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CONSERVATION-EDUCATION: A PANACEA TO MITIGATE THE IMPACT OF CLIMATE-CHANGE IN TARABA STATE, NIGERIA

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ABSTRACT

Effects of teaching conservation-education using KACE and NKACE methods of instruction as a panacea to mitigate the impact of climate change in upper basic education students were investigated. The design was quasi experimental, involving pretest and posttest. A sample of 529 upper basic education students was drawn from a population of 2646. Conservation-Education Test (CET) was used to collect data. The reliability of CET was calculated using Pearson Product Moment Correlation Co-efficient (PPMC) to be 0.84. Three objectives, three research questions and three null hypotheses guided the study. Research questions were answered using mean and standard deviation while the null hypotheses were tested at p≤0.05 level of significance using the One-way Analysis of Covariance (ANCOVA). The findings of the study among others revealed that students in the EG (KACE) have better concepts and application of conservation principles more than their counterparts in the CG (NKACE). It was concluded that the use of KACE outdoor method of instruction could mitigate the impact of climate change in Taraba State if widely apply. One of the recommendations is that science teachers should incorporate the use of KACE instructional strategy into the teaching of conservation education in the secondary schools.

Keywords: Kinetic Approach Conservation Education (KACE), Non-Kinetic Approach Conservation Education (NKACE), Ecosystem, Conservation, Climate Change, Global Warming, Mitigate, Panacea

INTRODUCTION

Conservation is the controlled exploitation or use of the natural resources such as the soil, plants, animals, water, among others, in order to allow their continuity and also to preserve the original (green nature) of the environment, Maikano (2022). Conservation education is synonymous to climate change education and it is the process of teaching the learner on how to take good care of their environment in order to maintain its greener nature. This can be achieved through discouraging harmful environmental practices like deforestation, pollution and encouraging good environmental practices like afforestation, recycling of non-biodegradable wastes like polythene bags, plastic, among others. This research was centred on the young students of the Upper Basic Education (UBE 1 – 3) IN Jalingo Education Zone of Taraba State because they are younger and have more time to interact with their environment which could positively heal it. This research was also keyed to the Upper Basic Students because it will entrench into the students the principles of environmental care through afforestation, control of pollution, recycling of non-biodegradable wastes, control of pollution, control of soil erosion, protection of endangered species like *Panthera leo* (lion), proper sewage & garbage waste disposal, control oil spillage, among others.

In this research work, conservation education also factored in, the teaching of the young ones which own the future on the dangers of using fossil fuel, such as diesel, petrol, aviation spirit because of the greenhouse gases, such as: carbon monoxide (CO), Carbon dioxide (CO2), Chlorofluorocarbon (CFC) that these bio fuels emit. The students were also taught about the renewable energy such as hydro, solar, wind, electrical, among others which are globally being conversed for, in order to reduce the emission of the greenhouse gases which will consequently reduce the impact of global warming on the earth surface. The students were also taught about the electric vehicles currently being introduced globally by the developed economy like the United States of America (USA), United

Kingdom (UK), Russia, China, among others which are environmentally friendly because of their zero level of greenhouse gas emission. The students were taught about some local ways to maintain greener environment. Some of these ways are, reducing the use of chemical fertilizers and pesticides in agriculture, afforestation by planting more trees, good solid wastes treatment and recycling plants, recovery and recycling materials, especially the non-biodegradables, saving energy at home by using energy saving bulbs. The entrenchment of conservation education in the mind of the young ones is very essential and timely because of the effects of global warming, like flooding, high temperature, abnormal seasonal changes, heat waves, desertification, melting of sea ice, gene mutations, dead of aquatic and terrestrial flora and fauna species, among others, that are already knocking at our doors.

Conservation education is keyed to the future survival of the bio-diversity found on the planet earth. When young ones who own the future are properly equipped with principles and skills like afforestation, recycling of non-biodegradables, control of the greenhouse gas emission, among others, their positive impact would be well felt on the global ecosystem because of the changed in interest, attitude and behaviour they must have acquired through the conservation education and their impactful life span on the earth surface which is very high because of their young and impactful age. One of the recommendations of this research work also encourages the stakeholders such as the Federal Government, State Government, Nigerian Conservation Foundation (NCF) to provide adequate resources for the conservation education in the secondary schools in Nigeria so that, the students can be well motivated to give their best to learn, care for the environment and also to serve as models to mentor other young ones.

Problem Statement

The acquisition of conservation education among learners is very important and necessary in order to mitigate the prevalent negative impact of climate change on the planet earth which is caused primarily by human activities through industrialization, emission of greenhouse gases, deforestation, and harmful agricultural practices, among others. Conservationists/ Climate Change Educators (CCE) were able to identify some of causes of global warming like power plants, transportation, agriculture, deforestation, oil drilling, natural gas drilling, permafrost, garbage, volcanic eruption, bush burning, among others. Solutions have been proffered and also implemented to some extent. However, the persistent lack of educating learnerscould interfere with the global attainment of greener natural environment which is not healthy for the survival of biodiversity on planet earth due to degradation of the environment by human activities. This prompted the researchers to investigate, if the inculcation into the students the ways to mitigate the negative impact of climate change through conservation education could be a panacea to the menace that is daily endangering the survival of man and other biodiversity on the planet earth. This is the premised on the paradigm that the learners own the future, and if they have good knowledge of conservation education, their behaviour to the natural environment could help to save planet earth from destruction due to unfriendly and harmful human activities.

Objectives of the Study

The main objectives of the study are to:

i. Ascertain the care of the environment through conservation education.
ii. Determine some of the measures that can be put in place to maintain the green natural environment.
iii. Point out some of the harmful environmental practices and the panacea to mitigate them.

Research Questions

i. What is the effect of conservation education on the greenish care of the environment on the students taught using KACE and NKACE methods of instruction?

ii. What are some of the conservation principles that can be enforced in order to maintain the original green nature of the environment noticeable between the KACE and NKACE groups?
iii. What are some of the harmful environmental practices identified by the KACE and NKACE groups and the ways to mitigate them from the environment?

Research Hypotheses

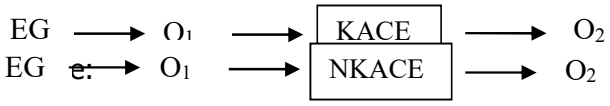
Ho1: There is no significant difference on the effects of conservation education to the greenish care of the environment between the conservation education students taught conservation principles using the KACE and those taught using NKACE methods of instruction.

Ho2: There is no significant difference on the observed conservation principles that can be enforced in order to maintain the original nature of the environment between the KACE and NKACE groups of students.

Ho3: There is no significant difference on the identified harmful environmental practices and how to mitigate them experimentally between the KACE and NKACE groups of students.

METHODOLOGY

This study was a quasi-experimental type of the pretest, posttest, non- equivalent, control group design. The design is a 2 x 2 factorial design. This paradigm represents two levels of treatment; the school taught conservation education using the practical outdoor kinetic approach (EG KACE) and the school taught conservation education using the non- practical or non- kinetic indoor approach (CG NKACE), and two levels of gender (male and female). This research design is graphically illustrated as follows:



EG: Experimental Group (KACE)
CG: Control Group (NKACE)
KACE: Kinetic Approach Conservation Education
NKACE: Non- Kinetic Approach Conservation Education
O_1: Pretest (to ascertain group equivalence)
O_2: Posttest (to determine the level of conservation skills acquisition)

Two schools were chosen in each of the three (Ardo-Kola, Lau and Jalingo) Local Government Areas for this research, making a total of six schools. In each of the Local Government Area, one school was used during the treatment as EG (KACE) while the other one was used as the CG (NKACE). Six research assistants were trained for this purpose, where each of them handled one school for the treatment purposes in the study locations with strict guide lines to follow, depending whether it was EG or CG. The three researchers served as the overseers in each of Local Government Area. This treatment lasted for eight weeks, using Friday and Saturday, with a minimum contact period of three hours each.

Population of the Study

The population of the study was made up of Upper Basic Education (UBE) Students in the public secondary schools in Jalingo Education Zone of Taraba State, Nigeria. Again, the choice of this group of students was based on the fact that, they were relatively younger and would have enough time within their life span to practice whatever conservation skills and principles they must have acquired in the course of this research work. The choice of Jalingo Education Zone is premised on the fact that, it is urban and semi- urban in nature where a lot of human activities like agriculture, vehicular movement, constructions, fishing, and mechanic workshops, among others that can easily degrade

or change the original nature of the environment were easily accessible. Jalingo Education Zone comprises of three Local Government Areas (Ardo- Kola, Lau and Jalingo). The Education Zone have 47 public secondary schools, their breakdown based on Local Government Area is: Ardo- Kola 11, Lau 11 and Jalingo 25(2022: Planning and Statistics Unit of PPSMB Office Jalingo). According to the Planning and Statistics Unit, the population of Upper Basic Students in 2021/2022 academic session as 2,646 students. This population is made up of 1,103 female and 1,543 male.

Sample and sampling

The total population was 2,646, out of which 1,103 were female and 1, 543 male. 20% of 2,646 which was 529, consisting of 229 female students and 300 male students was taken as the sample size. In the first stage, purposive sampling was used in selecting only six co-educational public schools. In the second stage, simple random sampling technique was used to assign and paired the six schools into three experimental and three control groups. This large sample size was used in order to allow a wide range of distribution within the 3 (Ardo- Kola, Lau and Jalingo) Local Government Areas where each Local Government Area had one experimental and one control group of the students.

Instrumentation

The research instrument used for this study was a Conservation Education Test (CET). This instrument was constructed by the researchers and validated by experts in science education, test measurement, based on the key topics in the area of conservation like global warming, greenhouse gases and their emission, degradation, waste management, deforestation, afforestation, green environment, among others. Data were collected primarily using the research instrument (CET) developed by the researchers called the 'Conservation Education Test. Descriptive statistics of mean and standard deviation were used to answer the research questions while the inferential statistics of Analysis of Covariance (ANCOVA) was used to test the hypotheses at $p \leq 0.05$ level of significance with the pretest serving as covariates.

Results

Research Question One

What is the effect of conservation education on the greenish care of the environment on the students taught conservation education using the KACE and NKACE methods of instruction?. The data used in answering this research question is found in Table 1.

Table One: **Mean conservation education scores and standard deviations of conservation students taught conservation principles using the KACE and NKACE methods of instruction**

Group	N	Pretest		Posttest		Mean Gain
		Mean	Std Dev	Mean	Std Dev	
KACE	264	12.40	1.85	39.09	2.71	26.69
NKACE	269	11.55	1.35	26.12	4.09	14.57
Mean Difference		0.85		12.97		12.12

Table one shows that the posttest mean scores of students taught using the Kinetic Approach Conservation Education (KACE) is 39.09 with the standard deviation of 2.71 while those students taught using the Non-Kinetic Approach Conservation Education (NKACE) have the mean scores of 26.12 with the standard deviation of 4.09. The difference between the pretest and posttest mean scores of KACE group is 26.69, while that of the NKACE group is 14.57. The pretest and posttest conservation education mean scores differences for the two groups show that, the KACE group is

higher. The implication is that, the students taught conservation education with KACE gained in enforcing conservation principles, like afforestation, recycling of non- biodegradable wastes, among others more than their NKACE counterparts.
In order to establish if the difference is statistically significant, inferential statistics (ANCOVA) was used to test hypothesis one.

Hypothesis One
There is no significant difference on the effect of conservation education to the greenish care of the environment between the conservation students taught conservation using the KACE and NKACE methods of instruction. Data testing this hypothesis is found in Table two.

Table Two: **One- way Analysis of Covariance of the mean effect of conservation scores of students in KACE and NKACE methods of instruction**

Sources of Variation	Sum of squares	DF	Mean square	F	Sig.	Partial Eta squared
Corrected model	3026.101	2	1513.051	100.220	.000	.642
Intercept	607.940	1	607.940	40.268	.000	.264
Pretest	494.603	1	494.603	32.761	.000	.226
Group	2317.579	1	2317.579	153.510	.000	.578
Error	1690.890	1.118	14.330			
Total	96226.000	1.21				
Corrected total	4716.991	1.20				

Table two is One-way ANCOVA between groups' analysis of covariance to compare the effect of Kinetic Approach Conservation Education (KACE) and the Non- Kinetic Approach Conservation Education (NKACE) methods of instruction on students' impact of conservation education on the maintenance of natural environment. The result F (1.118) = 153.510, P= .000 ≤ 0.05, shows that, the two groups differ significantly in favour of the EG KACE. Thus, the null hypothesis is rejected. Therefore, there is a significant difference on the impact of conservation education students taught conservation education using KACE and NKACE methods of instruction. The effect size (eta square = .578) is high and it indicates that 57.8 % of the difference in the mean scores is in favoured on the method (KACE) used.

Research Question Two
What are some of the conservation principles that can be enforced in order to maintain the original nature of the environment observed between the KACE and NKACE groups?. Data answering this research question is found in Table three.
Table Three: **Mean conservation principles scores of the students exposed to KACE and NKACE methods of instruction in preserving the original nature of the environment.**

Group	N	Pretest		Posttest		Mean
		Mean	Std. Dev.	Mean	Std. Dev.	Gain
KACE	264	13.00	2.05	42.60	1.96	29.60
NKACE	265	12.90	2.01	20.84	2.67	7.94

Mean Difference	0.10	21.76	21.66

Results in Table three reveals a posttest mean scores of 42.60 with Standard deviation of 1.96 for the KACE group of students taught conservation principles using the kinetic approach. On the other hand, NKACE students taught conservation principles using the non kinetic approach had a posttest mean scores of 20.84 with a standard deviation of 2.67. The difference between the pre-test and posttest mean scores of KACE is 29.60 and that of NKACE students is 7.94. These differences show that the NKACE (EG) has learned more of the conservation principles than the NKACE (CG) group. The findings of these results revealed that, the NKACE group can develop a greener environment by afforestation, pollution cleanup under normal conditions more than the NKACE group given the same conditions.
In order to establish if the difference is statistically significant, inferential statistics (ANCOVA) was used to test hypothesis two.

Hypothesis Two
There is no significant difference on the observed conservation principles that can be enforced in order to maintain the original nature (green environment) of the environment between the KACE and NKACE groups of students. Data testing this hypothesis is found in Table four.

Table Four: **One- way Analysis of Covariance of the observed conservation principles between the KACE and NKACE groups of students taught the enforcement of the conservation principles using the kinetic and the non kinetic approaches.**

Sources of Variation	Sum of squares	Df	Mean square	F	Sig.	Partial Eta squared
Corrected Model	195.210	2	97.605	6.191	.004	.181
Intercept	781.149	1	781.149	49.545	.000	. 469
CMS Pretest	192.365	1	192.365	12.201	.001	. 179
CMS Instruc. Methods	22.426	1	22.426	1.422	.001	. 025
Error	882.925	53	16.659			
Total	64474.000	55				
Corrected total	1078.136	54				

a. Rsquared = .181 (Adjusted R = .152)

Table four is the One- way ANCOVA between the methods of instruction analysis of covariance to compare the effects of KACE and NKACE on the students' enforcement of conservation principles. The results F (1.53) 1.422, P .001 ≤ 0.05 shows that the variation of scores for KACE and NKACE students varied. Thus, the null hypothesis is rejected. Therefore, there is statistically significant difference between the enforcement of conservation principles between the groups of KACE (EG) and NKACE (CG) groups of students in favour of the KACE group.

Research Question Three
What are some of the harmful environmental practices identified by the KACE and NKACE groups of students and the ways to mitigate them from the environment?. Data answering this research question is found in Table Five.

Table Five: **Identified harmful environmental practices noticed by the students taught conservation education using the KACE and NKACE methods of instruction**

Group	N	Pretest		Posttest		Mean
		Mean	Std. Dev.	Mean	Std. Dev.	Gain
KACE	264	12.80	2.50	37.54	3.41	24.74
NKACE	265	12.00	2.20	20.69	2.15	8.69
Mean Difference		0.80		16.85		16.50

Table five reveals that the posttest harmful environmental practices identified by the KACE (EG) is 37.54 with the standard deviation of 3.41 while that of the NKACE (CG) is 20.69 with standard deviation of 2.15. The difference between the pretest and posttest mean scores of KACE (EG) is 24.74 and that of the NKACE (CG) is 8.69. The implication is that the students taught harmful environmental practices using KACE acquired and understood more harmful environmental and how to mitigate them more than their counterparts taught the same concepts using the NKACE method. Some of these harmful environmental practices that constitute existential threats to the biodiversity are deforestation, oil drilling, wrong applications of chemical fertilizers, herbicides, pesticides, uncontrolled bush burning, and constructions of roads, among others.
In order to establish if the difference is statistically significant, inferential statistics (ANCOVA) was used to test hypothesis three.

Hypothesis Three
There is no significant difference on the identified harmful environmental practices and how to experimentally mitigate them between the KACE and NKACE groups of students. Data testing this hypothesis is found in Table Six.

Table Six: **One- way Analysis of Covariance of the mean identified harmful environmental practices and how to mitigate them between the KACE and NKACE groups of students**

Sources of Variation	Sum of squares	DF	Mean square	F	Sig.	Partial Eta squared
Corrected model	2046.121	2	1023.061	95.120	.000	.727
Intercept	509.850	1	509.850	30.275	.000	.280
Pretest	485.504	1	485. 504	31.671	.000	,668
Group	2243.261	1	2243.261	146.420	.238	.554
Error	1243.211	118	10.536			
Total	87325.000	121				
Corrected total	3827.871	120				

a.R squared = .727 (Adjusted R squared = .722)

Table six is the One- way ANCOVA between groups analysis of covariance to compare the impact of KACE and NKACE methods of instruction on students abilities to identify harmful environmental practices and how to mitigate them. The result F (118) = 146.420, P = .000 ≤ 0.05 shows that the

two groups do differ significantly. Thus, the null hypothesis is rejected. Therefore, there is statistically significant difference in the mean harmful environmental practices and how to mitigate them scores of students taught conservation education using KACE and those taught the same concepts using NKACE. The effect size (eta square = .554) is high and it indicates that only 55.4 % of the difference in the mean scores is based on the strategy used (KACE).

Discussion of findings

The purpose of this study was to investigate the effects of teaching conservation education using the kinetic (outdoor) and the non-kinetic (indoor) approaches as a way to mitigate the impact of climate change in Jalingo Education Zone Taraba State, Nigeria. To achieve this purpose the students were divided into two groups, the KACE (EG) and the NKACE (CG). The experimental group was taught conservation education using the Kinetic Approach Conservation Education (KACE) were the students were practically involved in afforestation, collection of non-biodegradable wastes, visit to construction, mining and fishing sites, among others. The control group was taught the same concepts of conservation education but by using the Non- Kinetic Conservation Education (NKACE) approach. In this way, this group of students was restricted to their classrooms (indoor) were the same concepts of conservation education were taught to them. The findings of this study were discussed under four major sub-headings. These are: effect of conservation education to the maintenance of greenish environment; effect of conservation education in the enforcement of the principles that can maintain the original nature of the environment; effect of some harmful environmental practices that can destroy the original nature of the environment and it also found out whether conservation education is gender friendly or not.

To answer the research question one, the mean and standard deviation of the students mean conservation education scores were computed. The result showed that, the EG (KACE) has mean scores of 39.09 while the CG (NKACE) was 26.12, with the mean gain of 12.97 in favour of the EG (KACE). This shows that, the students in the EG have better concepts and application of conservation principles in order to maintain the greenish nature of the environment. Such conservation principles include afforestation, pollution control, discouraged the use of chemical fertilizers, promote use of organic manure, irrigation, plantation formation, sand fills along the river bounds, among others. In order to establish if the difference is statistically significant, inferential statistic (ANCOVA) was used to test the hypothesis one. The result of testing the hypothesis $P = .000 \leq 0.05$ showed that the students in the EG (KACE) group who were taught conservation education using the Kinetic Approach Conservation Education (outdoor practical) gained significantly better than their counterparts in the CG (NKACE) who were taught the same conservation education using the indoor classroom environment. The significant difference gained is in favour of the KACE group suggested a greater effectiveness of the outdoor teaching of conservation education over the conventional classroom environment approach. This finding is in conformity with that of Maikano (2008) who reported that innovating teaching method such as the Kinetic Approach (outdoor practical) is more effective than the conventional classroom (indoor) environmental approach in enhancing the students' cognitive, affective and psychomotor achievement in ecology.

To answer the research question two, the mean and the standard deviation of the students mean conservation principles scores were computed. The results showed that, the EG (KACE) has mean scores of 42.60 while the CG (NKACE) is 20.84, with the mean gain scores of 21.76 in favour of the EG (KACE). This shows that, the students in the KACE group have better knowledge of some of the basic conservation principles and how they can be enforced to maintain a greener environment. Some of these conservation principles and how they can be enforced to maintain a greener environment are : encouraging irrigation during dry season to maintain greener environment, control of land pollution, ridding of bicycles instead of using automobiles like the cars in order to reduce the emission of the greenhouse gases (CO, CO2, CFC), collection of non-biodegradable wastes like plastics, polythene bags, metal scraps for recycling, control oil drilling to reduce the oil

spillage, siting of industries away from the residential areas, encouraging people to plant at least two trees when they cut one, among others. In order to establish if the difference is statistically significant, inferential statistic (ANCOVA) was used to test the hypothesis two. The result of testing the hypothesis ($P = .001 \leq 0.05$) showed that the students in the EG (KACE) group who were taught conservation principles and their enforcement practices using the Kinetic Approach (Outdoor practical) gained significantly better than their counterparts in the CG (NKACE) who were taught the conservation principles and their enforcement using the indoor classroom environment. This findings agreed with that of Maikano (2020) who reported that when students learn ecology using an open field natural environment, it gives them ample opportunities to manipulate the environment experimentally to arrive at what they want (greenish environment).

To answer the research question three, the mean and standard deviation of students mean harmful environmental practices scores were computed. The result showed that the EG (KACE) has mean scores of 37.54 while the CG (NKACE) was 20.69 with the mean gain of 16.85 in favour of the EG (KACE). This shows that, the students in the KACE group have a better knowledge of some of the harmful environmental practices and how to mitigate them in order to maintain a greener environment. Some of the identified harmful environmental practices and how to mitigate them include: power plants use for electricity productions accounts the emission of Carbondioxide, use of the renewable energy sources like the solar, wind and hydro can mitigate this. Transportation of people and goods also account for the emission of the greenhouse gases; use of electric cars, trains, bicycle can help to mitigate this. Deforestation to use wood for building materials, paper and domestic fuel increases global warming; afforestation can be used to replenish the trees cut from the environment, the use of cooking gas should be encourage by reducing the price and also making it available to all and sundry. Garbage as trash breaks down in landfills to release methane and nitrous gases; waste disposal accounts for maximum release of methane gas in the atmosphere; you can bury the garbage to stop this, among others.
In order to establish if the difference is statistically significant, inferential statistic (ANCOVA) was used to test the hypothesis three. The result of testing the hypothesis ($P = .000 \leq 0.05$) shows that the students in the EG (KACE) group who were taught conservation education on harmful environmental practices and how to mitigate them did significantly better than their counterparts in the CG (NKACE) who were taught the same concepts and how to mitigate them using the indoor conventional classroom environment. This finding conformed to that of Rickison (2014) who reported that outdoor experiences have the practical potentials to impact students in the affective, cognitive and psychomotor domains when students are expected to heal the environment because of existential threats arising from the degradation of the environment due to harmful environmental activities by man.

CONCLUSION

The findings of this study revealed that students gained better knowledge of conservation principles and the ways to experimentally apply them in the environment in order to mitigate the impact climate change and global warming when they are taught conservation education using the Kinetic Approach Conservation Education (KACE) which is the outdoor method of instruction.

RECOMMENDATIONS

Based on this finding, the following recommendations were made:

1. The entrenchment of conservation education in the mind of the young learners is very essential, this is because they have a long life span to live on the planet earth and also to heal it from the negative effects of climate change such as; flooding, high environmental temperature, distorted climate and seasonal changes, among others that are already knocking at our doors.

2. Stakeholders like the Federal Government, State Government, Nigerian Conservation Foundation (NCF) need to provide adequate resources for conservation/ climate change education in secondary schools in Nigeria so that the students can be well motivated to give in their best to learn, care for the environment and also to serve as models to mentor their young ones.
3. The quality of conservation/ climate change education should:

i. Be the mechanisms for accessing the environmental impact of climate change through the conservation / climate change education among the young learners.
ii. Abilities of the young learners to think critically and creatively using their ingenuity in order to solve simple to complex problems arising from the environmental climate change like high temperature, flooding, among others.
iii. Capabilities of the young learners to design scientific experiments, analyzing data, and drawing conclusions based on the impact of climate change on the ecosystem.
iv. Capacities of the young learners to articulate relationships between the effects of climate change and real world issues on the basis of finding solution to it.
v. Ability of the young learners to develop interest on conservation education and how to the apply conservation principle and skills using scientific knowledge as a tool for mitigating the impact of climate change on the ecosystem.

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