.

Willingness to Support a Government Policy to Cancel the Licenses of Factories and Industries that Pollute Streams and Rivers

Factories and other industries are major sources of point sources of water pollution. Kenya has a policy that regulations point sources related sources of water pollution. Participants were there asked if they were completely willing or unwilling to carry eco-friendly bags during their shopping. Results showed that 61% of the primary school students were completely willing to support compared to 43% of the high school students. It is however not clear why a low percent of high school students showed willingness to support a government policy mentioned. Pollution of rivers and lakes by factories benefits only a few individuals by way of cutting costs of wastewater treatment, yet the majority of the citizens pay for those consequences in terms of illnesses.

Willing to Carry Eco-Friendly Bags During Shopping

The provision of packaging materials to customers in shopping malls is a huge source of solid waste generation. One method in reducing solid waste related to packaging provided by shopping malls is to provide incentives where people carry their eco-friendly bags when they go shopping. Participants were there asked if they were completely willing or unwilling to carry eco-friendly bags during their shopping. Results showed that 70% of the students were completely willing to carry eco-friendly bags during shopping, compared to 57% of the high school students.

Willingness to Support a Government Policy to Charge People Who Wash Clothes in Streams

Washing clothes in rivers and streams and lakes is a common practice in many rural settings in Kenya. Many forms of detergents used for laundry have high levels of phosphates and other chemicals that pollute water and potentially trigger local eutrophication problems in water sources. Participants were there asked about their willingness to support or not to support a hypothesized scenario in which county

government enforced charges for people who wash clothes in streams in one measure to curb pollution associated with this practice. Results showed that 64% of the primary school students were completely willing to support the policy compared to 37% of the high school students. It's unclear why high school students would express low support toward a government policy that provides charges for people who wash their clothes in streams. Washing clothes in rivers and lakes contribute to localized eutrophication problems, undermining the quality of drinking water sources.

Willingness to Support a Government Policy to Charge People Who Wash Vehicles in Streams/Rivers

Washing vehicles in rivers and streams and lakes is a common practice in many rural settings in Kenya. Many forms of detergents used for laundry have high levels of phosphates and other chemicals that pollute water and potentially trigger local eutrophication problems in water sources. Participants were there asked about their willingness to support or not to support a hypothesized scenario in which county government enforced charges for people who wash clothes in streams in one measure to curb pollution associated with this practice. Results showed that 63% of the primary school pupil were completely willing to support the policy compared to just 48% of the high school students.

Willingness to Support a Government Policy to Charge People Who Pump Water from Rivers for Irrigation Without Permits

The abstraction of water from streams, rivers, swamps, and lakes to irrigate farm crops is a common practice. Although there are policies that require people irrigating crops to obtain water abstraction permits, this regulation is rarely enforced because the government lacks sufficient policing resources. Also, corruption in Kenya is pervasive further undermining the regulation of illegal abstraction of water from streams, rivers, lakes, and swamps for private irrigation gains. Participants were asked about their willingness to support or not to support a hypothesized scenario in which county governments enforced charges to all people found abstracting water for irrigation without permits. Results showed that 68% of the primary school students were willing to completely support compared to just 48% of the high school students.

Willingness to Support Policy to Charge Construction Companies Who Obtain Huge Amounts of Water for Construction from Streams Without Permits

Rapid urbanization has been a major source of extraction of water from both underground and surface resources. In many countries, the abstraction of huge amounts of water from streams and rivers competes with other forms of water uses such as water for livestock, small scale irrigation, and also domestic use. Even though governments may have policies that regulate regulate water abstraction, these bad practices might continue because governments lack sufficient resources to enforce compliance. Participants were asked about their willingness to support or not to support a hypothesized scenario in which county governments were to begin

requiring construction companies to pay for the water they collect from streams, rivers, and boreholes. Results showed that 68% of the primary school students were completely willing to support compared to just (48%) of the high school students.

Pro-environmental Behavior: Students' Self-Reported Willingness to Participate in Community-Organized Environmental Conservation Activities

Table 4 summarizes results of students' pro-environmental behavior measured according to respondent's self-reported willingness to participate in the community-organized environmental conservation activities.

Majority of the primary school students, 80%, and 74% of high school students were willing to voluntarily participate if their communities organized to clean local water streams. Most primary school students (84%) and high school students (79%) were willing to volunteer in garbage collection activities to keep their neighborhood clean. The level of response indicates and probably suggests interests for better environmental hygiene.

Majority of the high school and primary school students (75%) expressed willingness to donate some seedlings to their neighbors if they needed to plant some trees in their yards/fields. Majority (80%) of the high school and 75% of primary school students were completely willing to voluntarily participate in tree planting activities in their neighborhoods. The high-percent willingness probably suggests students' perception of the need for action to combat deforestation in their own locality. The majority of the primary school students (84%) were willing to donate some seedlings to a public primary school near where they live to plant at the school if they had tree nursery. This was an indication of conservation behavior because tree seedling is sold for monetary gain, but these respondents were selflessly willing to donate. Social studies they learn in school may also have played a major role in shaping their thought-form.

The survey also revealed that 77% of the high school students were also willing to donate some seedling to primary school. Majority (83%) of primary school students and 80% of the primary school students were willing to attend the meeting organized to discuss solutions to the environmental problem affecting their community. The impact of environmental degradation affects everyone in the ward. However, more so women and children are affected more than others because of house chores like looking for firewood and fetching water. Gill and Kewlani (2010) have reported that as the problems of deforestation worsened in India, there was a corresponding increase in the amount of time that women spent looking for firewood. Deforestation further reduced working hours in the agricultural fields thus aggravating poverty and hunger within these communities in India.

Natural environment enhances psychological satisfaction, a key ingredient for healthy lives (Bermudez et al. 2015). On the other hand, environmental degradation, particularly deforestation, can trigger the removal of the girl child from school to assist in these home activities to help in search for the scarce firewood. This can lead

Table 4 Pro-environmental behavior: *self-reported willingness to participate in community-organized environmental conservation activities* (N = 121)

	Category	Completely willing (%)	Partly willing (%)	Neither willing nor unwilling (%)	Not willing (%)	Completely unwilling (%)
Willingness to volunteer to participate in a community organized to clean water streams near the place I stay	High school	74	6	11	0	9
	Primary school	80	14	2	0	4
Willingness to volunteer in a garbage collection activity to keep neighborhood clean	High school	79	11	5	3	3
	Primary school	84	11	2	0	4
Willingness to donate some seedlings to neighbors if they need to plant some trees in their yards/fields	High school	75	9	3	5	0
	Primary school	75	14	5	5	0
Willingness to donate some seedlings to a public primary school near where I live to plant at the school	High school	77	9	5	5	5
	Primary school	84	9	4	0	4
Willingness to volunteer to participate in a tree planting activity in my neighborhood	High school	80	6	8	3	3
	Primary school	75	9	5	22	9
Willingness to meetings organized to discuss solutions to environmental problems	High school	80	14	3	0	3
	Primary school	83	7	5	5	0

(continued)

Table 4 (continued)

	Category	Completely willing (%)	Partly willing (%)	Neither willing nor unwilling (%)	Not willing (%)	Completely unwilling (%)
affecting my community						
Willingness to donate money toward youth environmental conservation activities such as wildlife clubs in schools	High school	59	23	8	5	6
	Primary school	55	23	5	9	7
Willingness to participate in community soil conservation activity in my neighborhood	High school	72	11	11	3	3
	Primary school	64	16	9	5	5
Willingness to donate money toward rural women groups involved in establishing tree nurseries	High school	63	14	5	8	11
	Primary school	84	5	4	4	4

Source: Survey data (2018)

to problems of gender parity in both high school and primary school enrollment. This can consequently perpetuate gender inequality in which women are unable to compete for jobs in the job market. Studies have shown that school wildlife and health clubs have positive environmental attitudes and pro-environmental behavior (Ajiboye and Silo 2008). Participants were asked to rank their willingness to donate money toward youth environmental conservation activities such as wildlife clubs in school. Results showed that barely over half of the high school students (59%) and 55% from primary were willing to donate money toward youth environmental conservation activities such as wildlife clubs in school.

Most soil conservation activities in rural areas rely on social capital for man power in undertaking various soil conservation activities. Social mobilization can take the form of men-to-men, women-to-women, but also youth mobilizing to dig trenches and holes among other soil conservation activities. Participants were asked to rank their willingness to participate in community soil conservation activities in my neighborhood. Majority (72%) of the high school and 64% of the primary school students were completely willing to voluntarily participate in soil conservation activities in their neighborhood. On the other hand, water was severely polluted by

runoff during the rainy season. During recent years, there have been increasingly more rural women groups involved with raising tree nurseries both as a source of income and as alternative sources of seedlings to plant in their farms. Participants were asked to rank the willingness to support rural women groups involved in establishing tree nurseries. Results obtained showed the majority (84%) of the primary school students and 63% from primary were willing to donate money toward rural women groups involved in establishing tree nurseries. Primary school students also appear to have understood the importance of trees.

Relationship Between Environmental Attitudes, Environmental Knowledge, and Pro-environmental Behavior and Participant's Gender and Level of Schooling

A two-factor MANOVA was conducted to examine the relationship between environmental attitudes, environmental knowledge, and pro-environmental behavior and participant's gender and level of schooling. The dependent variables in the model were composite scores of environmental attitudes; environmental knowledge; and pro-environmental behavior-1 "participant's self-reported willingness to support potential a government pro-environmental policy" and pro-environmental behavior-2 "participant's self-reported willingness to participate in community-organized environmental conservation activities."

Results obtained revealed that there is a significant relationship between students' level of schooling and environmental attitudes, $F = 11.79, (1, 120), p < 0.01$ (mean for high school students = 3.78, $SD = 0.57$; mean for primary school students = 3.31, $SD = 0.90$). In addition, there is a significant relationship between students' level of schooling and environmental knowledge, $F = 5.33, (1, 120), p < 0.05$ (mean for high school students = 2.83, $SD = 0.96$; mean for primary school students = 2.43, $SD = 0.92$). These findings are consistent with those from previous research.

Research findings revealed a significant relationship between gender and environmental knowledge, *that is, perceived severity of environmental problems*, $F = 9.62, (1, 120), p < 0.01$ (mean for girls = 2.91, $SD = 0.97$; mean for boys = 2.39, $SD = 0.88$). However, gender differences and, also, differences between primary and high school students' pro-environmental behavior were insignificant. Also, none of the interaction effects was statistically significant.

Lessons Learned, Study Limitations, and Recommendations for Future Research

Four of the most prevalent environmental problems mentioned by the students, namely, water pollution, deforestation, scarcity of water, and soil erosion, are consistent with the literature on prevalent problems confronting Kenya's rural citizens. It is unclear what informed student's mention of air pollution, among the list of top environmental problems. This is probably informed by literacy gained from classes on prevalent environmental problems globally. Compared to water pollution, Kenya has had considerable media publicity and, also public attention

during *barazas*, on deforestation and soil erosion as key threats to Kenya's environment and livelihoods. It is surprising, however, to find that students ranked water pollution as a top environmental problem.

This research is among the pioneer studies to use the NEP developed by Dunlap (Dunlap 2000). NEP scales have been used largely by researchers in western countries to measure environmental attitudes. Reliability tests revealed 9 out of the 15 NEW statements met the reliability threshold for a composite environmental attitude score. Further studies are needed to further explore the reliability of NEP scales for the measurement of environmental attitudes in Kenya. Measurements scales for environmental knowledge and pro-environmental behavior were adapted from literature. Further studies are needed to validate these scales in different parts of Kenya.

There are several limitations to this study. The target population is comprised of students largely drawn from one ethnic community. This potentially limits generalizations of study findings to different parts of the country. The study sample comprised of high school students were drawn from four, and primary school students were drawn from class seven. This study relied on a survey approach to gather data on self-reported environmental knowledge, environmental attitudes, and pro-environmental behavior. Future research needs to triangulate survey data with other techniques such as participant observation, to further verify correlations among variables. Potential opportunities for participant observations include targeting groups such as members of school health clubs and wildlife/environmental clubs to compare the extent of participation in and volunteerism toward community-organized environmental conservation activities.

This potentially limits generalizations of study findings to different schooling levels. There is, therefore, a need to examine primary versus high school students' environmental attitudes and pro-environmental behavior in other parts of Kenya and compare findings.

The study findings have implications on interventions, particularly by Embu County government and donor agencies working in the county, seeking to mobilize and engage participation by primary and high school students (school health clubs and wildlife/environmental clubs), in initiatives targeted to combat environmental degradation. Also, the country government use these findings to facilitate targeted environmental education to raise students' environmental attitudes and environmental knowledge to enhance conservation behavior.

Conclusion

Female students perceive environmental problems at the locality to be more severe, compared to their male counterparts. Nonetheless, gender differences in pro-environmental behavior are not statistically significant; also, between primary and high school students' pro-environmental behavior are significant. The study findings have implications on interventions by government and donor agencies seeking to mobilize student-led participatory efforts to promote environmental conservation and enhance rural communities' climate change adaptation efforts and resilience.

References

- Ajiboye JO, Silo N (2008) Enhancing Botswana children's environmental knowledge, attitudes and practices through the school civic clubs. *Int J Environ Sci Educ* 3(3):105–114
- Ajzen I, Fishbein M (1980) *Understanding attitudes and predicting social behavior*. Prentice-Hall, Englewood Cliffs
- Bermudez BC, Santos Branco DK, Trujillo JC, De Lima JE (2015) Deforestation and infant health: evidence from an environmental conservation policy in Brazil (No. 1008-2016-80406)
- Dunlap R (2000) Measuring endorsement of the new ecological paradigm: a revised NEP scale. *J Soc Issues* 56(3):425–442
- Gaye T, Hamide E, Ceren T, Semra S (2005) Environmental attitudes of young people in Turkey: effects of school type and gender. *Environ Educ Res* 11(2):215–233
- Gill MS, Kewlani J (2010) Deforestation and its impact on women. *Int NGO J* 5(7):171–176
- Government of Kenya (GoK) (2013) *National environmental policy 2013*. Nairobi. Government Printers
- Intergovernmental panel on climate change (IPCC) (2014) *Climate change 2014: mitigation of climate change*. Cambridge University Press, New York
- Johnson-Pynn JS, Johnson LR (2010) Exploring environmental education for East African youth: do program contexts matter? *Children Youth Environ* 20(1):123–151
- Kamweti J (2009) *Causes of deforestation in Africa*. Pauline, Nairobi
- Kioko J, Kiringe JW (2010) Youth knowledge, attitudes and practices in wildlife and environmental conservation in Maasailand, Kenya. *Southern Afr J Environ Educ*, Vol. 27
- Mango LM, Melesse AM, McClain ME, Gann D, Setegn SG (2011) Land use and climate change impacts on the hydrology of the upper Mara River basin, Kenya: results of a modelling study to support better resource management. *Hydrol Earth Syst Sci* 15(7):2245–2258
- Mifsud MC (2011) *An investigation on the environmental knowledge, attitudes and behavior of Maltese Youth*. Online Submission
- Millennium Ecosystem Assessment (2005) *Ecosystem and human well-being*. World Resources Institute, Washington, DC
- Shandra JM, Shandra CL, London B (2008) Women, non-governmental organizations, and deforestation: a cross-national study. *Popul Environ* 30(1–2):48–72
- Siefer D, Neaman A, Salgado E, Juan LC, Siegmar O (2015) *Human-Environment*. In: Smilor RW (ed) *The art and science of entrepreneurship*. Ballinger, Cambridge
- Ugulu I, Sahin M, Baslar S (2013) High school students' environmental attitude: scale development and validation. *Int J Educ Sci* 5(4):415–424

Open Access This chapter is licensed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.