

Assessing the Influence of School Environmental Programmes on the Environmental Attitudes and Behaviour Among Secondary School Students in Muranga County, Kenya.

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Abstract

Environmental degradation is a major challenge which requires appropriate strategies to reverse the situation. One of such strategies is experiential environmental education among high school students who, through change of attitudes and behavior, are able to participate in various environmental management activities. In this study the pro-environmental attitudes and behavior of high school students in Murang'a County, Kenya were examined to assess how environmental education programmes among the students affected environmental issues of waste management, water resources management, natural resources management and climate change in the schools. Nine hundred and sixty-one (961) students from nineteen (19) high schools from two sub-counties in the County was used in the study. The Likert type questionnaire and the 2-MEV Scale were used to collect the required data. The t-test statistic was applied to determine any differences between the variables. Results showed significant differences in pro-environmental attitudes and behavior with regard to solid waste management, water resources management, natural resources management. There were significant differences with regard to solid waste management, natural resources management, climate change and environmental concerns between members of Environmental Clubs and non-members. Pro-environmental attitudes and behavior were influenced by current membership of the Clubs rather than past membership. It is concluded that experiential environmental programmes improve the student's pro-environmental attitudes and behavior hence environmental management within the schools. It is recommended that appropriate policies be formulated to enhance the implementation of school experiential environmental programmes to ensure capacity building of the learners to effectively manage environmental issues in the schools.

Key words: *Environmental Education, Experiential Environmental Programmes, Pro-environmental Attitudes and Behaviors*

INTRODUCTION

Environmental degradation is a growing problem both locally and internationally, and will continue to be an issue in the future (Joldersma, 2017). This is because of the belief that “natural and physical resources are free and inexhaustible, and that the environment can assimilate all our wastes, leading to unsustainable use of resources” (Yarime *et. al* ,2012). Indeed, conservation scientists now posit that the earth is facing a sixth mass extinction (Johnson 2017). The on-going degradation can be attributed directly to human activity which has contributed significantly to the increasing crisis (Joldersma, 2017).

Therefore, since human action is at the heart of environmental issues, sustainable development ultimately depends on changing human behavior (Zelenika *et. al*, 2018). Notably, it has been noted that environmental degradation has been preceded by a long-standing erosion of environmental values from the human value system (Sanrakshan, 2014), which means it can also

be managed by changing relevant behavior. Indeed, according to Glažar *et. al* (1998), negative attitudes towards the environment and a low level of environmental awareness among the population are variables that can have a great social impact, highlighting the need for education for sustainable development.

Solutions to environmental issues acknowledge that environmental problems are not only problems of development, but basically problems of knowledge and education that go beyond learning about the environment, and that also have to do with the way in which environmental problems are understood and addressed (Sharma, 2016). Subsequently, coping with these problems requires education and engagement (Dillon, 2016), making environmental education increasingly important (Wals, 2014).

Environmental education is thus the key catalyst (Kaur, 2020), for the needed change, and a primary means of achieving environmental protection (Sharma, 2016). It is among the most effective strategies that does not require a large enough cost to change people's perspectives and attitudes towards the environment (Habibie, 2020).

To halt and reverse the ongoing degradation therefore requires appropriate mechanisms and strategies that promote environmental education, including policy formulation at both global, national and local levels, and upscaling of best practices. One other strategy to address this issue points at experiential environmental education among high school students who, through change of attitudes and behavior, are able to participate in various activities that conserve the environment.

In Kenya, environmental education (EE), both formal and informal, has been introduced to change students' attitudes and to appreciate environmental concerns (GoK, 2013). Kenya has incorporated environmental education considerations in the school curriculum (Kenya Institute of Education, 2002) and integrated it in the teaching of various subjects, both in the sciences and social subjects. This teaching of environmental education in Kenyan schools aims to develop in the students an appreciation of the environment, create positive attitudes and thereafter facilitate positive behaviors which will lead to the effective management and conservation of the environment (Kenya Institute of Curriculum Development, 2016). Subsequently, the knowledge and education among the students should be made manifest through positive environmental attitudes and behavior in society, leading to sustainable environmental management in the country.

However, despite environmental education being implemented in schools, the anthropogenic environmental impacts continue to increase in scale, which implies that the results on EE have not been seen (Kristalinawati, 2019). This means that EE as taught in schools does not seem to have the desired impact of promoting environmental conservation and instilling pro-environmental values and behavior. As such, the ongoing environmental degradation challenges have not been adequately addressed with most Kenyan citizens exhibiting poor environmental attitudes made manifest through negative environmental behavior

To boost environmental literacy and pro-environmental behavior, several experiential programmes are run in schools through clubs and societies. The purpose of this study was to investigate whether students' engagement in these experiential environmental programmes, which provide direct learning and conservation experiences among secondary school students,

positively impacts on instilling pro-environmental attitudes and behavior among learners in Kenya and Muranga county in particular. The study compared environmental knowledge, attitudes, and practices of secondary school students in their final year of secondary education who have participated in such experiential environmental programmes, so as to assess pro-environmental behavior which is an indicator of environmental education success (Hidayah, 2017).

METHODOLOGY

The study sites were located in two sub-counties in Muranga County, one of the 47 counties in Kenya. The county is in Central Kenya and is located in the Upper River Tana region. The County was selected because learners here have a higher chance in engaging in environmental management activities. The site also gives two different eco-systems – one that is semi-arid in the lowlands, and another that is humid in the highlands, and which mirrors the Kenya country context with regards to highlands and Arid and Semi-Arid lands (ASALs), meaning that study results from the study can be cascaded to reflect the situation in the country. The study sample was drawn from 19 secondary schools, of which 9 were from Kahuro (in the highlands) and 9 in Muranga South (in the ASALs) sub-counties. The total number of students sampled were 961, of which 44% were from Kahuro and 56% from Murang'a South. In terms of gender, female students were 58.8% and male were 41.2% of the total sample.

The study used quantitative methods in the collection of knowledge, attitudes and practices among the secondary school students. The questionnaire used tailored and based on the Environmental Attitude/Awareness Scale of Hassan Taj Environmental Attitude Scale; the 2-MEV Scale; "Attitude Scale for Environmental Issues" developed by Saraç and Kan (2015); and standardized tool of Environmental Behavior Scale (EBS) by Urmila Verma and Archana Singhal (2012). The questionnaire focused on knowledge, attitudes and practices, and avoided questions of an academic nature.

RESULTS AND DISCUSSION

Participation of Students in Clubs and Societies

There was good student membership in clubs and societies with an environmental component among the students sampled, with 51% of students being members, while 49% were non-members. In terms of sub-county, 47.5% of students in Murang'a South Sub-county were members of environmental clubs, while in Kahuro Sub-county, membership stood at 53.9%. With regard to gender, 52.9% of male students are members of environmental clubs while female membership stood at 48.9%. Membership of clubs and societies is voluntary in most schools. Students are usually attracted to those Clubs and Societies that are active and this is the main reasons that would explain the student membership in Clubs. Activity in the Clubs and Societies depended on school support, with regards to having a Patron who was active and supportive, and financial and material support from the school administration.

Scouts had the highest percentage of participants at 23 % of student Club members; followed by Wildlife clubs (22%); environmental clubs 21%; and Young farmers (19%). Other main clubs were: School Greening; Health club; while the smaller clubs included the Presidential Awards Scheme, Red Cross, and Peace Club, who were all engaged in some environmental activities.

Categories of Environmental Knowledge, Attitudes and Practices Among Respondents

The level of environmental knowledge, attitudes and practices was assessed in various environmental contexts and included: Solid wastes management; water resources management; hygiene; climate change and energy; natural resources management; and environmental concerns.

Solid Wastes Management

26% of the sampled students said they litter around when no one is watching. Of this group 15% did so because bins or they were far away; 8% because there were no bins; 15% of students did it sub-consciously; while 13% claimed it was due to ignorance coupled with carelessness.

When they get waste on the ground, 59% of the students sampled said they always picked it and placed it in trash bins; 7% always left it where it was; 25 % sometimes picked it up and put it in the trash bins, while 6% sometimes left it on the ground. When they finished eating something with some form of packaging while in a *matatu* (public transport vehicle); 27% of the sampled students tossed it out of the vehicle window; 7.5% threw it on the vehicles floor; 26% put it in the vehicles trash basket; and 36% kept it for later disposal in a trash bin.

The results of the study show that 45% of the sampled students had done some form of wastes recycling. Of these, 45% did it to keep the environment clean and for minimizing wastes generation; 36% did it for utility reasons as they were able to re-use the said products; while 19% did it for economic reasons such as saving monies or generating some money. Reasons given for not recycling were: Lack of technology (1.5%); lack of knowledge and know-how (1%); while 1% considered it a waste of time; and 0.5% saw no value in the waste to warrant recycling.

The findings of the study show 83% of students said they would willingly volunteer for a public clean-up exercise, while 17% said they would not. This is important to note because conservation work, and other pro-environmental practices are regarded lowly, and even regarded as punishment, or work for the lowly in society, thus creating a negative attitude among students about these pro-environmental activities. Ability to volunteer is thus an indicator of positive environmental attitudes.

Of the 'Yes' students, 64% said they would do so to keep the environmental clean; 15% said they would consider it as a community service; 8% for hygiene purposes and avoid diseases; 5% for environmental awareness creation within the community; and 3% as part of club activities. Among the 'No' students, 56% said they were busy and lacked time to volunteer; 23.4% said they were not interested; 13.3% said it was not their responsibility to clean; while 5.5% said it was risky with regards to their health. 83% of the students supported the ban on plastic bag carriers. Of these, 73% said they did so because the bags are agents of pollution (solid wastes and littering, air pollution when burnt); 21% because they are non-biodegradable; 2% because they block the drainage systems; and 1.2% because they can cause human diseases and animal deaths. Among those who did not support the ban (17%), the reasons given were that the bags were affordable (19%); the bags were re-usable (14%); have multiple uses (13%); and due to lack of good alternatives (12%). 23% consider school cleaning as part of punishment because it's mainly undertaken by wrongdoers; they came to school to study not to work (20%); its tiresome and time wasting (17%) and cleaning should be done by school support staff (7%). For those

who did not consider cleaning of the school as punishment (76%); school cleaning was part of ensuing a clean and habitable environment (49%), as part of conservation work and part of their responsibility (23%); and as a duty that moulds better future behavior (11%).

Table 1: T-Test Results for Solid Wastes Management

Attribute	Variables being compared	Means	95% Confidence Interval of the Difference		Difference of means	P value
			Lower	Upper		
Solid Wastes Management	Sub-county: Murang'a South (MS) and Kahuro (K)	MS = 6.99 K = 7.11	-0.441	0.197	-0.122	0.454
	Gender: Male (M), Female (F)	M = 6.65 F = 7.31	-0.986	-0.343	-0.665	0.000
	Membership of environmental clubs: Yes (Y); No (N)	Y = 7.20 N = 6.88	0.009	0.644	0.327	0.044
	Participation in environmental clubs before: Yes (Y); No (N)	Y = 7.13 N = 6.87	-0.080	0.598	0.259	0.134

After undertaking the comparison of means by use of t-tests, as shown in Table 1, it was determined that:

- 1) There is a significant difference in behavior on solid wastes management between male and female students in Murang'a county with the female students exhibiting better pro-environmental behavior. This is because girls are more conscious of their surroundings and are also generally cleaner. They also like to be associated with cleanliness than boys. This is in line with Stern *et. al.* (1993) who found that women have stronger beliefs about the harmful consequences of poor environmental conditions for others, the biosphere, and self and that these beliefs predicted more pro-environmental behavior.
- 2) There is a significant difference in behavior on solid wastes management between members of environmental clubs and non-members in Murang'a county. The difference in pro-environmental behavior can be attributed to the fact that most of the environmental clubs in school are engaged in aspects of cleanliness, including provision and emptying of bins. The students are also involved in improving the aesthetics of the schools by planting flowers and trees and maintaining them. The clubs thus seem to have reinforced the student's pro-environmental behaviors with regards to solid wastes management. The first-hand experience in cleanliness is an important influencing factor to getting students interested in nature, and positively influences students' beliefs towards their natural environment and eventually leads to pro-conservation behavior (Sharma, 2016). The question is "how do we create first-hand experiential opportunities for school students to learn about the natural environment?"

Water Resources Management

When they find a tap running, 88% of sampled students said they would turn it off; 2% said they would leave it open; 6% would sometimes leave the tap open (and close it other times). With regards to showering, 16% of students said they would take the shortest time possible; 36% would save water as much as possible by closing taps when soaping; 25% closed taps after use; and 19% said they take the longest time possible. When brushing teeth, 7% would leave the tap running as they brushed; 85% saved water by closing taps and only opening water when they required it; while 5% used cups/glasses to save on water.

Table 2: T-Test Results for Water Resources Management

Attribute	Variables being compared	Means	95% Confidence Interval of the Difference		Difference of means	P value
			Lower	Upper		
Water Resources Management	Sub-county: Murang'a South (MS) and Kahuro (K)	MS = 4.00 K = 4.06	-0.210	0.104	-0.053	0.506
	Gender: Male (M), Female (F)	M = 3.83 F = 4.13	-0.406	-0.088	-0.247	0.002
	Membership of environmental clubs: Yes (Y); No (N)	Y = 4.09 N = 3.96	-0.021	0.295	0.137	0.089
	Participation in environmental clubs before: Yes (Y); No (N)	Y = 4.03 N = 4.01	-0.152	0.195	0.021	0.808

After comparison of means using t-tests (Table 2), the following was determined:

- 1) There is a significant difference in behavior on water resources management between male and female students in Murang'a county. The difference between the means is -0.247 (95%CI -0.406, -0.088), with the higher one being among the female gender. This means that the female students have significantly more pro-environmental behavior than among male students. The female gender role of fetching water or assisting mothers at home do so means they appreciate the difficulties associated with water access and supply and therefore can be better stewards of the resource. This is in line with Hines *et al.* (1987), who suggests that female students were observed to more likely engage in responsible environmental behavior than the males.

Hygiene

After going to the toilets, 45% of students said they washed their hands with water and soap; 4% do not wash hands; 15% sometimes washed hands with soap; and 32% washed hands without soap. For those not washing hands with soap and water, 7% gave lack of running water as the main reason; 2% blamed broken wash basins; while 6% said wash basins are far off. For those

not using soap, 40% said that no soap was provided; soap was usually stolen (6%); and wash basins were far off (2%). Within the schools, the responsibility of washing toilets was with students 92%; staff (3.9%); and in some cases, both groups shared the responsibility.

Table 3: T-Test Results for Hygiene

Attribute	Variables being compared	Means	95% Confidence Interval of the Difference		Difference of means	P value
			Lower	Upper		
Hygiene	Sub-county: Murang'a South (MS) and Kahuro (K)	MS = 2.80 K = 2.88	-0.013	0.176	.082	0.090
	Gender: Male (M), Female (F)	M = 2.77 F = 2.90	-0.226	-0.038	-0.132	0.006
	Membership of environmental clubs: Yes (Y); No (N)	Y = 2.88 N = 2.81	-0.029	0.166	0.068	0.170
	Participation in environmental clubs before: Yes (Y); No (N)	Y = 2.85 N = 2.83	-0.082	0.130	.024	0.658

Following comparison of means using t-test (Table 3), it was determined that:

- 1) There is no difference in behavior in hygiene between students in Murang'a South and Kahuro sub counties. This is because the difference between the agro-ecological zones does not impact on hygiene education.
- 2) There is a significant difference in behavior in hygiene between male and female students in Murang'a County. The difference between the means is -0.132 (95%CI -0.226, -0.038), with the higher mean being for female students who exhibit more pro-hygienic behavior. As with cleanliness, girls are usually more conscious of their hygiene than boys and will thus take more trouble to ensure adherence to hygiene practices than boys. Zelesny *et. al* (2018) explained this by positing that females had higher levels of socialization to be other oriented and socially responsible. This is reinforced by Stern *et. al.* (1993) who found that women have stronger beliefs about the harmful consequences of poor environmental conditions for others, the biosphere, and self and that these beliefs predicted more pro-environmental behavior.
- 3) There is no difference in behavior in hygiene between members of environmental clubs and non-members in Murang'a County. This is because the behavior on hygiene is mainly affected by external factors, e.g. distance to taps and lack of soap in schools.

Climate Change and Energy

The students had noticed change in the weather and climate patterns. 28% of them had noticed more rain; 3% less rain; 36% more unpredictable rains; 35% changes in weather patterns; 2% more drought; and 3% more floods. The reasons given for climate changes were that they were acts of God (42%); natural changes (31%); because of use of fossil fuels (15%); due to environmental degradation (7%); and anthropogenic activities (6%).

When leaving a room last in the evening, 80% of students said they would put off the lights; 15% said they would sometimes leave the lights on; while 5% said they would always leave the leave lights on. This compares well with the behavior of students who find un-needed lights on in a room. 80% of students said they would turn the lights off; 14% would sometimes leave the lights on as they found them; while 6% would always leave the lights on. When taking a hot shower 16% of the sampled students said they take shortest time possible while 27% enjoy the shower for as long as possible. 23% of the students said they close taps after use, while 28.5% said they tried to save power as much as possible.

Table 4: T-Test Results for Energy and Climate Change

Attribute	Variables being compared	Means	95% Confidence Interval of the Difference		Difference of means	P value
			Lower	Upper		
Energy and Climate Change	Sub-county: Murang'a South (MS) and Kahuro (K)	MS = 5.92 K = 6.19	-0.509	-0.030	-0.270	0.027
	Gender: Male (M), Female (F)	M = 5.98 F = 6.08	-0.340	0.145	-0.098	0.429
	Membership of environmental clubs: Yes (Y); No (N)	Y = 6.18 N = 5.90	0.034	0.519	0.276	0.026
	Participation in environmental clubs before: Yes (Y); No (N)	Y = 6.08 N = 5.99	-0.200	0.340	0.070	0.610

To determine the impact of student’s locality, gender, current and past membership of environmental clubs, means were compared by use of t-tests (Table 4) and the following determined:

- 1) There is a significant difference in behavior in the area of energy and climate change between students in Murang’a South and Kahuro sub-county. The difference between the means is -0.270 (95%CI -0.509, -0.030) with the higher one being Kahuro sub-county. This means that student in Kahuro have significantly higher levels of understanding and behavior with regards to energy and climate change than those in Murang’a South. This can be explained by the fact climate change in Murang’a has been explained more with regards to rain – increase, decrease, and unreliable rains. With more rain in Kahuro,

aspects of climate change were thus clearer to the students who were also able to explain the links of this to human behavior.

- 2) There is no difference in behavior in the area of energy and climate change between male and female students in Murang'a County
- 3) There is a significant difference in behavior in the area of energy and climate change between members of environmental clubs and non-members in Murang'a county. The difference between the means is 0.276 (95%CI 0.034, 0.519) with the higher one being for members of environmental clubs. Most of the issues associated with pro-environmental energy and climate change understanding and behavior have to do with responsibility and leadership qualities which are among the key attributes that school administrations tie to being in the various environmental clubs. The skills learnt in the clubs are thus expressed by the responsible behavior of the students in their pro-environmental actions.

Natural Resources Management by Students

78% of the students said they had engaged in tree planting in the last one year, while 22% had not. 56.4% of the students planted the trees as individuals while 31% did it as part of a larger group. Of the students who had undertaken tree-planting, 60% said they had planted trees at home; 39% in School; 14% in churches; 4% in the forest; 1% along riverine; 0.8% in hills and parks; and 0.6% in other places. 80% of students had planted 1 – 20 trees; 21-50 trees (11%); 51 – 100 trees (4%); 101 – 200 trees (3%); and 1% students planting over 200 trees. Other than tree planting, 73% students said they further tended for the seedling planted. The tending aspect had thus increased the tree survival rates with 91-100% survival rates being observed by about 28% of the students; 71-80% survival by 20% of students, and 41-50% survival by 11% of students. The main reason for not planting trees was: Lack of interest (6%); lack of land (4%); lack of seedlings (9%); others will do it (2%); lack of opportunity to plan 91%); lack of time (0.6%) and; and 0.5% lack of support.

Table 5: T-Test Results for Natural Resources Management

Attribute	Variables being compared	Means	95% Confidence Interval of the Difference		Difference of means	P value
			Lower	Upper		
Natural Resources Management	Sub-county: Murang'a South (MS) and Kahuro (K)	MS = 5.63 K = 6.99	-1.737	-0.985	-1.361	0.000
	Gender: Male (M), Female (F)	M = 6.63 F = 5.94	.0302	1.077	0.690	0.001
	Membership of environmental clubs: Yes (Y); No (N)	Y = 6.59 N =5.85	0.350	1.125	0.737	0.000
	Participation in environmental clubs before: Yes (Y); No (N)	Y = 6.35 N =5.96	-0.033	0.818	0.392	0.71

After comparison of means using t-tests (table 5) it was determined that:

1. There is a significant difference in behavior on natural resources management between students in Murang'a South and Kahuro Sub-counties. This can be explained by the fact that Kahuro lies in the upper zone which has more rain unlike Murang'a South which is drier. The students in Kahuro engaged in natural resources management especially as regards to tree planting and tending thus have a higher chance of success than in Murang'a South where the chances of the trees planted surviving are lower. The engagement of students in the activity is thus tied to its chance of success which can be tied in to the aspect of locus of control which is the degree to which people believe that they have control over the outcome of events. In this regard, students in Kahuro can engage more in natural resources management because they believe it will have an impact as opposed to those in Murang'a South who have less control due to external factors related to the weather and changes of success. As such, the students in Murang'a South may feel that they are 'helpless', without blame, and not in control of their success or failure as regards engagement in natural resources management. This shows that people only behave in an environmentally responsible manner when they are sufficiently motivated and are capable of generating qualitative changes - optimistic attitudes leading to positive practices and vice-versa (Zheng, *et. al.*2018)
2. There is a significant difference in behavior on natural resources management between male and female students in Murang'a county. The difference between the means is 0.690 (95%CI 0.302, 1.077), with the male mean being higher at 6.63. This means that male students are more fully engaged in natural resources management than their female counterparts.
3. There is a significant difference in behavior on natural resources management between members of environmental clubs and non-members in Murang'a county. The difference between the means is 0.737 (95%CI 0.350, 1.125), with the mean being for those participating at 6.63. This means that students participating in environmental clubs are significantly more active in natural resources management than those who do not participate.

The students' participation in natural resources management by the students in Murang'a county was impressive. With an average 10 trees planted per student, and at least 50% survival on average, this translates to about 5 surviving trees per student. With about 100,000 secondary school students, this means that Murang'a County students are able to plant and grow about half a million trees in a year, which is about 1% of the 500 million trees, the country plans to plant (note, not grow) this year as it tries to meet the 10% tree cover in the country. This means that the country can actually target secondary students to grow about 30% of the planned annual tree

growing, and if it goes down to primary schools, assuming the same tree growing potential, the whole target would actually be met by the students.

Environmental Concerns by Students

Table 7: T-Test Results for Environmental Concerns

Attribute	Variables being compared	Means	95% Confidence Interval of the Difference		Difference of means	P value
			Lower	Upper		
Environmental Concerns	Sub-county: Murang'a South (MS) and Kahuro (K)	MS = 5.711 K = 6.521	-1.0181	-0.6028	-0.8105	0.000
	Gender: Male (M), Female (F)	M = 6.309 F = 5.900	0.1991	0.6193	0.4092	0.000
	Membership of environmental clubs: Yes (Y); No (N)	Y = 6.189 N = 5.945	0.0184	0.4686	0.2435	0.034
	Participation in environmental clubs before: Yes (Y); No (N)	Y = 6.113 N = 5.978	-0.1085	0.3781	0.1348	0.277

With regard to environmental concerns by students, it was determined through the comparison of means using t-tests (Table 7), that:

1. There is a highly significant difference in environmental concerns between students in Murang'a South and Kahuro sub-counties due to the high significance level of $p = 0.000$. As outlined in the concerns, deforestation and soil erosion are more likely experienced frequently in the upper of the agro-ecological zones than in the lower areas.
2. There is a significant difference in environmental concerns between male and female students in Murang'a county. The difference between the means is 0.4092 (95%CI 0.1991, 0.6193) with the higher one being for male students.
3. There is a significant difference in behavior in environmental concerns between members of environmental clubs and non-members in Murang'a county. The difference between the means is 0.2435 (95%CI 0.0184, 0.4686) with the higher one being for male students. This shows that it is the environmental attitudes and individual's sense of responsibility towards the environment that really shape environmentally friendly behavior (Chen 2016).

Overall Findings

Table 8: T-Test Results for Environmental Knowledge, Attitudes and Behavior

Attribute	Variables being compared	Means	95% Confidence Interval of the Difference		Difference of means	P value
			Lower	Upper		
Total scores	Sub-county: Murang'a South (MS) and Kahuro (K)	MS = 31.13 K = 33.66	-3.4255	-1.6433	-2.5344	.000
	Gender: Male (M), Female (F)	M = 32.22 F = 32.26	-0.9459	0.8624	-0.0417	0.928
	Membership of environmental clubs: Yes (Y); No (N)	Y = 33.13 N =31.34	0.8734	2.7050	1.7892	0.000
	Participation in environmental clubs before: Yes (Y); No (N)	Y = 32.54 N =31.64	-0.1169	1.9198	0.9014	0.083

When all the scores for the various aspects of knowledge, attitudes are combined, it was determined that:

1. There is a significant difference in in environmental knowledge, attitudes and behavior between students in Murang'a South and Kahuro sub counties with higher pro-environmental behaviour in Kahuro
2. There is no difference in behavior in environmental knowledge, attitudes and behavior between male and female students in Murang'a County. This agrees with Zelezny, *et. al* (2000) who indicated that while women report stronger environmental attitudes and behaviors than men, as a single variable, the effect of gender on pro-environmental behavior was consistently stronger than on environmental attitudes. This has been seen to be true on behavior, with attitudes being lower than males, resulting to a net zero difference.
3. There is a significant difference in behavior in environmental knowledge, attitudes and behavior between members of environmental clubs and non-members in Murang'a county. This shows that the clubs, through their experiential learning expose students to an active process of learning, where there is interaction between the learner and the environment, making leaning enjoyable (Anderson, 1987). The hands-on approach leads to heightened awareness and ultimately action (Chawla, 2015). The ultimate aim of education is to change human behavior (Harold, 2015) which is key to tackling and preventing environmental degradation. It can also be concluded that it is difficult to teach the values of conservation and preservation to persons who do not appreciate the natural world around them or who are afraid or loathe to venture into it (Chawla, 2015).

4. There is no significant difference in behavior in environmental knowledge, attitudes and behavior between students who have participated in environmental clubs in the past and those who have not in Murang'a county. This re-affirms that past membership has no impact on pro-environmental behavior, unlike that of current membership.

CONCLUSIONS AND RECOMMENDATIONS

The findings have established that environmental programmes actually improve student's pro-environmental behaviour and thus contribute to environmental literacy. This is because students who participate in school environmental clubs with aspects of environmental conservation have significantly more pro-environmental attitudes and behaviour than those students who do not participate in such clubs. The effectiveness of the clubs in promoting environmental literacy is due to the experiential learning methods where students learn by engaging in environmental activities which in turn transform their knowledge into action as regards environmental conservation.

Across the different aspects of environmental attitudes and practices, namely, with regard to solid wastes management; water resources management; hygiene; climate change and energy; natural resources management; and environmental concerns; students participating in the school environmental programmes were seen to be significantly different with regards to pro-environmental attitudes, and behaviour and therefore overall environmental literacy as their knowledge had transformed into action.

Female students had significantly higher knowledge, attitudes, and behaviour than their male counterparts in the areas of solid wastes management, water resources management, and hygiene. The reverse was however true in the areas of natural resources management, and environmental concerns where male students had significantly better pro-environmental behaviour and attitudes and thus higher environmental literacy. In the area of climate change and energy, there was no significant difference in knowledge, attitudes and behaviour based on gender.

Overall, pro-environmental attitudes and behaviour and overall environmental literacy was also different based on the students agro-ecological zones, and also with regards to climate change and energy; natural resources management; and environmental concerns with students in Kahuro exhibiting better environmental literacy and as such better pro-environmental attitudes, and behavior. This was due to the fact that Kahuro lies in the upper zone which has more rain unlike Murang'a South which is drier. The students in Kahuro engaged in pro-environment activities more due to the fact that they had higher chances of success, which can be tied in to the aspect of locus of control which is the degree to which people believe that they have control over the outcome of events. In this regard, students in Kahuro can engage more in natural resources management because they believe it will have an impact as opposed to those in Murang'a South who have less control due to external factors related to the weather and chances of success. This shows that people only behave in an environmentally responsible manner when they are sufficiently motivated and are capable of generating qualitative changes - optimistic attitudes

leading to positive practices and vice-versa (Zheng, et. al.2018). As outlined in the concerns, deforestation and soil erosion are more likely experienced frequently in the upper of the agro-ecological zones than in the lower areas. There was no significant difference with regards to hygiene, solid wastes management, and water resources management.

The clubs and programmes, having been seen as boosting environmental literacy, should thus be encouraged and supported. Leeming et al., (1993) reported that participation in nature-related activities led the students to appreciate the nature and accept the environmental issues. Their curiosity is also aroused, and their subsequent participation in the natural activities, helps develop individuals' sense of responsibility and motivation to take environmental action. This has started in a way through the Competency Based Curriculum which is being implemented in the lower primary classes at the moment. Ways to initiate a policy for informal environmental education in the current 8-4-4 system that is gradually being phased out should also be undertaken so that those who are already in the system do not loose out with regards to environmental literacy whose success should be measured once it is translated to pro-environmental attitudes and behaviour.

REFERENCES

- Batanero, J.M. *et. al.* (2018). Design, Application and Evaluation of a Technological Instrument about Environmental Education. *International Journal of Environmental & Science Education* E-ISSN: 1306-3065 2018, Vol. 13, No. 7, 579-588
- Dillon, J. (2016). 50 Years of JBE: From Science and Environmental Education to Civic Science. *J. Biol. Educ.* 50, 120–122.
- Erdogan, M. (2011). “The Effects of Ecology-Based Summer Nature Education Program on Primary School Students’ Environmental Knowledge, Environmental Affect and Responsible Environmental Behavior.” *Educational Sciences: Theory and Practice* 11(4), pp. 2233-2237
- Glanz, K., Lewis, F.M. & Rimmer, B.K. (Eds) (1997). *Health behavior and health education: Theory research and practice: 2nd edition.* San Francisco.
- Government of Kenya, 2013. *National Education for Sustainable Development Policy (draft).* Government Printer, Nairobi.
- Government of Kenya, 2013. *National Environment Policy.* Government Printer, Nairobi
- Grund J., & Broc. A. (2020). *Education for Sustainable Development in Germany: Not Just Desired but Also Effective for Transformative Action.* Sustainability, 2020.
- Habibie, A. (2020). The Effect of Personality over Student Insights on the Environment. *International Journal of Multicultural and Multi-Religious Understanding.* ISSN 2364-5369 Volume 7, Issue 2 March, Pages: 74-81.
- Hassan *et. al.* (2019). *The Level of Environmental Knowledge, Awareness, Attitudes and Practices Among University of Kebangsaan Students.* University Kebangsaan Malaysia.

- Hines, J., Hungerford, H., & Tomera, A. (1986). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *The Journal of Environmental Education*, 18(2), 1-8.
- Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, IPBES.
- Bruce, J., & Constantinos C. (2011). The 2-MEV Scale in the United States: A Measure of Children's Environmental Attitudes Based on the Theory of Ecological Attitude. *The Journal of Environmental Education*, 42(2), 84–97.
- Joldersma, C. (2017). Education, Change, and Development, Educational Theories and Philosophies. *Oxford Research Encyclopedia of Education*. Oxford University Press USA, 2017.
- Kaur, M. (2020). Maninder. Impact of Environmental Education on Environment Awareness among School Students: A Case Study of District Amritsar (Punjab). *Studies in Indian Place Names (UGC Care Journal) ISSN: 2394-3114 Vol-40-Issue-40*.
- Kopnina, H. (2012). Education for sustainable Development: The turn away from 'environment' in environmental education. *Environmental Education Resources*.
- Linda, S., & Charles, V. (2009). Encouraging pro-environmental behavior: An integrative review and research agenda. University of Groningen, Faculty of Behavioral and Social Sciences, The Netherlands. *Journal of Environmental Psychology* 29 pp 309–317.
- Kristalinawati, S. Utomo, W., & Susilo T. E. B. (2019). Effect of teacher's performance in the implementation of environmental education to the student's active participation in maintaining environmental sustainability. *JPLB*, 3(3):364-378 ISSN 2598-0017 | E-ISSN 2598-0025
- Leeming, F.C., Dwyer, W.O., Porter, B.E. & Cobern, M.K. (1993). Outcome Research in Environmental Education: A Critical Review. *Journal of Environmental Education* 24 (4): 8-21.
- Loubser, C.P. (2012). Students' Views about the Inclusion of Environmental Education and Education for Sustainability in Teacher Education Courses. Department of Science and Technology Education, University of South Africa, Pretoria, South Africa
- Martínez-Borreguero Guadalupe, Jesús Maestre-Jiménez, Milagros Mateos-Núñez and Francisco Luis Naranjo-Correa (2020). An Integrated Model Approach of Education for Sustainable Development: Exploring the Concepts of Water, Energy and Waste in Primary Education. *Sustainability*.
- Sandhu, S. S. (2015). Environmental Awareness of Secondary School Students In Relation To Gender And Locale. *International Journal of Informative & Futuristic Research IJIFR/ V3/ E4/ 003 pp1188-1192 ISSN: 2347-1697*.

- Schneiderhan-Opel, J., & Bogner F.X. (2020). The Relation between Knowledge Acquisition and Environmental Values within the Scope of a Biodiversity Learning Module. Sustainability.
- Sasikala, M. (2014). Environmental Education - An Instrument for Inculcating Healthy Attitudes Towards Environmental Development. Indian Journal of Applied Research. Volume: 4 | Issue: 7
- Schultz, P.W.; Oskamp, S.; Mainieriv, T. (1995). Who recycles and when? A review of personal and situational factors. *J. Environ. Psychol.* 15, 105–121.
- Sharma, P. K. (2016). Assessment of Environmental Literacy of School Students. Calorx Teachers' University.
- Singh, R. (2015). Environmental Awareness Among Undergraduate Students in Relation to Their Stream of Study and Area of Residence. *Scholarly Research Journal for Interdisciplinary Studies.* ISSN2278.8808.
- Stern, P.C. (1991). Managing scarce environmental resources. In *Handbook of Environmental Psychology*; Stokols, D., Altman, Y.I., Eds.; Wiley and Sons: New York, NY, USA, 1991; Volume 2, pp. 1043–1088.
- Taj Hassen (2001). Manual for Environment Awareness scale, Department of education. Bangalore University.
- UNESCO (1976). The Belgrade charter on environmental education. *Connect UNESCO-UNEP Environ. Educ. Newsletter* 6, 135–136.
- UNESCO (2007). The UN Decade of Education for Sustainable Development (DESD 2005–2014) The First Two Years.
- UNESCO (2014). Roadmap for Implementing the Global Action Programme on Education for Sustainable Development; UNESCO: Paris, France.
- UNESCO (2014). United Nations Decade of Education for Sustainable Development (2005–2014): International Implementation Scheme; UNESCO: Paris, France.
- UNESCO (2017). Education for Sustainable Development Goals: Learning Objectives; UNESCO: Paris, France.
- UNESCO (2020). Sustainable Development Goals (Online); UNESCO: Paris, France, 2015; United Nations Environment Programme (1972). Stockholm 1972—Declaration of the United Nations Conference on the Human Environment; UNEP: Nairobi, Kenya.
- United Nations General Assembly. A/RES/57/254—United Nations Decade of Education for Sustainable Development— UN Documents: Gathering a Body of Global Agreements; United Nations General Assembly: New York, NY, USA.

UNESCO. Education for Sustainable Development Goals: Learning Objectives. Paris. 2017

Wals, A., Weakland, J., and Corcoran, P. B. (2017). Preparing for the Ecocene: Envisioning futures for environmental and sustainability education. *Japanese Journal of Environmental Education*, 26(4): 71-76.

Zelenika, I.; Moreau, T.; Lane, O.; Zhao, J. Sustainability education in a botanical garden promotes environmental knowledge, attitudes and willingness to act. *Environ. Educ. Res.* 2018, 24, 1581–1596.

Zeng Jingjing, Meiquan Jiang and Meng Yuan (2020). Environmental Risk Perception, Risk Culture, and Pro-Environmental Behavior. *International Journal of Environmental Research and Public Health*. March 2020.

Zheng et al., (2018): Correlation between the environmental knowledge, environmental attitude, and behavioral intention of tourists for ecotourism in China. *Applied Ecology and Environmental Research* 16(1):51-62. Budapest, Hungary