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Ameliorating Student's Performance and Attitude towards Chemistry through Chemistry Problem-Solving Techniques (CPST)

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Abstract

This paper determined the effect of Chemistry Problem Solving Technique (CPST) on students' performance and attitude towards chemistry. The study was an experimental design that was also aimed at illuminating the claim by several authors that the methods of instructions could change students' attitude positively towards chemistry. 100 male and female senior secondary two students were randomly assigned into experiment and control groups and taught electrolysis. The control group received instruction via the traditional lecture method while the experimental group received theirs through the CPST. Two instruments, a 4-item electrolysis problem solving test (EPST) and a 23-item attitude towards chemistry problems-solving technique inventing (ATCPSI) were developed and administered to both groups after the period of instruction. Data collected were analyzed using the t-test for equality of means. The study established the usefulness of chemistry problem solving technique in motivating students towards chemistry. It also established the relative efficacy of CPST over the traditional lecture method in students' problem solving in chemistry thereby confirming the fact that acceptable methods of instructions are capable of changing students' performance and attitude towards chemistry. The study recommended that chemistry teachers be encouraged through workshops and seminars, to embrace chemistry problem solving techniques as a strategy for teaching and learning of chemistry.

Keywords: Students, Performance, Attitude, Chemistry, Problem-Solving, Techniques.

Reference to this paper should be made as follows:

Delmang, T. K., & Gongden, E. J. (2016). Ameliorating Student's Performance and Attitude towards Chemistry through Chemistry Problem-Solving Techniques (CPST). *International Journal of Scientific Research in Education*, 9(2), 41-47. Retrieved [DATE] from <http://www.ij sre.com>

INTRODUCTION

Several studies (Eboka & Obiajulu, 2014; Agommuoh & Maryam, 2014) have acknowledged science and technology as the bedrock of national development but which cannot survive without chemistry. According to Gongden (2015), development in technology goes hand in hand with advancement in science such that any nation that lags behind in science will lag behind in technological development. Chemistry is seen as the foundation upon which science is built and hence technology. Most developed countries are at par with Nigeria because they recognized the relevance of chemistry in their national economy. Based on this, Arokoyu & Ugonwa (2012) pointed out that chemistry is one of the fundamental ingredients of technology. Chemistry education takes a central position in science and technology.

Chemistry is the study of the composition, properties, uses and structure of matter. It is the science of matter and the changes it undergoes, and attempts explaining chemical phenomenon of everyday life (Kolomuc & Tekin, 2011). Aniodoh and Eze, (2014) described it as a branch of science which enables learners to understand what happens around them, it affords its recipients the opportunity to explore their immediate environment. Chemistry education has a crucial role to play in helping to find answers to various human and socio-economic problems as well as making the society more scientifically literate. The objective of chemistry education in schools extends to the fundamental concepts of chemistry that students need to learn and understand and the chemical processes behind phenomena in life (Kolomuc & Tekin, 2011; Ifeyinwa & Nweze, 2014).

Research evidences have proved that chemistry's contribution to quality of life and nation building are worthwhile in all aspects. According to Oak (2011), the knowledge of chemistry is brought to play in the manufacture of products that improves man's luxury such as herbicides, insecticides, plastic products, foams, drugs, clothing materials etc. A lot of activities centered on the study of chemistry and they include the management of natural resources, manufacturing, processing and storage of food and health facilities and a favorable living environment draw their basis from chemistry. In the view of Ababio (2014), chemical technologies enrich our quality of life in numerous ways by providing new solutions to problems in health, materials and energy usage. Chemistry education is a necessary ingredient for becoming self-reliant, earning a living and contributing towards building a sustainable economy. This explains why chemistry is a compulsory science subject at the secondary school level in Nigeria.

Unfortunately, the performance of chemistry students in the Senior Secondary Certificate Examinations (SSCE) has been poor despite the several studies and their recommendations.

Table 1: Performance of Chemistry Students in the West African Senior School Certificate Examination (WASSCE).

S/No	Year	% of Candidates with Grades 1 – 6
1	1997	25.30
2	2001	36.25
3	2002	34.42
4	2003	50.98
5	2005	50.91
6	2006	44.90
7	2007	45.96
8	2008	44.44

9	2009	43.70
10	2010	50.70
11	2011	49.54
12	2012	43.13

Source: The West African Examination Council (2012)

Danjuma (2005) and Gongden (2015) observed that various reasons have been given for students' dismal performance in chemistry. They include the abstract nature of the concepts, misconceptions by teachers and students and students' inability to solve chemistry problems. Another important factor is the student's attitude. Students' attitude toward chemistry is essential and crucial in discussing factors in chemistry achievement. Attitude and academic achievement are important outcomes of science education in secondary schools (Najdi, 2013). Student's attitude and interest could play substantial role in students' decision to study science (Abulude, 2009). Hofstein and Naaman (2011) lamented that recent publications presented a gloomy picture regarding students' ignorance in chemistry and decline in enrollment in science – based careers. Mukherjee (2002) explained attitude as someone's feelings, thoughts and predispositions to behave in some particular manner towards some aspects of his environment. Attitude regarding students' learning has to do with the feelings or opinions that they have towards the subject as an organized body of knowledge. This can be positive or negative depending on their perception of problem-solving in chemistry. Several studies (e.g., Yunus & Ali, 2012; Najdi, 2013) showed that most chemistry students have negative attitude towards chemistry hence low attitude towards problems-solving in chemistry. They lack interest in the subject and syllabus and do not grasp the concept of chemistry. The inadequate teachers' approach to the materials and poor non-formal instructional materials were also identified as reasons for the negative attitude of students towards chemistry. They suggested the development of positive attitudes in students towards chemistry problem-solving through suitable instructional methods. Berkeley (2015) noted that good teaching occurs when students learn. Therefore there is need for teachers to ensure that whatever method of instruction they adopt in classroom promotes learning among students'. It is envisaged that the use of problem-solving method of instruction in teaching chemistry will help students to acquire desirable scientific attitude as well as improve their attitude and achievement chemistry generally. It was the purpose of this study to investigate the influence of chemistry problems-solving techniques (CPST) on students' attitudes and performance in chemistry.

Research Hypotheses

Two null hypotheses were tested:

1. There is no significant difference between the mean scores of students' exposed to CPST in the experimental group and those in the control.
2. There is no significant difference between the attitudes of chemistry students who were exposed to CPST in the experimental group and those in the control

MATERIALS AND METHOD

The study was an experimental study designed to establish the relationship between two or more variables: the CPST and students' attitude and performance in chemistry. The sample consisted

of 100 senior secondary school students. The students were randomly assigned to control and experimental groups with each group having fifty students. The experimental class was taught electrolysis using the CPST. Specifically, the chemistry problem solving technique put forward by the Rapid Learning Centre (2010) was used. The strategy consisted of: identification of what is given, clarification of what is being asked, and selection of a strategy, solving using elected strategy and reviewing the answer arrived at. The control group was also taught the same concept of electrolysis but using the traditional lecture method. Topics covered for the four hours in the week include; factors affecting the selective discharge of ions, the electrochemical series of element, the laws of electrolysis and calculation in electrolysis and uses of electrolysis. All the students were taught by the same teacher. Both groups were administered a post-test after the period of instruction. The test included a 4-item electrolysis problem solving test (EPST) and a 23-item attitude towards chemistry problems – solving technique inventing (ATCPSI). Results were analyzed using the t-test

RESULTS

Data obtained from the students were analyzed using the t-test but applying the z-test approximation. The results are shown in tables 2 and 3 below.

Table 2: T-Test Analysis of the Post-Test Scores of Students in Problem Solving of Experimental and Control Groups

Group	N	Mean	SD	df	t-cal	t-crit
Expt	50	67.78	9.85	45	3.48	0.001
Control	50	62.04	8.13			

The results of table 2 showed that the mean score of the experimental group (67.78) was higher than that of the control (62.04), indicating that the performance of the experimental group in problem – solving was more positive than those of the control group after treatment.

Hypotheses one: there is no significant difference between students' performance after exposing them to CPST.

From the results, the t – calculated (3.48) was greater than t – critical (0.001) at 45 degree of freedom and 0.05 level of significance. Therefore, the null hypothesis was rejected. Therefore there was a significant difference between the mean scores of students' exposed to CPST in the experimental group and those in the control. It could be deduced from the findings that CPST was more interesting to the students. This was reflected in their performance after treatment.

Table 3: T-Test Analysis of Students' Perception and Attitude of the CPST Value in Studying Chemistry

Group	N	Mean	SD	df	t-cal	t-crit
Expt	50	2.52	76	49	3.48	0.001
Control	50	2.18	77			

From table 3, the experimental group had a mean score of 2.52 while that of the control group was 2.18. This shows that the experimental group students had better perception and attitude towards the use of CPST in studying chemistry.

Hypothesis two: There is no significant difference between the attitudes of chemistry students who were exposed to CPST in the experimental group and those in the control.

From table 3, t – cal (3.48) was observed to be higher than t – critical (0.001) at significance level of 0.05. The null hypothesis was therefore rejected because it has no sufficient ground to be retained. Therefore there was a significant difference between the attitudes of chemistry students who were exposed to CPST in the experimental group and those in the control.

DISCUSSION OF RESULTS

The study found out that the CPST enhanced chemistry students' performance in chemistry. There was a significance difference in the mean score in favour of those taught using the CPST. This result agreed with those of Danjuma (2005) and Gongden (2015) who found out that chemistry problem solving is key to successful learning of chemistry. It also agreed with Armagan, Sagir and Celik, (2009) who stated that the first thing that is necessary for problem solving, whether personal, scientific or an organizational problem is the knowledge of the problem solving process.

The research also showed that the students taught electrolysis using the CPST were motivated than those in the control. The same students in the experimental group performed better than those in the control. This means that when students are motivated to have positive attitude towards chemistry, they will performed better in chemistry examinations. This result agreed with those of Kan and Akbas (2006), Bassey, Umoren and Udida (2008) and Oluwatelure and Oloruntegbe (2010). These all who found out that there is a significant relationship between students' attitude towards chemistry and their performance

CONCLUSION

The eminent purpose of the CPST is to make students to be actively involved in the teaching–learning process through problem – solving and to enhance their thinking ability and improved their skills rather than being passive recipients of knowledge. The study showed that the CPST can be used to motivate students and help them develop more positive attitude towards chemistry. It also established the fact that positive attitude towards a subject enabled better performance in the subject.

Chemistry teachers should embrace chemistry problem solving technique as one of the strategies to teach their students. It is necessary to organize workshops and seminars for practicing chemistry teachers to intimate them on the importance of CPST for teaching and learning of chemistry.

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Assessment of the Population Dynamics of Diurnal Primates in Old Oyo National Park, Nigeria

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Abstract

Assessment of the population dynamics of diurnal primates in Old Oyo National Park, Nigeria, was carried out from March 2011 to March 2012. To date, there had not been any census carried out to ascertain the distribution of primate species within the park and the influence of biotic and abiotic factors, particularly, anthropogenic activities, hence, this study. Ten transect lines were located as representative samples in the park, farmers and hunters assisted me in providing information on the primate species present in the park. These include Red monkey (*Erythrocebus patas*), Green monkey (*Erythrocebus sebaeus*), Tantalus monkey, Tataras monkey, White-throated monkey (*Cercopithecus erythrogastar*), Putty-nosed monkey (*Cercopithecus nititans*), Baboon (*Papio anubis*) and Green colobus (*Colobus satanas*). Data were collected and analysed by calculating the mean numbers of primate species with respect to standard errors. The monthly mean number of each primate species encountered in the park were recorded as follows: Red monkey 20.10 ± 0.68 , Green monkey 16.00 ± 0.17 , Tantalus monkey 2.00 ± 0.00 , Tataras monkey 10.80 ± 0.97 , White-throated monkey 7.17 ± 0.31 , Putty-nosed monkey 4.20 ± 0.67 , Baboon 39.82 ± 1.47 and Green colobus, 20.50 ± 15.51 . From the result obtained, Tantalus monkey with mean number of 2.00 ± 0.00 , Putty-nosed monkey 4.20 ± 0.67 and White-throated monkey with the mean number of 7.17 ± 0.31 had become threatened or endangered. This census provides baseline information on the status of primate diversity and numbers within the park which can help to direct conservation efforts of the primates and other animals by various tiers of government. This will further enhance the sustainability of the park as enshrined in UNESCO: Man and the Biosphere Reserve, to which Nigeria is a signatory.

Keywords: Assessment, Population Dynamics, Diurnal Primates, Old Oyo, National Park, Nigeria.

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INTRODUCTION

The primates are in the Order of animals which comprises of Prosimians, Monkeys, Apes and Humans. The name 'primate' is derived from the Latin word '*primus*' which means 'first' or 'foremost'. They are referred to by this name because they have a brain of the first rank, i.e., they are the most intelligent among the animals (Burton, 1985). The primate Order comprises a wide spectrum of some 200 living species as well as a large number of extinct fossil forms (Eimerl and DeVore, 1975). Primates do not, like other groups of mammals, have any single feature that is common to their group. Nevertheless there are some general features that can be used to identify an animal as a primate. These features include very mobile fingers and toes, hands and feet which are adapted for grasping, opposable digits, eyes on the front of the face – binocular vision, finger and toe nails, pads on the tips of digits which are sensitive to touch, a flatter face (shorter snout) than many other mammals, a bigger, more complex brain relative to body size. All primates share common adaptation to living in the trees, and all, share the ability to climb by grasping because they have hands with movable fingers. The above combination of characteristics makes them well adapted to many different environments. This study aims to investigate the diurnal activities of primates in Old Oyo National Park. Such knowledge is necessary for effective management and conservation of primates' population.

There are seven National Parks in Nigeria, namely: Old Oyo National Park in Oyo State, Kainji Lake National Park in Niger State, Chad Basin National Park in Maiduguri, Dachankar gumti National Park between Taraba and Adamawa States, Cross River National Park in Cross River State, Okomu National Park in Edo State and Kamuku National Park in Kaduna State.

Old Oyo National Park was founded in the year 1999. It is a large area of land that was established by the Federal Government of Nigeria in Oyo North of Oyo State through the promulgation of Decree 46 of 1999. The purpose was mainly for conservation, preservation and protection of our natural resources. It also contained historical resources from Old Oyo Empire. The motto of the park is "Blending of our glorious park with nationhood". The park is made up of five ranges namely: Marguba range in Sepeteri, Oyo Ile range in Igbeti, Yemoso range in Ikoyi-Ile, Tede Park in Tede, Sepeteri range in Igboho. Old Oyo National park like most other parks in Nigeria needs increased protection if it is to be sustained for the future. It provides a thriving habitat for a range of wild fauna among which are primates which inhabit the guinea savannah trees but the wildlife component has not yet been well researched.

Statement of Research Problem

Primates are essential components of animal diversity because of their prominent position in the phylogenetic tree. These species and their habitats are threatened by logging, poaching and encroaching farmlands. The last census of wild animals in Nigeria was conducted during the colonial period and it only indicated the presence of the primates and not their numbers. There is no information on the diversity and population size of diurnal primates in Old Oyo National Park, hence this study.

The threats posed to animals in the park as a result of hunting for bushmeat, exploitative influence of modernization by the industrialized world, unsustainable logging, environmentally degrading agricultural practices, and plantation forestry, are very prominent in our parks and needs to be looked into to see the extent of their impact on these primates and to come up with regulatory measures. The scope of this research will be limited to the inventory and enumeration

of the species encountered, weather condition at the time of encounter, height above the ground of groups encountered on trees, numbers in a troop, activity at detection, perpendicular distance from the transects in meters and habitat type where group are sighted. Activities at detection which premised on three principal components; feeding, grooming and travelling will be monitored. This also includes distribution of males and females, adult to juveniles. To this end, the objectives of this research work are to:

- Determine and provide information on the number of existing diurnal primates, their diversity and population size.
- Investigate the roles and interrelationship of both biotic and abiotic factors on the distribution of the diurnal primates within the National Park with a view to ensuring their sustainability.
- Identify the primates that are highly endangered or threatened with extinction within the park.
- Determine the abundance of the various species.

It is hoped that this study will provide useful information on the diversity and estimated populations of primate species in Old Oyo National Park which is a part of the Southern Guinea Savannah area of Nigeria. It will also provide information on factors that affect the distribution of the primates and their interrelationships within the National Park.

LITERATURE REVIEW

Africa is a continent of particular concern in terms of global primate conservation (Cowlshaw and Dunbar, 2000; Chapman et. al., 2006; Marshall and Hovet, 2006). Many primate species are threatened and it is apparent from studies that population of primates are on the decline generally and in Nigeria in particular as a result of anthropogenic activities (Anadu & Oates, 1982; Eniang, 1999; Agbelusi et. al., 2003; Ogunjemite, 2007; Oates et.al., 2008). Twenty eight species of primates are represented in Nigeria as represented by International Union for Conservation of Nature (IUCN) in 1996. Many of them are diurnal and may be easily encountered in their different habitat refugia. Nigeria is among the fifteen countries worldwide scoring highest for primate species richness (Cowlshaw & Dunmbar, 2000).

Studies of primate community structure, association patterns and habitat diversity are rare in Nigeria. Studies of primate community structure increases our understanding of behaviours, adaptation and evolution because it enable us to formulate and to test hypothesis on patterns of competitions, predations and extinction (Lehman, 2000).Data on community structure provide some support to the theory that species in habitats with low level of food resources cannot support numerous polyspecific association due to increase in competition for food, low tree diversity while abundance and low fruit and leaf production may influence pattern of association among primates (Lehman,1999).

Kay et. al. (1997), indicates that plant productivity is the ecological variable most strongly correlated with primate species richness. Thus, low plant productivity in the park may reduce the abundant of food resources and result in scabble and competitions among primates.

Historical and modern terminology

The relationships among the different groups of primates were not clearly understood until relatively recently, so that commonly used terms are somewhat confused. For example, "ape" has been used either as an alternative for "monkey" or for any tailless, relatively humanlike primate. Sir Wilfred Le Gros Clark was one of the primatologists who developed the idea that there were trends in primate evolution, and that the living members of the order could be arranged in an ascending series leading to humans. Commonly used names for groups of primates, for example "prosimians", "monkeys", "lesser apes" and "great apes", reflect this arrangement.

According to our current understanding of the evolutionary history of the primates, several of these groups are paraphyletic, meaning that although all the species in the group descend from a common ancestor, the group does not include all the descendants of that ancestor. By contrast with approaches such as those of Le Gros Clark, modern classifications typically use groups which are monophyletic, since they include all the descendants of a common ancestor. Prosimians" contain two monophyletic groups, the suborder Strepsirrhini (lemurs, lorises and allies), as well as the Tarsiers, which are a sister group to the infraorder Simiiformes, "monkeys" consist of two monophyletic groups, New World monkeys and Old World monkeys, but exclude hominoids (superfamily Hominoidea), "apes" as a whole, and the "great apes" in particular, are not monophyletic because they exclude humans.

Thus, the two sets of groups, and hence names, do not match, which causes problems in relating scientific names to common names. Consider the superfamily Hominoidea. In terms of the common names on the right, this group consists of apes and humans, and there is no single common name for all the members of the group. One possibility is to create a new common name, in this case "Hominoids". Another possibility is to expand the use of one of the traditional terms. For example, in the Vertebrate Palaeontologist, Benton,(2005) wrote, "The apes, Hominoidea, today include the Gibbons and Orang-utan ... the Gorilla and Chimpanzee ... and Humans", thereby using "Apes" to mean "Hominoids". The group traditionally called "Apes" must then be called the "non-human primates".

There is no consensus as to which approach to follow, whether to accept traditional paraphyletic common names or whether to use monophyletic names, either new ones or adaptations of old ones. Both approaches will be found in biological sources, often in the same work. Thus although Benton defines "Apes" to include humans, he also repeatedly uses "Ape-like" to mean "like an Ape rather than a Human", and when discussing the reaction of others to a new fossil writes of "claims that Orrorin ... was an Ape rather than a Human".

Order Primates is part of the clade Euarchontoglires, which is nested within the clade Eutheria of Class Mammalia. Recent molecular genetic research on Primates, Colugos, and treeshrews has shown that the two species of colugos are more closely related to Primates than treeshrews, even though Treeshrews were at one time considered Primates. These three orders make up the clade Euarchonta. The combination of this clade with the clade Glires (composed of Rodentia and Lagomorpha) form the clade Euarchontoglires. Variouslly, both Euarchonta and Euarchontoglires are ranked as SuperOrders. Some scientists consider Dermoptera a suborder of Primates and call the "true" primates the suborder Euprimates.

Distinguishing Features

Primates have diversified habitat, arboreal (trees) and bushes and possess many characteristics that are adaptations to this environment. They are distinguished by: retention of the collar bone in the pectoral girdle; shoulder joints which allow high degrees of movement in all directions; five digits on the fore and hind limbs with opposable thumbs and big toes; nails on the fingers and toes (in most species); a flat nail on the hallux (in all extant species); sensitive tactile pads on the ends of the digits; orbits encircled in bone; a trend towards a reduced snout and flattened face, attributed to a reliance on vision at the expense of olfaction (most notably in Haplorrhines, and less so in Strepsirrhines); a complex visual system with stereoscopic vision, high visual acuity and color vision; a brain having a well-developed cerebellum with posterior lobe and a calcarine fissure; a large brain in comparison to body size, especially in simians; differentiation of an enlarged cerebral cortex; reduced number of teeth compared to primitive Mammals; three kinds of teeth; a well-developed cecum; two pectoral mammary glands; typically one young per pregnancy; a pendulous penis and scrotal testes; a long gestation and developmental period; and a trend towards holding the torso upright leading to bipedalism.

Primates generally have five digits on each limb (pentadactyly), with keratin nails on the end of each finger. The bottom sides of the hands and feet have sensitive pads on the fingertips. Most have opposable thumbs, a characteristic primate feature, though not limited to this order (Opossums, for example, also have them). Thumbs allow some species to use tools. In primates, the combination of opposing thumbs, short fingernails (rather than claws) and long, inward-closing fingers is a relict of the ancestral practice of gripping branches, and has, in part, allowed some species to develop brachiation (swinging by the arms from tree limb to tree limb) as a significant means of locomotion. Prosimians have claw like nails on the second toe of each foot, called toilet-claws, which they use for grooming.

Locomotion

Primate species move by brachiation, bipedalism, leaping, arboreal and terrestrial quadrupedalism, climbing, knuckle-walking or by a combination of these methods. Several prosimians are primarily vertical climbers and leapers. These include many Bushbabies, all Indriids (i.e., Sifakas, Avahis and Indris), sportive Lemurs, and all Tarsiers. Other prosimians are arboreal quadrupeds and climbers. Some are also terrestrial quadrupeds, while some are leapers. Most monkeys are both arboreal and terrestrial quadrupeds and climbers. Gibbons, muriquis and spider monkeys all brachiate extensively, with gibbons sometimes doing so in remarkably acrobatic fashion. Woolly monkeys also brachiate at times. Orangutans use a similar form of locomotion called quadramanous climbing, in which they use their arms and legs to carry their heavy bodies through the trees. Chimpanzees and Gorillas knuckle walk, and can move bipedally for short distances. Although numerous species, such as Australopithecines and early Hominids, have exhibited fully bipedal locomotion, humans are the only extant species with this trait.

Social Systems

Britanica (2010), stated that social systems of non-human primates are best classified by the amount of movement by females occurring between groups. He proposed four categories:

Female transfer systems – Here, the females move away from the group in which they were born. Females of a group will not be closely related whereas males will have to remain with their natal groups, and this close association may be influential in social behavior. The groups formed are generally quite small. This organization can be seen in Chimpanzees, where the males, who are typically related, will cooperate in defense of the group's territory. Among New World Monkeys, Spider monkeys and Muriquis use this system.

Male transfer systems – The females remain in their natal groups, the males will emigrate as adolescents. Polygynous and multi-male societies are classed in this category. Group sizes are usually larger. This system is common among the ring-tailed Lemur, Capuchin monkeys and Cercopithecine monkeys.

Monogamous species – a male–female bond, sometimes accompanied by a juvenile offspring. There is shared responsibility of parental care and territorial defense. The offspring leaves the parents' territory during adolescence. Gibbons essentially use this system, although "monogamy" in this context does not necessarily mean absolute sexual fidelity.

Solitary species – often males who defend territories that include the home ranges of several females. This type of organization is found in the Prosimians such as the slow loris. Orangutans do not defend their territory but effectively have this organization.

These social systems are affected by three main ecological factors: distribution of resources, group size and predation. Within a social group, there is a balance between cooperation and competition. Cooperative behaviors include social grooming (removing skin parasites and cleaning wounds), food sharing, and collective defense against predators or of a territory. Aggressive behaviors often signal competition for availability of food, sleeping sites or mates. Aggression is also used in establishing dominance hierarchies.

Primate Evolution

The primate lineage is thought to go back at least 65 mya (million years ago), even though the oldest known primate from the fossil record is Plesiadapis (55–58 mya) from the Late Paleocene. Other studies, including molecular clock studies, have estimated the origin of the primate branch to have been in the mid-Cretaceous period, around 85 mya. By modern cladistic reckoning, Order Primates is monophyletic. Suborder Strepsirrhini, the curly-nosed or "wet-nosed" primates, is generally thought to have split off from the primitive primate line about 63 mya, although earlier dates are also supported. The seven strepsirrhine families are the five related Lemur families and the two remaining families that include the Lorises and the Galagos. Older classification schemes wrap Lepilemuridae into Lemuridae and Galagidae into Loridae, yielding a four-one family distribution instead of five-two as presented here. During the Eocene, most of the northern continents were dominated by two groups, the Adapiforms and the Omomyids. The former are considered members of Strepsirrhini, but did not have a toothcomb like modern Lemurs; recent analysis has suggested *Darwinius masillae* fits into this grouping. The latter was related closely to Tarsiers, Monkeys, and Apes. It is unclear exactly how these two groups relate to extant primates. Omomyids perished about 30 mya, while Adapiforms survived until about 10 mya.

According to genetic studies, the Lemurs of Madagascar diverged from the loriforms approximately 75 mya. These studies, as well as chromosomal and molecular evidence, also show that Lemurs are more closely related to each other than to other Strepsirrhine primates. However, Madagascar split from Africa 160 mya and from India 90 mya. To account for these

facts, it is thought that a founding Lemur population of a few individuals reached Madagascar from Africa via a single rafting event between 50 and 80 million years ago. Other colonization options have been examined, such as multiple colonizations from Africa and India, but none are supported by the genetic and molecular evidence. Until recently the Aye-aye has been difficult to place within Strepsirrhini. Theories had been proposed that its family, Daubentoniidae, was either a Lemuriform primate (meaning its ancestors split from the lemur line more recently than Lemurs and Lorises split) or a sister group to all the other Strepsirrhines. In 2008, the Aye-aye family was confirmed to be most closely related to the other Malagasy Lemurs, likely having descended from the same ancestral population that colonized the island.

Suborder Haplorhini, the simple-nosed or "dry-nosed" primates, is composed of two sister clades. Prosimian tarsiers in the family Tarsiidae (monotypic in its own infraorder Tarsiiformes), represent the most basal division, originating about 58 mya. The infraorder Simiiformes emerged about 40 mya, and contains two clades, both Parvorders: Platyrrhini, which developed in South America, consisting of New World monkeys, and Catarrhini, which developed in Africa, consisting of Old World monkeys, humans and the other Apes. A third clade, which included the Eosimiids, developed in Asia but went extinct millions of years ago.

As in the case of Lemurs, the origin of New World monkeys is unclear. Molecular studies of concatenated nuclear sequences have yielded a widely varying estimated date of divergence between Platyrrhines and Catarrhines, ranging from 33 to 70 mya, while studies based on mitochondrial sequences produce a narrower range of 35 to 43 mya. It is possible that anthropoid primates traversed the Atlantic Ocean from Africa to South America during the Eocene by island hopping, facilitated by Atlantic Ocean ridges and a lowered sea level. Alternatively, a single rafting event may explain this transoceanic colonization. Due to continental drift, the Atlantic Ocean was not nearly as wide at the time as it is today. From *Britanica*,l(2010), a small 1 kg (2.2 lb) primate could have survived 13 days on a raft of vegetation. Given estimated current and wind speeds, this would have provided enough time to make the voyage between the continents.

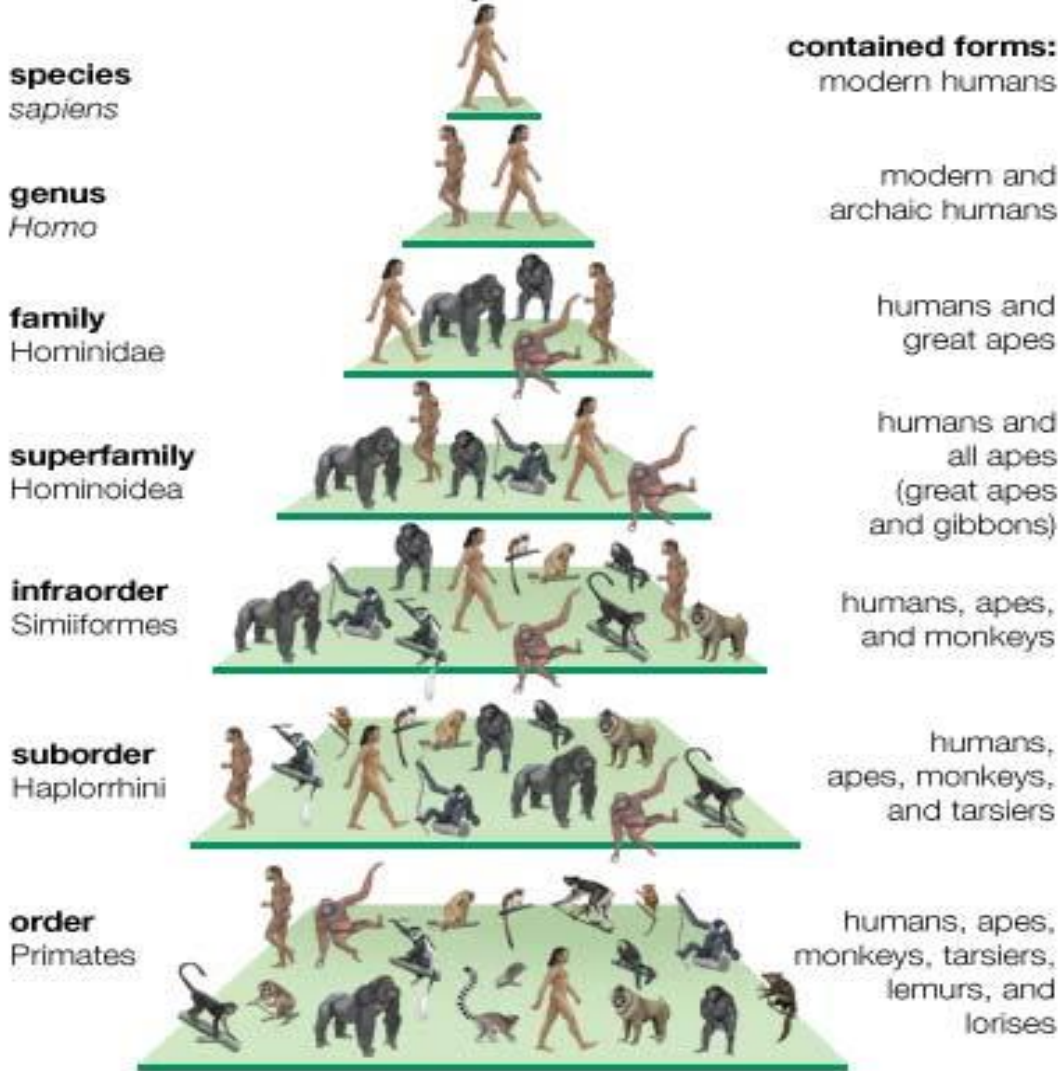
Apes and monkeys spread from Africa into Europe and Asia starting in the Miocene. Soon after, the Lorises and Tarsiers made the same journey. The first Hominid fossils were discovered in Northern Africa and date back 5–8 mya. Old World monkeys disappeared from Europe about 1.8 mya. Molecular and fossil studies generally show that modern humans originated in Africa 100,000–200,000 years ago. Although primates are well studied in comparison to other animal groups, several new species have been recently discovered, and genetic tests have revealed previously unrecognised species in known populations. Primate Taxonomist listed about 350 species of primates. Groves (2001) increased that number to 376 for his contribution to the third edition of *Mammal Species of the World (MSW3)*. However, publications since the taxonomy in MSW3 was compiled in 2003 have pushed the number to 424 species, or 658 including subspecies.

Evidence points to the rest of the primates having some relationship with the tree shrews, a small insectivorous mammal that took to the trees some 70 million years ago in the Palaeocene or the earlier Cretaceous epoch. From this little shrew-like progenitor was founded the primate order which came to dominate the animal kingdom. The charts below trace the evolution and divergence of primates. Fig. 1 chart is based on fossil finds while fig. 2 shows the divergence of the primates traced through biochemical studies as employed by Vincent (1967). The biochemical studies show the relationship among man and animals by comparing substances found in their molecules. The above authors considered the tree shrew to be a most primitive primate as can be seen by their inclusion of this animal in their charts.(Fig.1 and Fig.2)

Classification is used in biology for two totally different purposes, often in combination, namely, identifying and making natural groups. The specimen or a group of similar specimens must be compared with descriptions of what is already known. This type of classification, called a key, provides as briefly and as reliably as possible the most obvious characteristics useful in identification.

Primate Classification

Classification of *Homo sapiens* within the order Primates



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Figure 3: Evolutionary Trends of Primate Species

Order Primates has traditionally been divided into two main groupings: Prosimians and Anthropoids (Simians). Prosimians have characteristics more like those of the earliest primates, and include the Lemurs of Madagascar, Lorisiforms and Tarsiers. Simians include the monkeys,

apes and humans. More recently, taxonomists have preferred to split primates into the suborder Strepsirrhini, or curly-nosed primates, consisting of non-tarsier Prosimians, and the suborder Haplorhini, or dry-nosed primates, consisting of Tarsiers and the Simians. Simians are divided into two groups: Platyrrhine ("flat nosed") or New World monkeys of South and Central America and Catarrhine (narrow nosed) monkeys and apes of Africa and southeastern Asia. New World monkeys include the Capuchin, Howler and squirrel monkeys; Catarrhines consist of Old World monkeys (such as Baboons and Macaques), Gibbons and great apes. Humans are the only extant Catarrhines that have spread successfully outside of Africa, South Asia, and East Asia, although fossil evidence shows many other species were formerly present in Europe. Several primates have been discovered in the year 2000s. There are about 300 species of primates divided into three suborders namely: Prosimii, Tarsiodea and Anthropoids. Of these, 200 species were found predominantly in tropical regions, especially forests.

Suborder Prosimii

These are the most primitive primates (Prosimii). The name prosimian means 'before apes'. These primitive primates are the forerunners of the Monkeys and Apes. They are mostly small in size and characterized by: a nocturnal lifestyle, grooming claws as well as nails, long snouts and a wet tip, specialized scent glands, eyes slightly more to the side of the head than monkeys (but they still have good forward vision) and front teeth in the lower jaw projecting forward almost horizontally. This suborder comprises 4 families made up of Lemuridae: e.g. Lemurs, Indridae e.g., Indris, Loriscidae: e.g., Loris, Pottos, and Bush babbies (galagos), Tarsiidae: e.g., tarsiers, Daubentoniidae: e.g., Aye-aye. The Lemurs are exclusively native to Madagascar with examples like black and white ruffed lemur, ring-tailed lemur, mouse lemur, and dwarf lemur. The tarsiers were once widely distributed over most of northern hemisphere but have now dwindled to just one single living genus that is now restricted to a few Southern-East Asian islands. The loriscoids, unlike the other prosimians survived outside of Madagascar and the islands of the western Indian Ocean. These include the African galagos, the Sri Lankan slender loris, the slow loris of South-East Asia, the African pottos and angwantibo. The indris and the Aye-aye are also among the Prosimians that are native only to Madagascar.

Suborder Tarsiodea

Tarsier, common name for any of four species of primates found in Indonesia, Borneo, and the Philippine Islands that are slightly smaller than full-grown rats. Tarsiers have soft, furry bodies and slender limbs. They are brownish-gray, with large, rounded heads, the most conspicuous features of which are enormous, gogglelike eyes adapted for the animals' nocturnal life-style. The muzzle is short, and the ears are long and rounded. The hind limbs are especially modified for leaping. The fingers and toes are extremely long and are equipped with fleshy disks that provide traction. The tail is long and ends in a tuft of hair. The animals are arboreal and forage for food, usually insects and lizards, only at night. They are primarily solitary. Breeding takes place throughout the year. One species, the spectral tarsier, has olive markings on its body and black markings on its head and face. Tarsiers make up the family Tarsiidae.

Suborder Anthroidea (Simians)

The anthropoids are the higher primates made up of Monkey, Apes and Humans. Most are large in size and diurnal. There are, at least, 145 living species in this suborder and over 90 percent of them are monkeys (see Figure 3)

Monkeys

Monkeys make up two broad groups i.e., Old world monkeys (in Africa and Asia) and New world monkeys (in the Americas). The two can be easily distinguished by the differences visible on their heads and tails. The old world monkeys are characterized by tear drop-shaped nostrils pointing downwards and close together, some species have cheek pouches to carry food, tails are never prehensile, hairless callous pads on their rumps, dental formula of 2.1.2.3, while their new world monkeys are characterized by nostrils round, pointing outwards and wider apart, absence of cheek pouches, prehensile tails, i.e., tails that are capable of being used as 'third hands' for holding onto branches and supporting their bodies, bottoms completely covered with fur, and dental formula of 2.1.3.2 or 2.1.3.3 (Wikipedia, the free encyclopedia, 1912)

Old World Monkeys

Old world monkeys occupy a wide variety of environments in South and East Asia, the Middle East, Africa and even Gibraltar at the Southern tip of Spain. They are found in tropical forests, arid grasslands and even mountainous areas with heavy winter snows. There are at least, 78 species of old world monkeys in two subfamilies-Cercopithecinae and Colobinae.

Cercopithecinae group

Most of the old world monkeys which belong to this subfamily include Macaques, Mandrills, Mangabeys, Patas monkeys, Baboons, and Guenons. With the exception of the macaques which also live in Gibraltar and Asia, the rest are African species. The cercopithecine group shares two identifiable anatomical features as Ischial callosities which are bald pads of skin on the bottom of the primates and cheek pouches that expand to allow and secure temporary storage of food.

Colobinae groups

The colobinae group includes the colobus monkeys of Africa, the South Asian langurs and the proboscis monkeys. These are all herbivores, unlike the Cercopithecinae, which are more omnivorous in their diet. The colobines are characterized by the lack of cheek pouches, presence of sacculated stomachs, that is., their stomachs 'sacculi', or sac like compartments in which bacteria and usual combination of enzymes breakdown cellulose, thereby providing more usable calories, unusually long intestines that increase the absorption of nutrients, and stomachs which contain more acid than do other monkeys.

New World Monkeys

These monkeys live within the primate habitat ranges in the tropical regions of the Americas. All new world monkeys are fairly small and exclusively tree dwelling. The new world monkeys are divided into two families: the Callithricidae and the Cebidae. The Callithricidae are the most primitive monkeys and comprises the Marmosets and Tamarins. The Cebidae are largest and also the only primate that have prehensile tails. Examples of Cebidae are squirrel monkeys, capuchins, spider monkeys, woolly monkeys, sakis, uakaris, night monkeys, titi monkeys, and howler monkeys. Apes are grouped into 'lesser' and 'great' apes. The lesser apes include Gibbons and Siamangs while the great apes are orangutans, Bonobos, Chimpanzees, Gorillas, and Humans. Apes are characterized by absence of tails, longer arms than legs, very flexible wrists, and barrel-shaped chests. Siamangs, Gibbons, and Orangutans are of Asian origin while Chimpanzees and Gorillas are of African origin.

Primate values

Raising local primates can have great economic returns when the species are traded. For example, the monkey industry began in 1984 in Mauritius and grew to become the biggest livestock industry in the country in terms of export earning (over 100 million Rands per annum). Alongside the booming industry was the provision of 220 direct employment for the people (Stanley & Griffiths, 1997). On the tourism side the economic value of primates can also be appreciated in the light of the income that wildlife sanctuaries generate. Being close relative to man, studies on their anatomy and physiology have proved useful. For example, facts about human blood chemistry and disease prevention have been revealed by studies on Rhesus Monkeys.

Primates and Tree Felling

Primates are among the species that are declining due to the direct effect of tree felling. The clearance of some areas around the park for agricultural purposes is rampant, often encouraged by increased access along logging roads. The fact that logging stimulates hunting and wildlife trade is usually poorly addressed and commercial hunting of primate, especially in logging concession, threatened their existence. Ammann's investigation of hunting pressure in and outside the International Union for Conservation of Nature and Natural Resources surveyed areas strongly indicates that unprotected and unstudied apes are being destroyed by a burgeoning commercial bushmeat trade (1993, 1996a). The primary catalyst of this destruction is the growth of the timber industry (Ammann, 1996b; Pearce & Ammann, 1995).

Control hunting in park areas subject to logging is especially complex because of the many different players such as local people, logging employees, and other hunters, and the associated social, cultural and economic change brought about by the logging activity. While the effects of logging on primates are deleterious, the indirect impacts of logging resulting from increased access into the park often far outweigh the initial damage done by even the worst predatory animals (Francis et al., 2000).

Primate hunting

Hunting of wildlife is sustainable when harvest does not exceed the reproductive rate of the animals. The production rate is determined by the density or numbers of animals, and the reproductive rate of the average individual animal. Harvest rate of wildlife is driven by the demand of the consumers, and controlled by taboos, rules, regulations, enforcements and incentives. Hunting is already a global threat to primates (Mittermeier, 1987). A growing body of evidence shows that shifts in human social and economic practices in forests of Africa has greatly increased the killing of primates for meat and Oates (1996a) observed that analysis of survey data suggests that human predation tends to have greater negative impact on primate populations than does selective logging or low-intensity bush-fallow agriculture. According to Oates et al., 2006, hunting by humans appears to be the ultimate cause of the extinction of Waldron's red colobus monkey, *Procolobus badius waldroni*, a primate taxon endemic to the West African forests of Ghana and Cote d'Voire.

In West and Central Africa commercial hunting is a leading threat to the survival of primates, including the great apes. For example, in 44 primate studies and conservation projects described in IUCN's recent status survey on African primates, primate hunting is reported in 27 of them and in 12 of these, hunting by humans is listed as a severe threat to their survival (Oates, 1996b). The bush meat trade has emerged as the direct result of increase in the growth of industrial extractive commerce in the economically poor region of Africa as most contemporary Africans are losing their traditional theistic reverence for wildlife and taking on the utilitarian view (Mordi, 1991). This has stretched all the way from the bush to the cities where more rare and expensive fare is available. Gorillas, Chimpanzee, and Elephants are among the animals that are slaughtered in timber concessions and sold their meat at prices ranging from two to six times the cost of the beef or pork that is readily available to consumers in larger towns and cities (Rose, 1998). Monkeys are a serious pest to agriculture by attacking and damaging most types of crops. This also contributes to their intensely being hunted for in agricultural areas in addition to the bushmeat crises they already face.

Need for Primate Conservation

The International Union for Conservation of Nature and Natural Resources,(IUCN) formerly called World Conservation Union (WCU) surmised that, threatened animals showed a large increase in threat status of mammal species, with primates being the most threatened by extinction (IUCN, 1996). As a matter of fact, all forest living primates may be considered endangered because tropical forests are being destroyed at a high rate, more especially so, those that have slow reproduction rate. Nigeria, for example, has lost most of its forest primate habitats and some primate species now have only isolated fragments remaining through their entire range. All the Guenons in Nigeria are declining as a result of habitat loss through Agricultural expansion, logging, and intensive hunting. The IUCN classifies the following Nigerian Guenons as endangered: *Cercopithecus preussi*, *C. sclateri*, *C. erythrogaster* and *C. erythrotis*, *C. sclateri* is one of the most endangered primates in all of Africa and it is endemic to Nigeria.

The IUCN also classified the red-capped Mangabey as vulnerable. They are now locally extinct in some isolated patches of swamp forest in the Niger delta and extremely rare in other areas of their habitat range and particularly vulnerable to hunting because of its large size and

value as bush meat. The grey-checked mangabey has not been seen for many years in Nigeria and it is feared that it may already have become locally extinct.

The Western lowland Gorilla living in the Nigerian-Cameroon border is known to be critically endangered. Lists of endangered primates now include lemurs in Madagascar, Tamarins in Brazil, Langurs in Vietnam, *Sumatran orangutans*, Gorillas and a variety of Monkeys. Recent extinctions of primates have not been with notice. From www.wikipedia.com, surveys in Ghana and Cote d'Ivoire from 1993-1996 revealed that Waldron's red colobus monkey, *Procolobus boadius waldroni*, which is endemic to this part of West Africa has gone into extinction (Oates et. al., 2006).

In the face of much fragmentation of forests by logging, road and building construction which create isolated islands of primates that are being systematically trapped and shot by hunters, the disappearance of Waldron's red colobus monkey will most likely turn out to be the first obvious primate extinction in recent times. This will soon be followed by a series of other extinctions if measures are not taken to reverse this trend towards primates' extinction.

Primate Surveys

Primate census surveys are useful because their population density estimates are important variables when considering conservation priorities and creating management plans for primate populations (Ganzhorn et al., 1997). These surveys are also valuable to researchers trying to understand socio-ecological differences between primate populations (Butynski, 1990).

West African diurnal Primates

Diurnal primates native to West Africa are the Apes and Monkeys. The Apes are made up of Western lowland Gorilla and Chimpanzee. The Western lowland Gorilla is found in the tropical rainforests of Cameroon, Gabon, Central African Republic, Equatorial Guinea, Cabinda (Angola), and the Republic of Congo (Brazzaville). They can weigh up to 210 kg. A sub species of western lowland gorilla lives in the border area of Nigeria and Cameroon (Cross River). The Chimpanzee. (*Pan troglodytes*) are found in savannah woodlands, grassland-forest mosaic and tropical moist forests, from sea level to about 3,000m elevation.

The Monkeys are made up of Patas monkey. (*Erythrocebus patas*) which inhabit acacia woodland and dry savannah ranging from West Africa to Ethiopia, Kenya, and Tanzania . The patas long slender limbs, the back and sides are reddish brown and the under-parts are grey/white. They have white moustache and the face varies from black to light grey. They have shaggy, grey-streaked shoulders with the males have a bright blue scotum. The Grey-cheeked mangabey (*Lophocebus albigena*) ranges from West Africa to Uganda, North of the Congo River. Their vocalization is whoop-gobble.

The Vervet monkey or Green monkey (*Cercopithecus pygerythrus*) is found from the Southern Sahara to the whole Southern part of the African continent, except in the rain forests. They vary in colour, but generally the body is a greenish-olive or silvery grey. The males are easily recognized by their turquoise blue scrota. The Red Colobus (*Piliocolobus badius*) is an obligatory arboreal species which depends on nature forests. They are found in parts of Uganda and Tanzania and Western Africa. They differ from other colobus species as their fur is of even length over the whole body, with no tufts of longer hair.

The Mona monkey (*Cercopithecus mona*) are brightly coloured, loud, and noisy small Guenons found in a variety of forest types from mangrove swamps to gallery forests and woodlands. Their most distinctive marks are two bold white spots on their hips, long thick sideburns and white long tufts on the ears. They are both arboreal and terrestrial and move through the forest quadrupedally. Their vocalizations are boom calls and back calls. They are found in tropical South-West Africa from Ghana to Cameroon.

Greater white-nosed or putty nosed monkey (*Cercopithecus nititans*) is a forest Guenon species that has its range running from Guinea to Congo and Zaire and North of the Congo River. The White-throated or red-bellied guenon (*Cercopithecus erythrogaster*) is a forest Guenon species that is native to Eastern Benin and Western Nigeria. The Preuss's Guenon (*Cercopithecus preussi*) is a forest guenon species that is native to South-eastern Nigeria, and Cameroon. The Red-eared Guenon (*Cercopithecus erythrotis*) is a forest Guenon species that is native to South-Eastern Nigeria and South-Western Cameroon. The Sclater's guenon (*Cercopithecus sclateri*) is endemic to South-Eastern Nigeria between the Niger and Cross Rivers. The Crowned Guenon (*Cercopithecus pogonias*) is a forest guenon species that ranges from South-Eastern Nigeria through Cameroon, Equatorial Guinea, Gabon to North-Western Zaire. Red-capped or white-collared Mangabey (*Cercocebus torquatus*) is a large partially terrestrial species found only within approximately 200 km of the coast in areas of high rainfall enjoying a wide range of habitats from swamp forest to Agricultural areas. This Mangabey is found distributed from Senegal through West Africa up to Congo.

Scientific classification:

Kingdom: *Animalia*
Subkingdom: *Metazoa*
Phylum: *Chordata*
Subphylum: *Vertebrata*
Superclass: *Tetrapoda*
Class: *Mammalia*
Subclass: *Theria*
Infraclass: *Eutheria*
Order: *Primates*

METHODS

Study Area

Old Oyo National Park is one of the seven National Parks in Nigeria that was created by Decree 46 of 1999. The park covers a land area of approximately (2,512) sq.km-making it the fourth largest park in Nigeria after Gashaka Gumti (6,731) sq.km, Kainji Lake (5,340.82) sq. km, Cross River 4000 sq. km. Others are Chad Basin 2, 258 sq. km, Kamuku 1,121 sq. km, Okomu 202 sq. km, shape like a saxophone. The park is about 120km long from the Southwest to the Northeast and about 50km at its widest in the South. The purpose was mainly for conservation, preservation and protection of our natural resources. It also contained historical resources from Old Oyo Empire. The Motto of the park is "Blending of our glorious park with nationhood". The park has five ranges which are: Marguba range in Sepeteri, Oyo Ile in Igbeti, Yemoso in Ikoyi-

Ile, Tede Park in Tede and Sepeteri range in Igboho. Old Oyo National park like most other parks in Nigeria needs increased protection if it is to sustained into the future. It provides a thriving habitat for a range of wild fauna among which are primates which inhabit the guinea trees but the wildlife component has not yet been well researched. Old Oyo National Park is located in Oyo State in southwest of Nigeria. It lies between North Latitude 008° 10'N-009° 5' N and Longitude 003° 0' E 004° 20' E, the two nearest National Parks are Kainji Lake and Kamuku National Parks. The park is approximately 300km from Lagos, 60km from Ibadan, 160km from Ilorin, 660km from Abuja, 660km from Kaduna and 910km from Kano. The study area and its vegetation are shown in figures 4 and 5 respectively. A network of fairly tarred roads surrounds the park, making it possible to reach with relative ease. Travellers from eastern part of Nigeria and Lagos/Ibadan axis can come in through Ibadan-Iseyin-Sepeteri to enter the park through Ajaku gate. Travellers from Abuja, Kaduna Kano axis can come in through Ilorin-Igbeti to enter the park through Jokoro. Tessa Garuba or Apata routes. Those from Kainji Lake can come in through Kaiama Kishi-Soro to enter the park through Soro gate, while those travelling from Central Benin Republic can come in through Yashikira Kosubosu-Igboho to enter the park through Alagutan route.

Climate and Weather

Annual rainfall in the park is between 900mm and 1,500mm, and main annual temperature is between 12°C and 37°C. The rainy season begins in April through September, with the highest rainfall record between July and August. The dry season begins in October through early April and driest and hottest period is between November, December, February through March. During this time, night temperatures are quite low.

Topography and Drainage

Most part of Old Oyo National Park are lowlands plains, undulating from 300m to 500m above sea level. Few hills, notable Yemoso and Gbogun, however rise several meters above their general surroundings. The greater part of the park is watershed and is well drained by two river systems; the Ogun river flowing Southwards to the Atlantic Ocean, and the Tessa river flowing Northwards to the River Niger. Several tributaries flow South-Westward, and Eastward, and North-Westwards to join these two main rivers respectively.

Project design

The present study had been designed as shown in the flow chart of figure 6

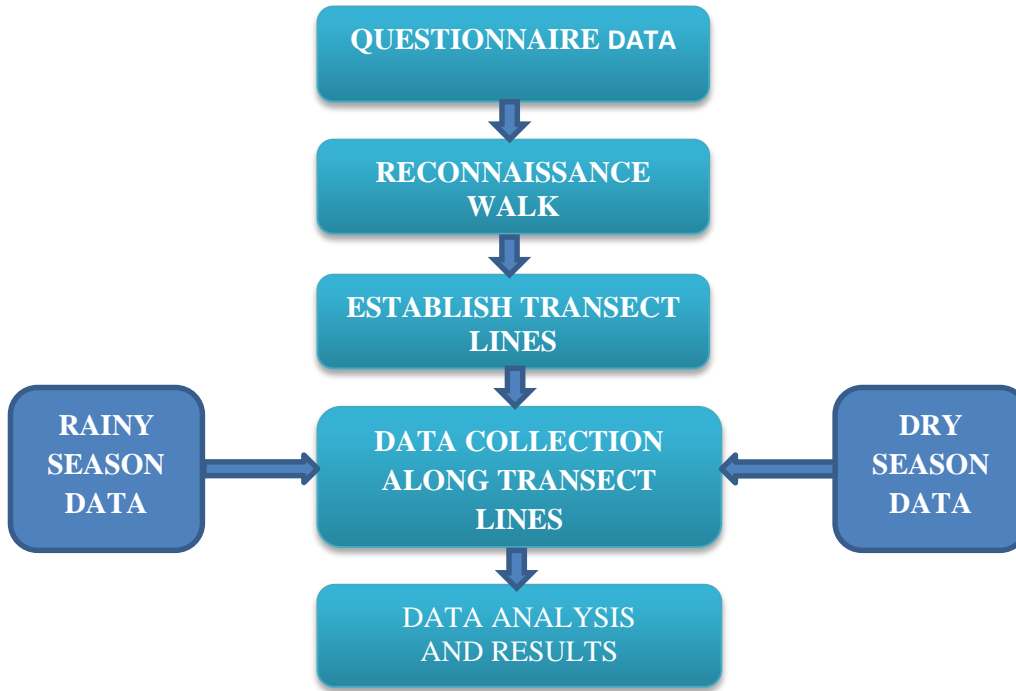


Figure 6: Flowchart illustrating the project design.

Line Transect

The research methodology used for this survey is the transect method. A transect is a defined area in which sample population counts can be taken. The area has to be large enough to truly characterize the biotic and abiotic factors being studied in the ecosystem. Currently, there is a general agreement that line transect surveys are the most efficient methods for surveying most species (Plumptre and Cox, 2006). These surveys have the advantage of providing information on primate distribution and abundance in a relatively short period (Struhsaker, 1981).

The line transect involves walking a straight path usually located at random through a representative sample, of the park and recording specific information on the primates encountered. It will be repeated a number of times until analysis shows that results obtained will not vary significantly with further transects. The line transect sampling is used to obtain an estimate of primate density which can then be converted to a population density by multiplying the density from the sampled area by the total area being surveyed.

Preparation of Transect Lines

A reconnaissance walk was first made by walking in as straight a line through the park (Walsh & White, 1999) with an experienced ranger who knows the park very well as a guide. This was to

get a picture of what the park looks like. The park was mostly heterogeneous with native trees except for farmlands and plantations, e.g., Teak, *Gmelina*, and also of food crops like Cassava, Yam and Corns.

The criteria for establishing transects were that each had to pass through representative area of the park (i.e. sample the entire habitat types in the park). Transect 1 was in river area where the animals came to drink water; Transect 2 was in an area where the animals came to lick salt; Transect 3 was in an area that was close to farmlands; Transect 4 was in an area where the animals used to play, here, we have a concentration of tall trees with much branching; Transect 5 was in an area where there were rock, abandoned paths were also used as transects.

Transects were located from arbitrarily selected reference points. The transect lines were marked out at random by making a straight path of between 3 and 6 km long through the park using a compass bearing. Each transect was divided along its length into sub-units of 100m and marked out with brightly coloured tapes for easy measurement of the distance, primate groups were spotted from the beginning of the transect lines. The lengths were derived by the slow walking speed of 1–1.5km/hr.

Walking the Transects

Transect were walked as quietly as possible between the hours of 0630-1100 and 1500-1830 hours when primates are notably most active and therefore easier to detect (Butyls and Mwangi, 1994). No transect was walked on two consecutive days. This was to avoid disturbances that could be caused by frequent movements along the transects. They were walked at a speed of about 1.5km per hour, making frequent stops to look at sightings and listen for primate vocalizations.

Data Collection

Data collection was first made by visiting the staffers in Akoto in Sepeteri, Igbeti and Ikoyi-Ile, all on the outskirts of the park, using questionnaires (See Appendix 1). These questionnaires were to collect information from rangers and poachers and some hunters living very close to the park. Among these hunters only one has been hunting in the park for less than ten years, seven has been hunting for between eleven to twenty years, five have been hunting for between twenty one to thirty years, and three for more than thirty one years. To ensure correct identification of the primates, full coloured pictures of primates likely to be found in the eco-region were used to assist the hunters' identification of the primates they encounter in the reserve.

The strip census method which utilizes sighting distances is used here. This method is particularly useful in rough terrains where compass line courses are difficult if not impossible to follow. So the sighting distances can be measured from a meandering course as easily as from a straight line (Robinette *et al.*, 1974).

Observations were made while walking along the transects, watching, listening and recording the number of primate groups seen and some measure of the distance from observer to the primates. These observations were made usually to see whether groups are bisexual, an all-male band, or mixed species, or even solitary individuals. Different species were identified both visually and vocally with the help of a ranger guide who is well acquainted with the primates. Whenever a primate group is observed, information about the group is collected and entered into the data sheet (See Appendix 1). Only animals seen and counted while walking the transects are

used in the 'subgroup' size. Care was taken to ensure that no group was counted twice. This number is used to estimate primate density (Laake et al., 1994). The data collected along the transects were done in both rainy and dry seasons. Each transect was walked twice in June to October, 2011 (rainy season), twice from November, 2011 to March, 2012 (dry season).

Data Analysis

Assumptions Made in Calculating Densities

There were six basic assumptions summarized below by Dunn (1993):

1. Animals positioned directly over the transect lines are not missed. It is also understood that not all the animals within the survey area are detected; some invariably are missed and the probability of detection declines with increasing distance from the transect line.
2. Animals or social groups are seen before they flee, none are counted twice. Any behavioural response by the animal to the presence of the observer does not affect sighting distances i.e. the positioning of the group determined before they move away.
3. The sighting of each animal (or group) is independent of sighting of other animals or groups
4. All group animals are distributed at random with respect to the transect
5. The behaviour of groups do not vary with location along the transect. Species-specific behaviour is constant relative to the observer.
6. Behaviour of groups is species-typical (i.e. the response of a group to observers is the same as that of other groups of the same species regardless of group size or composition) and does not affect detectability with increasing distance from the transect, or between survey areas.

Estimations

Fashing and Cords (2000) have found that the observer to animal distance method by Struhsaker (1981) was reliable when tested on animal sights for which 'true' primate density values are available for comparison in which it provided relatively accurate results. This method is also preferable when mean group spread cannot be reliably determined, for example, in a thick bushy area. Struhsaker (1981) maximum reliable observer to animal distance method formula for calculating group density used here is given by:

Absolute densities—sum of groups sighting per square kilometre of transect.

(Sum of group sightings refers to the total number of groups sighted at a distance equal to or smaller than the fall-off distance). The fall-off distance was described as the influence of the movements of the eyes in the estimation of length was emphasized by Helmholtz. An accurate comparison of the lengths of two parallel lines AB and CD can be made, whereas if an attempt is made to compare the nonparallel lines $A'B'$ and $C'D'$, quite large errors occur. According to Helmholtz, the eye fixates first the point A , and the line AB falls along a definite row of receptors, thereby indicating its length. The eye is now moved to fixate C , and if the image of CD falls along the same set of receptors the length of CD is said to be the same as that of AB .

Such a movement of the eye is not feasible with lines that are not parallel. Similarly, the parallelism, or otherwise, of pairs of lines can be perceived accurately because on moving the eye over the lines, the distance between them must remain the same.

Fairly accurate estimates of relative size may be made, nevertheless, without movements of the eyes. If two equal lines are observed simultaneously, the one with direct fixation and the other with peripheral vision, their images fall, of course, on different parts of the retina; if the images were equally long it could be stated that a certain length of stimulated retina was interpreted as a certain length of line in space. It is probable that this is roughly the basis on which rapid estimates of length depend, although there are such complications as the fact that the retina is curved so that lines of equal length in different parts of the retina do not produce images of equal length on the retina.

Relative abundance indices – average numbers of primate groups encountered per kilometer of transect. The transect width estimator used is the maximum reliable distance from observer to animal (reliable distance to animal method) (Struhsaker, 1981). The area sampled is calculated as $\text{Transect Area} = \text{transect length} \times \frac{1}{2} \text{transect length (width)}$. The computer program used to perform calculations for comparing the relative abundance among the species and the diversity between the transects is Palaeontological Statistics software (PAST).

The period of study was between March, 2011 to March, 2012. The study was carried out both in the morning and in the evening, the period covered rainy and dry seasons. The transect were placed along the following route:

Tede/Sepeteri (Marguba) range:

- (i) Along salt licking area (Aho) = 3.3km (Plate 1)
- (ii) Along the Ibuya river = 4.0km (Plate 2 and 3)
- (iii) A place where they normally meet = 6.0km (Plate 4 and 5)
- (iv) Very close to the farmland = 3.5km(Plate 6)

Igboho/Oyo-Ile range:

- (i) Along the river (Weke river) = 3.0km
- (ii) Very close to the hill = 5.0km (Plate 7)
- (iii) Close to the farmland = 3.0km

Yemoso (Ikoyi-Ile) range:

- (i) Along the hill (Oke gbogun) =4.0km
- (ii) Along the river (Oowe river) =3.6km
- (iii) Close to the farmland =3.2km

Total transect distance in kilometer was =38.6km

$\text{Transect Area} = \text{transect length} \times \frac{1}{2} \text{transect length (width)}$

Total length of the transects in the five ranges = 38.6km

$\frac{1}{2} \text{transect length (width)} = 19.3\text{km}$.

The total area sampled = 744.98 sq. km

The total area of the park=2,512 sq.km

A Radar-like post for observing the animals was placed in the park at Akoto area; it can also be used to detect poachers who entered the park illegally to kill the animals (Plate 8).



Plate 1: A transect line placed at where they normally lick salt



Plate 2: Ibuya River in Akoto where transect line was placed



Plate 3: An open space close to Ibuya River



Plate 4: Another spot where transect line was placed, here, there were concentration of tall trees (*Margaritaria discoideus*)

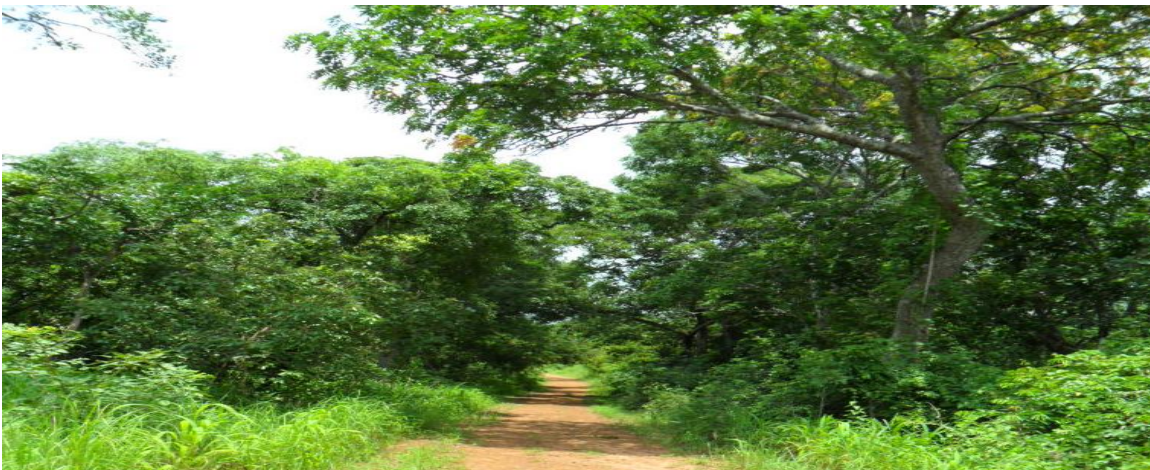


Plate 5: Another spot where the transect line was placed



Plat 6: A place closed to the farmland



Plate 7: Transect placed very close to the hill



Plate 8: A radar-like post placed in the park at Akoto for observing the animals

RESULTS AND DISCUSSION

Primate Presence through Hunters' Responses

From the questionnaire survey with the hunters, before the transect walks, it was gathered that there were presently eight primate species in the Old Oyo National Park. All the eight primate species were Monkeys and Baboons. These include Red monkey (*Erythrocebus patas*), Green monkey (*Chlorocebus sebaeus*), Tantalus monkey, Ash coloured monkey (*Tataras monkey*), White throated monkey (*Cercocebus erythrogaster*), Green colobus (*Colobus satanas*) and Putty-nosed monkey (*Cercopithecus nititans*) and Baboon (*Papio anubis*). These were the primates species they had observed in the Old Oyo National Park except the Gorilla (*Gorilla gorilla*) and Chimpanzee (*Pan troglodytes*) which were never seen in the last forty years. All the hunters confirmed the presence of Baboon (Plate, 9, 10 and 11) and the Red monkey (Plate 12). Eight of them confirmed the presence of Tantalus and Green monkey (plate 13).

Primate presence through direct observation

During the transect walks however all these species were encountered except during the rainy season, when the Green colobus and Putty-nosed monkey (*Cercopithecus nititans*) were not seen at all. This confirmed the report of eight out of the twenty hunters to which the questionnaires were administered. One of the hunters however reported having encountered a pair of chimpanzees (a male and a female) twice in 2009 and once in 2011 when the male alone was sighted. The observations were made close to the border between Nigeria and Benin Republic. There were no encounters with chimpanzees and the Gorilla while walking through the park.

Primate Populations

Transect Area

Initial reconnaissance transect walks revealed that the primates were only concentrated within a limited area due to anthropogenic influences, hence the total sampled area was less than the total area of the park.



Plate 9: Baboon and its young sitting on a rock in Oyo-ile range



Plate 10: A Baboon carrying its baby in Marguba range



Plate 11: Troops of Baboon in Oyo-ile range



Plate 12: *Erythrocebus patas*



Plate 13: *Erythrocebus sebaeus*

Number of Primate Species in the Park

Table 1: Total number of Primate species in Old Oyo National Park sighted between two and eleven times.

Common Name	Species	Total No.
Red monkey	<i>Erythrocebus patas</i>	201
Green monkey	<i>Chlorocebus sebaeus</i>	80
Tantalus monkey	<i>Tantalus sp.</i>	22
Tataras monkey	<i>Tataras sp.</i>	54
White-throated monkey	<i>Cercopithecus erythrogaster</i>	43
Putty-nosed monkey	<i>Cercopithecus nititans</i>	21
Baboon	<i>Papio anubis</i>	438
Green colobus	<i>Colobus satanas</i>	41
	Total =	900

Table 1 showed that Baboon (*Papio anubis*) had the highest population with a total number of 438; followed by Red monkey (*Erythrocebus patas*), 201; Green monkey (*Chlorocebus sebaeus*) which was 80; *Tataras sp.* 54; *Cercopithecus erythrogaster* 43; Green colobus (*Colobus satanas*) 41; *Tantalus sp.* 22 and *Cercopithecus nititans* 21.

Primate composition in Old Oyo National Park

Table 2: The percentage composition of the Primate species in Old Oyo National Park

Common Name	Species	Total No.	% Composition
Red monkey	<i>Erythrocebus patas</i>	201	22.33
Green monkey	<i>Chlorocebus sebaeus</i>	80	8.88
Tantalus monkey	<i>Tantalus sp.</i>	22	2.45
Tataras monkey	<i>Tataras sp.</i>	54	6.00
White-throated monkey	<i>Cercopithecus erythrogaster</i>	43	4.78
Putty-nosed monkey	<i>Cercopithecus nititans</i>	21	2.33
Baboon	<i>Papio Anubis</i>	438	48.67
Green colobus	<i>Colobus satanas</i>	41	4.56
	Total =	900	100

Table 2 showed that total number of 900 primates were censused on the 10 transects used. Baboons (*Papio anubis*) were the commonest accounting for 48.67% (N=438) of the total number of primate species. The Red monkey (*Erythrocebus patas*) were also frequent in the censuses accounting for 22.33% (N=201) of total species. The Green monkey (*Chlorocebus sebaeus*) had 8.88% (N=80) of the species. Tataras monkey had 6.00% (N=54) of the total species. White throated monkey (*Cercopithecus erythrogaster*) had 4.78% (N=43) while Green colobus had 4.56% (N=41) of the total groups. *Tantalus sp.* had 2.45% (N=22) of the total groups and lastly Putty-nosed monkey (*Cercopithecus nititans*) had 2.33% (N=21) of the total species which was the least.

Mean Number of Primate Species in Old Oyo National Park

Table 3: The mean numbers of Primate species encountered in the Park along the transect lines

Common name	Species	Total No.	No. of sightings	Mean No. \pm S.E
Red monkey	<i>Erythrocebus patas</i>	201	10	20.10 \pm 0.68
Green monkey	<i>Chlorocebus sebaeus</i>	80	5	16.00 \pm 0.71
Tantalus monkey	<i>Tantalus sp.</i>	22	11	2.00 \pm 0.00
Tataras monkey	<i>Tataras sp.</i>	54	5	10.80 \pm 0.97
White-throated monkey	<i>Cercopithecus erythrogaster</i>	43	6	7.17 \pm 0.31
Putty-nosed monkey	<i>Cercopithecus nictitans</i>	21	5	4.20 \pm 0.67
Baboon	<i>Papio anubis</i>	438	11	39.82 \pm 1.47
Green colobus	<i>Colobus satanas</i>	41	2	20.50 \pm 15.51
	Total =	900	55	

Table 3 showed that *Papio anubis* had mean of 39.82 \pm 1.47; Green colobus had mean of 20.50 \pm 15.51; followed by Red monkey 20.10 \pm 0.68. Next to it was Green monkey 16.00 \pm 0.71; Tataras monkey 10.80 \pm 0.97. This was followed by White throated monkey 7.17 \pm 0.31 and next to it was Putty-nosed monkey 4.20 \pm 0.67 while Tantalus monkey had the least 2.00 \pm 0.00.

Absolute densities of the Primate species in Old Oyo National Park

Table 4: The absolute densities of the Primate species

Common Name	Species	Mean No. \pm S.E	Sighting Rate (per km)
Red monkey	<i>Erythrocebus patas</i>	20.10 \pm 0.68	0.52
Green monkey	<i>Chlorocebus sebaeus</i>	16.00 \pm 0.71	0.41
Tantalus monkey	<i>Tantalus sp.</i>	2.00 \pm 0.00	0.05
Tataras monkey	<i>Tataras sp.</i>	10.80 \pm 0.97	0.28
White-throated monkey	<i>Cercopithecus erythrogaster</i>	7.17 \pm 0.31	0.19
Putty-nosed monkey	<i>Cercopithecus nititans</i>	4.20 \pm 0.67	0.11
Baboon	<i>Papio anubis</i>	39.82 \pm 1.47	1.03
Green colobus	<i>Colobus satanas</i>	20.50 \pm 15.51	0.53

Table 4 showed that the sighting rate was the frequency at which the primate species were crossing the transect lines. This table also shows the abundance of some species having a sighting rate of above 0.5 per km while some were having much less than 0.5 which means they had become threatened or endangered.

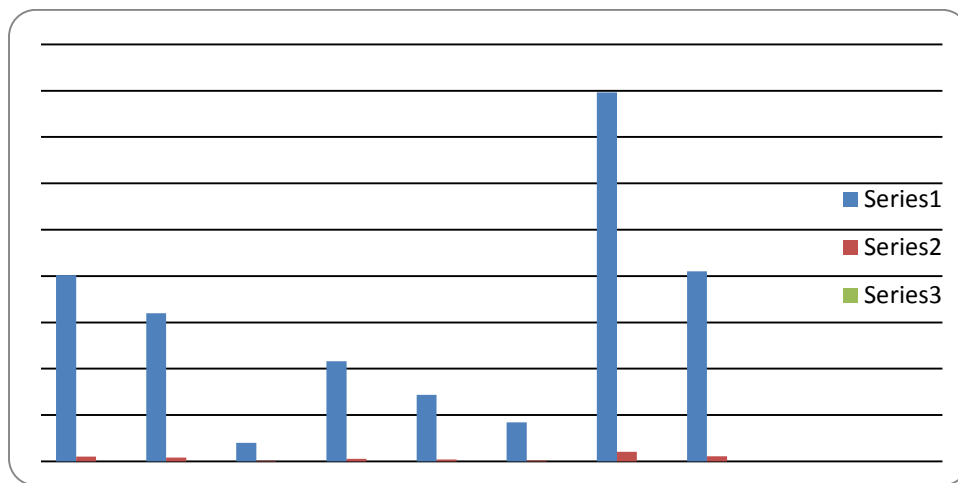


Figure7: Variation in the mean sighting rate per km of eight Primate species

Series 1. Represent the Mean No. \pm S.E

Series 2. Represent the Sighting Rate per km while

Series 3. Represent the Standard Error

1-Red monkey; 2-Green monkey; 3-Tantalus monkey; 4-Tataras monkey; 5-White throated monkey; 6-Putty nosed monkey; 7-Baboon; 8-Green colobus.

The fig.7 above showed that Baboon was sighted most. Next to it was the Green colobus and followed by Red monkey. This was followed by Tataras monkey, White-throated monkey and Putty –nosed monkey. Tantalus monkey was the least sighted during the study.

The threatened Primate species in Old Oyo National Park

Table 5: Four threatened Primate Species in Old Oyo National Park

Common Name	Species	Sighting Rate(per km)
Tantalus monkey	<i>Tantalus sp.</i>	0.05
Tataras monkey	<i>Tataras sp.</i>	0.28
White-throated monkey	<i>Cercopithecus erythrogaster</i>	0.19
Putty-nosed monkey	<i>Cercopithecus nititans</i>	0.11

Table 5 above showed that *Tantalus sp.* had 0.05 sighting rate per km; *C. nititans* had 0.11 sighting rate per km; *C. erythrogaster* 0.19 sighting rate per km and *Tataras sp.* had 0.28 sighting rate per km. From the result above, all these species were becoming endangered and if care is not taken, they will soon become extinct.

Seasonal variation in the number, mean and number of sighting of Primate Species in Old Oyo National Park

Table 6a: The mean of the total Primate species in Old Oyo National Park in Rainy seasons from April-October 2011.

Common Name	Species	Rainy season		
		No. of Primate species	No. of sightings	Mean \pm S.E
Red monkey	<i>Erythrocebus patas</i>	103	06	17.17 \pm 0.65
Green monkey	<i>Chlorocebus sebaeus</i>	66	04	16.50 \pm 0.65
Tantalus monkey	<i>Tantalus sp.</i>	16	08	2.00 \pm 0.25
Tataras monkey	<i>Tataras sp.</i>	32	03	10.67 \pm 1.34
White-throated monkey	<i>Cercopithecus erythrogaster</i>	23	03	7.67 \pm 0.34
Putty-nosed monkey	<i>Cercopithecus nititans</i>	00	00	0.00
Baboon	<i>Papio anubis</i>	274	07	39.14 \pm 1.16
Green colobus	<i>Colobus satanas</i>	00	00	0.00

Table 6a above showed the mean of the total Primate species in Old Oyo National Park in Rainy seasons from April-October 2011. *Papio anubis* had the highest number, this was followed by *Erythrocebus patas*, *Chlorocebus sebaeus*, *Tataras sp.*, *C. erythrogaster*, *Tantalus sp.* and lastly were *C. nititans* and *Colobus satanas* with zero value.

Table 6b: The Mean of the Total Primate Species in Old Oyo National Park in Dry Seasons from November, 2011-March 2012.

Common Name	Species	Dry Season		
		No. of Primate Species	No. of Sightings	Mean \pm S.E
Red monkey	<i>Erythrocebus patas</i>	98	04	24.50 \pm 0.65
Green monkey	<i>Chlorocebus sebaeus</i>	14	01	14.00
Tantalus monkey	<i>Tantalus sp.</i>	06	03	2.00 \pm 0.00
Tataras monkey	<i>Tataras sp.</i>	22	02	11.00 \pm 1.00

White-throated monkey	<i>Cercopithecus erythrogaster</i>	20	03	6.67 ± 0.34
Putty-nosed monkey	<i>Cercopithecus nititans</i>	21	05	4.20 ± 0.71
Baboon	<i>Papio anubis</i>	164	04	41.00 ± 0.32
Green colobus	<i>Colobus satanas</i>	41	02	20.50 ± 4.51

Table 6b showed the mean of the total Primate species in Old Oyo National Park in dry seasons from November,2011-March,2012. *Papio anubis* had the highest number, this was followed by *Erythrocebus patas*, *Colobus satanas*, *Tataras sp.* *C.nititans*, *C.erythrogaster*, *Chlorocebus sebaeus* .*Tantalus sp.* had the least.

Table 6c: The absolute densities of the Primates species in Rainy and Dry seasons

Common Name	Species	Rainy season		Dry season	
		Mean ± S.E	Sighting Rate(km ⁻¹)	Mean ± S.E	Sighting Rate(km ⁻¹)
Red monkey	<i>Erythrocebus patas</i>	17.17 ± 0.65	0.44	24.50 ± 0.65	0.63
Green monkey	<i>Chlorocebus sebaeus</i>	16.50 ± 0.65	0.43	14.00 ± 0.00	0.36
Tantalus monkey	<i>Tantalus sp.</i>	2.00 ± 0.25	0.05	2.00 ± 0.00	0.05
Tataras monkey	<i>Tataras sp.</i>	10.67 ± 1.34	0.28	11.00 ± 1.00	0.28
White-throated monkey	<i>Cercopithecus erythrogaster</i>	7.67 ± 0.34	0.19	6.67 ± 0.34	0.17
Putty-nosed monkey	<i>Cercopithecus nititans</i>	0.00	0.00	4.20 ± 0.71	0.11
Baboon	<i>Papio anubis</i>	39.14 ± 1.16	1.01	41.00 ± 0.32	1.06
Green colobus	<i>Colobus satanas</i>	0.00	0.00	20.50 ± 4.51	0.53

Table 6c showed that the Red monkeys were more in abundance in dry season having a mean of 24.50 ± 0.65 than in dry season than 17.17 ± 0.65 in rainy season while the Green monkey were in abundance in the rainy season having a mean of 16.50 ± 0.65 and 14.00 in dry season. Tantalus monkey had a value of 2.00 ± 0.25 in rainy season. There was no much variation in dry and rainy season of Tataras monkey and White throated monkey, The value of Baboons during the dry season was 39.14 ± 1.16 and increased in rainy season to 41.00 ± 0.32. Putty-nosed monkey and Green colobus were not seen at all during the rainy season but were seen only during the dry season.

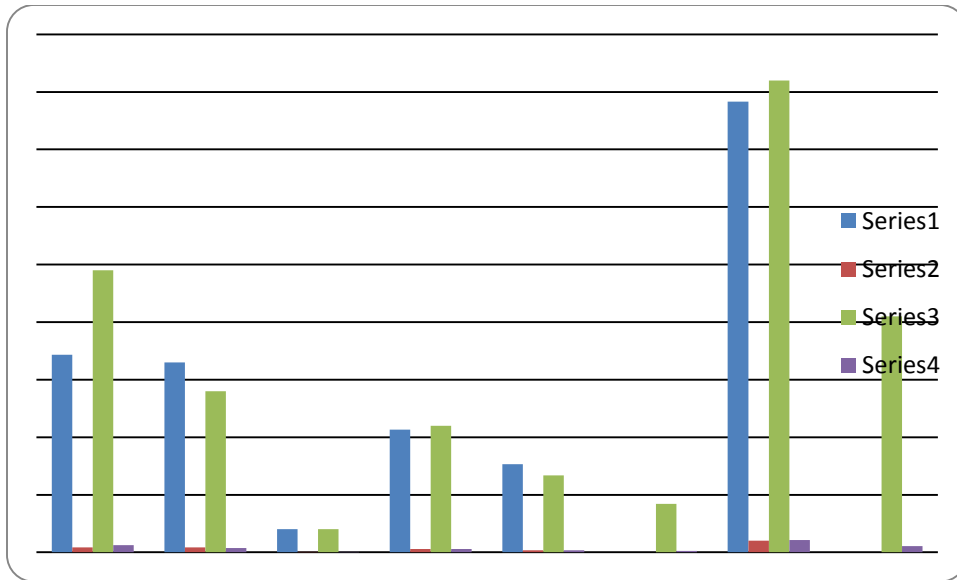


Figure 8: The distribution of primates in rainy and dry season in Old Oyo National Park

Series 1. Represent the mean in rainy season while Series 3. Represent the mean in dry season.

Series 2. And 4. Represent the sighting rate during the rainy and dry seasons respectively.

1-Red monkey; 2-Green monkey; 3-Tantalus monkey; 4-Tataras monkey; 5-White throated monkey; 6-Putty nosed monkey; 7-Baboon; 8- Green colobus.

Sex distribution of Primate species in Old Oyo National Park

Table 7: Ratio of Male to Female Primate Species in Old Oyo National Park

Common Name	Species	No. of Males	No. of Females	Male:Female ratio
Red monkey	<i>Erythrocebus patas</i>	30	120	1:4
Green monkey	<i>Chlorocebus sebaeus</i>	20	40	1:2
Tantalus monkey	<i>Tantalus sp.</i>	1	1	1:1
Tataras monkey	<i>Tataras sp.</i>	10	16	5:8
White-throated monkey	<i>Cercopithecus erythrogaster</i>	8	12	1:1.5
Putty-nosed monkey	<i>Cercopithecus nititans</i>	8	6	1:0.75
Baboon	<i>Papio Anubis</i>	40	112	5:14
Green colobus	<i>Colobus satanas</i>	10	20	1:2

Table 7 showed the Ratio of male to female Primate specie in Old Oyo National Park. *Papio anubis*, *Erythrocebus patas*, *Tataras sp.* had higher numbers of female than male. *Chlorocebus sebaeus*, *Colobus satanas*, *Tantalus sp.* and *C. erythrogaster* had almost the same proportion of male to female except for *C. nititans* that had greater number of males than females.

Adult-juvenile relationship of Primate Species in Old Oyo National Park

Table 8: Ratio of adult to juvenile species in Old Oyo National Park

Common Name	Species	No. of Adults	No. Juvenile	Ratio
Red monkey	<i>Erythrocebus patas</i>	198	3	1:0.02
Green monkey	<i>Chlorocebus sebaeus</i>	80	-	80:0
Tantalus monkey	<i>Tantalus sp.</i>	22	-	22:0
Tataras monkey	<i>Tataras sp.</i>	52	2	1:0.04
White-throated monkey	<i>Cercopithecus erythrogaster</i>	42	1	1:0.02
Putty-nosed monkey	<i>Cercopithecus nititans</i>	20	1	20:1
Baboon	<i>Papio anubis</i>	432	6	72:1
Green colobus	<i>Colobus satanas</i>	40	1	40:1
Total		886	14	1:0.016

Table 8 showed the ratio of adult to juvenile species in Old Oyo National Park and it was not a good ratio for all the primate species.

CONCLUSION

Primate abundance

Eight species of primates were eventually encountered in the park which were made up of Red monkey, Green monkey, Tantalus monkey, Tataras monkey, White-throated monkey, Putty-nosed monkey, Baboons and Green colobus. Only five of these were in abundance which were made up of Red monkey, Green monkey, Tataras monkey, Baboons and Green colobus. Others were very few and had become threatened or highly endangered within the park.

Distribution among the various transects

The reason for the uneven distribution of primates sightings were probably due to the activity of farmers and timber contractors in some part of the park, hence, very low sightings as opposed to other unopened areas of the park. Monkeys tend to stay nearer the farms where they forage for farm crops like bananas, pawpaw and vegetables used as food. The foraging takes place at the early hours of the day before the arrival of the farmers and late in the evening. Baboons feed on all kinds of fruit particularly, *Borassus aethiopum* (Plates 14 and 15).

Primates on the brink: Mankind's closest living relatives under threat around the World

Antananarivo, Madagascar (April 7, 2005) -- Mankind's closest living relatives -- the world's Apes, Monkeys, Lemurs and other Primates -- face increasing peril from humans and some could soon disappear forever, according to a report released by the Primate Specialist Group of IUCN-The World Conservation Union's Species Survival Commission (SSC) and the International Primatological Society (IPS), in collaboration with Conservation International (CI). Primates in Peril: The World's 25 most endangered Primates-2004-2006 reveals that 25 percent-or one in four-of the 625 Primate species and subspecies are at risk of extinction. The report compiled by more than 50 experts from 16 countries cites deforestation, commercial bushmeat hunting, and

the illegal animal trade as the primary threats, and warns that failure to respond will bring the first Primate extinctions in more than a century.

The golden-headed Langur of Vietnam and China's Hainan Gibbon number only in the dozens. The Horton Plains slender Loris of Sri Lanka has been sighted just four times since 1937. *Perrier's sifaka* of Madagascar and the Tana River Red colobus of Kenya are now restricted to tiny patches of tropical forest, leaving them vulnerable to rapid eradication. Hunters kill Primates for food and to sell the meat, traders capture them for live sale, and loggers, farmers, and land developers destroy their habitat. "More and more, mankind's closest living relatives are being cornered into shrinking areas of tropical forest," said CI President Russell A. Mittermeier, who also chairs the IUCN-SSC Primate Specialist Group. "This is especially true of Madagascar, one of the planet's biodiversity hotspots that has lost most of its original forest cover. More than half its Lemurs, none found anywhere else in the world, are threatened with extinction. Without immediate steps to protect these unique creatures and their habitat, we will lose more of our planet's natural heritage forever."

The World's 25 Most Endangered Primates list, compiled at the 20th Congress of the International Primatological Society in Turin, Italy, follows similar reports in 2000 and 2002. Fifteen of the primates on the new list, including the Sumatran Orangutan of Indonesia and the northern Muriqui of Brazil, are "three-time losers" for having appeared on all three lists. Seven are new additions to the 2004-2006 list, and three appeared once before. Madagascar and Vietnam each have four Primates on the new list, while Brazil and Indonesia have three, followed by Sri Lanka and Tanzania with two each, and one each from Colombia, China, Cameroon, Ivory Coast, Equatorial Guinea, Ghana, Kenya, Nigeria, Rwanda, Uganda, and Democratic Republic of Congo. Some primates on the list are found in more than one country. By region, the list includes 10 from Asia, seven from Africa, four from Madagascar, and four from South America, showing that threat to Monkeys, Lemurs, Great Apes and other Non-human primates exist wherever they live.

All 25 primates on the 2004-2006 list are found in the world's biodiversity hotspots-34 regions identified by Conservation International that cover just 2.3 percent of the Earth's land surface but harbor well over 50 percent of all terrestrial plant and animal diversity. Eight of the hotspots are considered the highest priorities for the survival of the most endangered primates: Indo-Burma, Madagascar and the Indian Ocean Islands, Sundaland, Eastern Afromontane, Coastal Forests of Eastern Africa, Guinean Forests of West Africa, the Atlantic Forest of Brazil, and Western Ghats-Sri Lanka. Habitat loss due to the clearing of tropical forests for agriculture, logging, and the collection of fuel wood continues to be the major factor in the declining number of primates, according to the report. Hunting for subsistence and commercial purposes also is a major and insidious threat, especially in Africa and Asia. Live capture for the pet trade also poses a serious threat, particularly to Asian species.

"Southeast Asia's Primates are subject to relentless poaching because of the profits to be made from the illegal trade," said Chantal Elkin, manager of the Threatened Species Program in CI's Center for Applied Biodiversity Science. "Although some of the region's threatened primates are taken as pets-notably Orangutans and Gibbons -they are most often hunted and traded for use in traditional medicines. Most of this trade appears to be international, primarily to China." As "Flagship Species" and our closest living relatives, Nonhuman primates are important to the health of their surrounding ecosystems. Through the dispersal of seeds and other interactions with their environments, Primates help support a wide range of plant and animal life that make up the Earth's forests.

The 2004-2006 list focuses on the severity of the overall threat rather than mere numbers. Some on the list, such as the Sumatran Orangutan, still number in the low thousands but are disappearing at a faster rate than other Primates. The December tsunamis that devastated coastal Sumatra have triggered a possible new threat to Orangutan habitat from resettlement of area residents. Changes to the list from 2002 reflect a desire to draw attention to other endangered Primates. For example, *Miss Waldron's red colobus*, which has gone decades without a live sighting, was replaced by the *Bioko red colobus* to show that other Colobus species also are under extremely grave threat. "All evidence tells us that the first extinctions among Africa's Primates will occur among the Red colobus," said Thomas Butynski, director of CI's Eastern Africa Biodiversity Hotspots Program. "*Miss Waldron's red colobus* in Ghana and Ivory Coast, and *Bouvier's red colobus* in the Republic of Congo may already be extinct, while the Tana River Red colobus in Kenya and *Bioko red colobus* in Equatorial Guinea could be gone within the next 20 years." (Source: Conservation International: Date: 26 April, 2005).



Plate 14: Picture of *Borassus aethiopum*



Plate 15: Fruits of *Borassus aethiopum*

To ensure that the data does not yield inaccurate densities for species that may show strong seasonality in their use of different parts of the park, the census was conducted over a period of rainy and dry seasons. Seasonally, the diurnal primate species in the park were unevenly distributed all year round from the sightings during the transect walks and also from responses to the questionnaires administered to the hunters (i.e., there was a strong seasonality in their use of the park). More primate species were sighted during the dry season which probably due to openness of the park which makes it easier to see into the park.

Among the species encountered, only the putty-nosed monkey showed a lesser number of females than males in their population. Usually, one observed a grown up adult male and few young male primates. The presence of more females in the species offers more mating partners for the males and hence, the likelihood of a rapid increase in the numbers of these species but during the period of observation, only fourteen juvenile were seen. Tantalus monkey were only two, a male and a female and always walking together, this does not spell a promising future for these primates because there will be less numbers of infants to succeed the adults when they die off should this linger.

The breakdown of the principal activities of the primates show that the Baboon and the Red monkey follow the same trend in their major activities with about 50% of their time was spent on feeding. Not many of the Tantalus monkey were encountered; it is therefore difficult to say with all certainty what their activities could portray. Generally, all possesses adaptations for climbing trees, although, Baboon are primarily terrestrial rather than arboreal (www.wikipedia.com). Locomotion techniques used include leaping from tree to tree, walking on two or four limbs, knuckle-walking and swinging between branches of trees known as branchiations. (www.wikipedia.com).

The estimated population was less than the actual primate population of primates in the park. The entire monkey encountered took to their heels as soon as they detected our presence, which is not surprising in view of the intensive hunting and other human activities observed in the park. Some species must have probably detected our presence much earlier than we could have detected theirs and fled without our knowing they were there. The white-throated monkey unlike other species tended to move quietly away when it detects danger and so is much easier for them to be under counted than others (Oates, 1985).

For a very long period in the past, the area has suffered indiscriminate and uninhibited destructive human activities including hunting. As a result, animal species have been greatly depleted and some species have either become locally extinct or rare. Fauna is relatively more abundant in the southern part of the park than other sections. The other fauna encountered in the park include Roan antelope (*Hippotragus equines*), Western Hartebeest, (*Alcelaphus buselaphus*), Kob (*Kobus kob*), Red flanked Duiker (*Cephalopus rufilatus*), Grey duiker (*Sylvicapra grimmia*), Water Buck (*Kobus defassa*), Bush Buck (*Tragelaphus Scriptus*), Oribi (*Ourebia ourebi*), Warthog (*Phacochoerus aethiopicus*).

Major anthropogenic activities around and within the park that are detrimental to the status of the park include agriculture, encroachment by settlers, unsustainable logging and plantation agriculture.

The impact of hunting for subsistence purposes in the park was without doubt, much, but the far greater menace was commercial hunting around Igbeti area which was several orders of magnitude greater. The harvest of wildlife from the park was multiplied by logging operations primarily by increasing access to previously remote areas. The new roads serve as conduits for commercially traded meat and other wildlife products according to Francis *et al.*, (2000). In

addition to the increased access by logging roads, hunting pressure in logging areas also increased because of the number of people involved in logging. Logging also provides a ready market for meat and other wildlife products. This makes local communities to shift towards commercial hunting to satisfy the demands of the loggers. Of particular concern was the tendency for hunters to target almost any species larger than 1 kg, including species that are vulnerable to extinction as reported by Bodmer et. al. (1997). One mechanism is to try to ensure that tropical log harvesting is more sustainable through logging certification. Some of the bullets and empty shells recovered from different poachers were shown in (Plate 16, 17, 18 and 19) .



Plate 16: Bullets recovered from Poacher and stored in old Oyo National Park Office



Plate 17: Traps recovered from Poachers and kept in the old Oyo National Park office



Plate 18: Loggers at work in Tede range



Plate 19: Some hunters at Ikoyi-ile range

According to the Schedule of the Amendment Order of the park right, various communities were allowed to farm within certain demarcated areas are recognized within the park. So also were the rights to reside within the park and farm within the demarcated areas (UNESCO, Man and Biosphere Reserve). Seven thousand six hundred and eighty (7,680) hectares were released for agricultural crops. But further and deeper encroachments have been made into the restricted areas over the years. It is not uncommon to see the undergrowth of large masses of land cleared to plant crops like cassava and yam. Hence, there is an ongoing destruction of the soil by this degrading agricultural practice. A biosphere reserve is an area of land or water that is protected by law in order to support the conservation of ecosystems, as well as the sustainability of mankind's impact on the environment. This means that each biosphere reserve aims to help scientists and the environmental community figure out how to protect the world's plant and animal species while dealing with a growing population and its resource needs. Biosphere reserves were created by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) under a program called Man and the Biosphere (MAB) in 1968. Since its creation,

MAB has helped dozens of countries create biosphere reserves. In order to create a reserve, a country must suggest an area of land for the MAB to approve.

There are three main parts to a biosphere reserve. The first part is called the core zone. This zone is strongly protected for the conservation of biological diversity — to make sure that different types of plants and animals are safe from human impact. The second part is called a buffer zone. These zones surround the core zones and provide a space for environmental research, recreation, and tourism. The last part is called a transition zone. A transition zone is for local communities that have a hand in managing the resources of the area through farming, fisheries, and other non-governmental activities. Ultimately, the ways that these three zones operate depend on the specific needs of the biosphere reserve they are in. Each biosphere reserve is governed by the country in which it resides. This allows each country or state to use a biosphere reserve for the region's specific needs, therefore making sure that every reserve is used wisely and for the benefit of the communities around it. Thus, each biosphere reserve has different laws and regulations about its maintenance.

There are numerous benefits to biosphere reserves. Not only can they help raise awareness of mankind's impact on the environment, but they support local communities in the maintenance of the natural environment around them. A biosphere reserve is also used for environmental recreation and education, meaning people can use the reserve to teach others about the environment, as well as use the land for nature activities, such as hiking and fishing. Biosphere reserves have also been quite helpful to scientists because the reserves create large areas of land for people to research plants, animals, and the overall conditions of the ecosystem (Source: mab@unesco.org).

Encroachment by human settlers in and around the park is also contributing to the degradation of the park as people are drawn by prospects of hunting and also of the market for meeting the needs of the people.

These plantations comprised both indigenous and exotic tree species such as Cinderella, *Tectona grandis*, Afara trees, *Gmelina arborea*. The greater majority of these plantations were of exotic trees like *Tectona grandis* and *Gmelina arborea* occurring in both mono and mixed plantations. Thus there was much destruction of natural species at the expense of the exotic ones as shown by loggers at work in Tede range of the Old Oyo National park (plate 19).

Recommendation

The future of primates in the park is not bright. According to Wilson (1989), the rate of extinction of species when their habitat is destroyed is dependent on the size of the habitat patch left undisturbed and the group of organisms concerned. Among the seven species of monkeys in the park, Tantalus and putty-nosed monkey were most likely to decline even more rapidly than others since they inhabit the very tall trees. With unregulated logging taking place, the putty-nosed monkey has a very bleak future in the park. The lower ratio of juveniles to adults does not give a promising future for the primates in the park. Further studies to determine how to reverse the process would be a valuable venture to undertake.

This census provides baseline information on the status of primate diversity and numbers within the park. This is a signal to immediately begin the conservation of the primates and other animals by Local, State and Federal government agencies. Effort should be made to conserve the putty-nosed monkey and Tantalus monkey by restricting or, at least, regulating the cutting of the very tall tree species. Also the replacement of cut-down trees through planting will help them to

regain their numbers. The section of the park where more of the monkey species were seen both in numbers and species should be protected for its primate richness.

Measures to salvage the park should commence irrespective of the extent to which the park had been disturbed. Even the natural ecosystem that had changed drastically with time at the expense of native wildlife can still be salvaged as was done in Australia by a private individual who took the initiative in 1969 to create a native fauna sanctuary. This was done by fencing off all the introduced predators from degraded farmlands and replanted them with native trees and shrubs. Some of the native animals were then re-introduced. The result was that this sanctuary, in twenty years, increased the numbers of at least rare and endangered mammals (Bolton, 1997).

There is need to reduce the impact of logging on the parks' primates by regulating logging-associated hunting. Close involvement of local communities and logging employees in proposing regulations to be adopted in the management of primates and other wildlife in the park should be encouraged. Setting up projects that would recruit, train and re-employ bush meat hunters as reserve guards, field assistants, census takers, teachers and bush meat monitors to enforce the regulations are commended. This will further enhance the sustainability of the park as enshrined in UNESCO: Man and the Biosphere Reserve, to which Nigeria is a signatory.

The need to ensure more sustainable timber harvesting through timber certification is advocated; returning back to the former method of logging by concessions and recruiting personnel to enforce this by following the loggers into the park to supervise their activities; making low-intensity selective logging a component of the conservation plan for primates, since it is more compatible with primate conservation according to Chapman et al. (2000) instead of the high intensity logging which is detrimental to primates.

The intensity of hunting in the park particularly in Ikoyi-Ile and Igbeti area is unsustainable. Regulations should be put in place to limit the hunting to a sustainable level through the Forestry Department and village heads in and around the park; establishing extension programmes to provide locally-appropriate production of alternative source of protein and cash will reduce the hunting pressure on the primates and other wildlife. These programmes will use community-based techniques to educate reserve communities about the ecological and health risks as well as the need to conserve both faunal and floral life of the reserve.

Protection of key areas for primates within the park leaving them as primary section will create a system of unlogged blocks within the logging concessions which may serve as a refuge for the primates, and from which they can re-colonise logged areas. It is suggested that, at least, 20 percent of the total area of the logging concessions be based on prior field surveys. This will also serve to protect other wildlife.

The need to endow and institutionalize primate (or even wildlife as a whole) protection teams to enforce wildlife laws through interdiction and prosecution is advocated. Feasibility of reintroducing Chimpanzees and Gorillas into the park should be considered. If the prospects of reintroducing them are good.

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APPENDIX I

TRANSECT DATA COLLECTION SHEET

1. Date _____ 2. Time _____
3. Species sighted _____
4. Initial cue to detection _____
5. Sighting distance _____
6. Total number _____ 7. Group spread _____
8. Number of females _____ 9. Number of males _____
10. Number of adults _____ 11. Number of juveniles _____
12. Activities engaged in _____
13. Where sighted (on tree (high/low) or on ground) _____
14. Vegetation type of place sighted in _____

APPENDIX II

QUESTIONNAIRE DATA FORM

PRIMATE PRESENCE IN OLD OYO NATIONAL PARK AND FACTORS AFFECTING THEIR NUMBERS AND DISTRIBUTION

1. Data _____ 2. Occupation _____
3. How long have you been hunting/patrolling in the reserve? _____
4. How often do you hunt/patrol in the reserve? _____ Almost every day _____ Once per week _____ Once in two weeks _____ One per month _____ Less than once per month.

A. PRIMATE PRESENCE

5. Have you been seeing primates in the reserve? ____ Yes ____ No
6. If "Yes" how often do you see them in the reserve
 ____ Always ____ Occasionally ____ Rarely
7. Which kinds of primates have you been seeing?
 ____ Gorillas ____ Chimpanzees ____ Monkeys ____ Prosimias
 ____ Others
8. Do any of the primate migrate? If so, which?
 Migrating primates Times they have To where Times they return
 _____ _____ _____ _____
 _____ _____ _____ _____
9. Which primates are diurnal and which are nocturnal?
 Nocturnals _____
 Diurnals _____
10. Are there any extinct primates species in the reserve?
 Names When last seen
 _____ _____
 _____ _____


B. PRIMATE DISTRIBUTION

11. Are the primates evenly distributed in the reserve? ____ Yes ____ No
12. If no, which locations are they concentrated more in _____
13. What factors influence their distribution in this way _____
14. Which primate species have you been seeing and in what locations did you see them?
 Species Locations seen
 _____ _____
 _____ _____
15. Which species is more abundant in the reserve and why? _____
16. Which species is least abundant and why? _____
17. Are species no longer common?
 Names Why so? When last reported seen where last seen
 _____ _____ _____ _____
 _____ _____ _____ _____

C. PRIMATE EXPLOITATION

19. How often do you kill/trap primates?
 ____ Once/weekly ____ Once/bi-weekly ____ Once/monthly ____ Once/yearly
20. For what purposes do you kill/trap primates?
 ____ Food ____ Pests ____ Pet ____ Life sale ____ Others (specify)
21. What number of each species do you kill/trap per year and what purposes?
 Species Number Purposes
 _____ _____ _____
 _____ _____ _____
 _____ _____ _____
22. What factors contributed to your killing/trapping the most and the least?
 (a) The most _____

- (b) The least _____
23. How much of a pest are primates seen to be?
 _____None _____Little much _____Very much
24. How do people respond to them in view of this? _____
25. Are primates seen to be of any usefulness? If so, which _____
26. Are there any laws regulating hunting in the reserve (government or community)? If so, which? _____

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Assessment of the Lack of Sports Equipment as Constraint to the Teaching and Learning of Physical Education in the Secondary Schools in Kogi state, Nigeria

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Abstract

The study assessed the lack of sports equipment as constraints to the teaching and learning of physical education in secondary schools in Kogi state, Nigeria. The population of the study consisted of schools principals, teachers and the games masters/mistresses in Kogi State. A total sample of one thousand three hundred and fifteen (1315) respondents were randomly selected from the various secondary schools in Kogi State through the use of dip and pick method with replacement. The instrument used for the study was a structured and validated questionnaire, which contained forty items. One null hypothesis was formulated to direct the study and one sample t-test was employed to test the hypothesis. The study revealed that the lack of sports equipment is a significant constraint to the teaching and learning of physical education in secondary schools in Kogi State, Nigeria. The study recommends that the Kogi State Sports Council should be well equipped with the standard sports equipment so that secondary schools can purchase from them basic sporting equipment's needed to teach the physical education at a reasonable price.

Keywords: Sports, equipment, constraint, secondary, teaching.

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INTRODUCTION

Physical education according to Bucher and Krotee (2002) is an educational process that uses physical activities as a means to help individual acquire skills, fitness, knowledge and attitudes that contribute to their optional development and well-being. This educational process is a continuous process of learning that occurs throughout the life span of individuals. To Fishburne (2004), the aim of physical education is to produce individuals who have good health (physical fit), altitudes (such as honesty, sportsmanship, fair lay, courtesy desire of physical activities), knowledge in physical education and skills. Physical education has as its primary goal the improvement of the wellbeing and quality of individuals who take part in physical education programme. This can be accomplished by socialising individuals into the role of participants who will make long-term commitment to participation in enjoyable and meaningful physical education activities and sport experiences.

The main purpose of physical education is to provide people with the skills, knowledge and altitude to participate in regular physical activity throughout their life span so as to bring complete development of individuals. Venkateswarlu (2008) stressed further that the status of physical education in school curricula worldwide was an apparent issue in some countries in the 1970s and 1980s. Subsequent manifestation of a detonation situation was enhanced by a number of conference themes. And numerous article, reports on the perilous position of physical education in schools, several international and national surveys, on-going analysis of national and international trends (Hardman, 2000) and a patronage of international agencies and regular continental organizations, position, policy, advocacy and declaration statements (Hardman & Marshall, 2000). The outcome of this initiative was the world summit on physical education which took place from 3th to 5th November 1999 in Berlin organized by ICSSPE from the IOC, United Nations Education Scientific and Cultural Organization (UNESCO) and the World Health Organization (WHO). In general, physical education as a subject of study in secondary schools has been marginalised (Spark, 2002; Ladani, 2008; Daughtrey & Woods, 2000) within the field itself.

Research suggests that there is a lack of adequate sports equipment which would have been used by the professional as to how physical education should be taught (Venkateswarlu & Ladani, 2004). These issues further compound the already prevailing dilemma of inadequate research on physical education. In attempt to find answer to these concerns motivated this study to investigate into the perceived constraints of lack of adequate sports equipment for the teaching and learning of physical education in secondary schools of Kogi State, Nigeria.

Research Question

To the problem observed, the researcher posited the following research question to direct the study:

- Is the lack of sports equipment for physical education in the secondary schools a constraint to teaching and learning in secondary schools of Kogi State, Nigeria?

Hypothesis

For the purpose of the study, a null hypothesis was formulated to further direct the study:

- The lack of sports equipment does not significantly influence the teaching and learning of physical education in the secondary schools in Kogi State, Nigeria.

Theoretical perspective

According to Ladani (2006), sports equipment in physical education refers to a relatively permanent materials or appliances which usually last from 5-20 years even with repeated use. Examples are landing form, net for volley ball, football, netball, table tennis supplies, unlike equipment are expendable. They last for 1-2 years with repeated use, examples are, balls, boots, running shoes, jerseys, bean bags (Ventakeswarlu, 2006). There is little excuse for a physical education programme or any sporting programmes for that matter, with little or no equipment just as students cannot be expected to learn to read without books. Sport boys and girls are not expected to develop their movement abilities without the proper equipment.

The equipment situation in most secondary schools make it difficult for teachers who are eager to teach physical education and those who do not want to teach the subject have excuses (Ladani, 2004). Obiyemi (2000) believe that the quantity and quality of equipment in most secondary schools are very poor, and damaged equipment's are used frequently. Equipment might limit the performance of an athlete boy or girl because he or she fails to appropriate function during competition or practical class. Athletes and teachers who do not use the appropriate safety equipment may limit performance through injury (Daughtrey & Woods, 2000). For any meaningful physical education lesson to take place, enough equipment should be made available so that each individual benefit from maximum participation and practice. Hardman and Marshall (2005, 2006) reported on what experts said when they know that all over the Central and Eastern Europe, as well as Asia and Africa, the quantities and qualities of equipment in secondary schools were said to be inadequate and this negatively affected the teaching of physical education in schools. However, according to Zuba and Young (2003), before sports organs would be developed, basic facilities and equipment will show successful human participation, development and promotion, paper maintenance of equipment can keep the items in usable condition to extend their lifespan. Expensive equipment's are hard to justify if it is not properly cared for and maintained. Equipment in poor repair results in disruptions and in effectiveness in programme development (Amanchukwu & Ololube, 2015).

METHODOS

The information required to assess the lack of sports equipment as a constraint to the teaching and learning of physical education in the secondary schools in Kogi State Nigeria was already available without manipulation of the variable, as a result, an ex-post facto research designed was used in the study. The sample for this study consisted of one thousand three hundred and fifteen (1315) respondents out of the population all the principals, teachers and the games masters/mistresses in secondary schools Kogi state, Nigeria. The instrument used was a structured and validate questionnaire to elicit appropriate information from the respondents. The designed questionnaire was presented to the experts in sports management for their input and necessary comments. Their suggestions and corrections were adopted in the final print out of the questionnaire which was personally distributed to the selected respondents from the selected secondary schools for the study. The filled and returned questionnaires were however collected

for data analysis. One sample t-test was used to test for the acceptance or rejection of the variable at an alpha level of 0.05.

RESULT AND DISCUSSION

The result shown in table 1 revealed that the lack of sports equipment significantly influences the teaching and learning of physical education in the secondary schools in Kogi State. This is depicted in the t-value=35.153 and p-value of .000, which is less than the alpha level of 0.05. This implies a significant factor on the null hypothesis which states that the lack of sports equipment does not significantly influence the teaching and learning of physical education in the secondary schools in Kogi State, Nigeria. The significant factor means that the null hypothesis was rejected implying that the lack of sports equipment is actually a constraint to the teaching and learning of physical education in secondary schools of Kogi state Nigeria. (See table 1 for further detail).

Table 1: One sample t-test on the lack of sports equipment in secondary school as a constraint to the teaching and learning of physical education

Variable	N	\bar{X}	SD	SE	T-value	Df.	Sig.
Lack of sport equipment	1315	4.1270	.64680	.01784	35.153	1314	.000
Fixed mean	1315	3.50	00	0.000			

The finding in this study reflects the lack of sports equipment to be a constraint to the teaching and learning of physical education in Kogi State, Nigeria. The finding in this study supports that of Ladani (2004) who reported that all over the world, the quantities and qualities of equipment in the secondary schools were said to be inadequate. This study also supports that of Ojo (2015), which evaluated the barriers to the teaching of physical education in Nigerian secondary schools using Ado metropolis secondary schools in Ekiti State, Nigeria as a case study. Using a linear regression analysis, it revealed that facilities and equipment will be a barrier for teaching physical education in Ekiti State, Nigeria.

For a meaningful physical education lesson to take place, enough equipment should be made available so that each individual benefit from maximum participation and practice. According to Adesanya (2004), before any meaningful development can take place in sports and games basic equipment should be provided to enhance the successful human participation, development and promotion. The researcher believes that in a situation where a teacher uses one soccer ball for a class of fifty students within a duration of 30 minutes means that if each child is to torch the ball per minute, then 20 students would not have a feel of the ball for the duration of that lesson. This scenario indicates how precarious the situation is when it comes to teaching and learning of physical education with insufficient equipment in the secondary schools of Kogi State, Nigeria.

The use of poor and damaged equipment by the secondary schools teachers also result in injury for students. Marshal (2000) believed that the quality and quantity of equipment in most secondary schools is very poor. Equipment might limit performance and become a barrier or constraint by failing to perform its appropriate function during competition or practice class. Most teachers of the secondary schools in Nigeria use soccer balls for volley ball classes. This often results in injuries to the students and eventually leads to students who feature in games to

exhibit the wrong skill. According to Davis (2000), athletes and teachers who do not use the appropriate safety equipment may limit performance through injuries.

CONCLUSION/RECOMMENDATIONS

Based on the finding of the study the following conclusion is drawn. Thus, the lack of sports equipment for the teaching and learning of physical education in secondary schools is a significant constraint in Kogi State, Nigeria. Based on this, the study recommends:

- Secondary school principals should supply sports equipments to the schools so that any time the government release their capital grants the money can be deducted at source as such would enhance the teaching of the physical education as a subject in the secondary schools of Kogi State.
- Sport council should be equipped with the standard sports equipment so that the secondary schools can purchase basic sports equipment needed to teach the subject at a reasonable price.

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Managing the Role of Science and Technology Education Programs in Promoting Enterprises for National Development in Nigeria

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Abstract

This article focused on the identification of possible strategies of promoting science and technology education programs for enhanced service delivery in developing enterprises in Nigeria. Science and technology has employed numerous strategies to promote the development of enterprises in order to ensure that the rising number of unemployed youths and economically productive adult population are gainfully engaged in meaningful national development. This theoretical article evaluates the meaning and concept of science and technology education, the need for it, and its relationship with industries in national development and survival of man, as well as the strategies for implementation and the benefits. The paper recommends among others, that adequate instructional materials for the teaching science and technology education should be made available to give room for more practical classes than theory, which should be adequately supervised. More professional teachers in science and technology should be employed and government should make provision for improved funding for science and technology education. It concludes that science and technology has helped citizens in modern times to have faith in their ability to feed and defend themselves.

Keywords: Science and Technology, Education, Enterprises, National Development, Nigeria.

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INTRODUCTION

Modern societies are dominated and driven by ideas and products from science and technology (S&T) and it is very likely that the influence of science and technology on our lives will continue to increase in the years to come. Scientific and technological knowledge, skills and artefacts invade all realms of life in modern society. The workplace and the public sphere are increasingly dependent on new as well as upon more established technologies. Scientific and technological knowledge and skills are crucial for most of our actions and decisions as workers, voters, consumers, etc. Meaningful and independent participation in modern democracies assumes ability to judge the evidence and arguments associated with the many socio-scientific issues that appear on the political agenda (Sjøberg, 2002).

Development at any phase is always linked with technology and technology happens when there is advancement in science. Hence science, technology and development are all proportional to each other (Pujari, 2014). Science and Technology are tools that solve quite readily the numerous challenges people face in life on daily bases (Sjøberg, 2002). In a country like Nigeria, which seeks to improve the quality of life of all her citizens, this involves attempting to solve the many problems facing her population. These problems include ill health, illiteracy, public utilities, inadequate education facilities, hunger and unemployment. Others are general security of life and properties, youth restiveness, poor industrial and communication infrastructure and corruption.

These problems acting either individually or collectively hinder development by making the people less capable of making meaningful contribution to national development. The problems also weaken determination and motivation of the people for self-reliance. However, science and technology have helped humans conquer many problems they face in their struggle for survival in their environment (Ololube, 2013). It has also in recent time, become powerful tools for resolving our numerous problems world-wide. Science and technology has done a great deal in the transformation of Nigeria and other countries of the world. The creation of different types of industries and services such as hospitals, education institutions and banking etc. are all the good hand of science and technology. A well-articulated and implemented science and technology education programs will transform the country to a high competitive and dynamic knowledge based economy, promote positive enterprise culture; create employment for youths and productive adults. It will empower students to take control of their own learning (focus in master learning) and empower them to maximize their capabilities, and find joy in learning.

CONCEPT OF MODERN SCIENCE AND TECHNOLOGY

Science emerged as human's invented ways of organizing their experiences. The ways of organizing human experiences has been described as major branches of knowledge, which help us to resolve or at least reduce the numerous anxieties that results from conflicts and problems of our daily experiences, while technology is said to be the systemic application of knowledge of technique gained from science in producing and making use of materials like machines, tools, weapons etc., it deals with the application of knowledge in providing solution to practical problems of humans and their environment. Consequently, it is safe to say that science and technology are twin terms that are closely related.

Furthermore, science is concerned with the search for and understanding of knowledge about nature, technology deals with the scientific application of knowledge in the solution of

practical problems of everyday living. The product of science are ideas, theories and principles arrived at through a process of continuous enquiry, guess, devices, procedures, processes and materials, which are usually but not always derived from science. According to Auta (1995) modern technology featured during the metal or iron age which was characterized by the introduction of modern techniques of agriculture, warfare, transportation, communication, commerce, development of complicated manufacturing and industrial processes and rapid architectural development. However, Bolye (2011) opined that traditional technology is characterized by crude method of production with little boosting mass production and producing standardized manufactured products, the qualities that have distinguished modern technology from traditional technology.

OBJECTIVES AND GOALS OF SCIENCE AND TECHNOLOGY

The development of enterprises is tied to the national goals of Nigeria as a developing country. Federal Republic of Nigeria (2004) identified the national goals of Nigeria to include among other things the building of:

- Free and democratic society;
- Just and egalitarian society;
- United, strong and self-reliant nation;
- A great and dynamic economy; and
- A land full of bright opportunities for all citizens.

Consequently, the objectives and goals of science and technological education in promoting national enterprises include among other things to:

- Enhance the country's image;
- Expands Nigeria technological framework;
- Reduce poverty at local community level;
- Create wealth and employment opportunities;
- Enhance local production of goods and services; and
- Generate appreciable income.

Apparently, the ultimate aim of science and technology education is to improve the poor living conditions of people in a nation. Wilcocks(2013) stated that the ultimate objective of development is to help to improve the living conditions of poor people in society especially in a country, to guarantee the people adequate food and water for basic needs, health and to help equip them with the knowledge which essential to empower themselves to build a better future. Federal Republic of Nigeria (2004) documented among other things the educational processes for the promotion of community development enterprises:

- Life-long education shall be the basis of the nation's educational policy;
- Education and training facilities shall continue to be expanded in response to societal needs and made progressively accessible to afford the individual a far more diversified and flexible choice;

- Educational activities shall be centered on the learner for maximum self-development and self-fulfillment;
- Efforts shall be made to relate education to overall community needs.

Accordingly, to reap the rewards of science and technology, the quality of science and technology education should focus on establishing the values of acquisition of new ideas, knowledge, skills and competence, which must be relevant enough to the prevailing economic realities of a modern society. A lot of educational processes have to be followed in an attempt to promote meaningful national development enterprises.

SCIENCE AND TECHNOLOGY AND INDUSTRIES

The relationship between science and technology and industries is such that the dividing line between them is very thin. Industrial development of any nation depends very highly on the level of advanced science and technology that the nation had achieved. It is worth while to note that science and technology are prime instruments in the exploitation of resources for human use.

The stage of technology advancement in Nigeria has been possible through science and technology. Water resources, for example, has been utilized and transformed into hydro-electric power on River Niger at Kainji Dam. Specialized human resources, sophisticated equipment and geological surveys are essential tools for locating and exploiting minerals. Some technicalities like prospecting (geological survey of potential mineral locations), drilling, refining and transportation are required in exploitation and development of natural resources. These processes are attained through advances in science and technology. Other natural resources that have been exploited and developed for technological progress and economic development are petroleum, forest (for fuel, pulp and paper, timber and ply-wood at Sapele) iron ore (for production of steel at Aladja and Ajaokuta) and limestone (for production of cement at Sokoto, Abeokuta and Nkalagu). Onuolu in Bolye (2011) posited that the consumer good industries have constituted the early stage of modern industrial development in Nigeria. They range from small to medium scale industries using mainly local agricultural raw materials for processing activities. The modern industries employ higher level of technology than traditional industries. Abdulahi (1995) notes that there are non-food processing industries like textiles, located in Ibadan and Kaduna. Plastic in Western States of Ondo and Oyo, soap and cigarettes in Ibadan and Kaduna etc., these industries are among the fastest growing industries in Nigeria and have benefited from the rapid growth of the market and investment in science and technology.

In the same vein, better understanding of the principles of hygiene and public health, e.g. EPI and other health programmes, infant mortality is drastically reduced, and most mothers who ensure that their babies get immunized against killer diseases are happy to watch their babies grow without fear and recourse for emergencies, which was very rampant in the past. All these are wonders of science and technology which has greatly influenced family life and have brought about high standard of living for families in Nigeria.

STRATEGIES FOR IMPLEMENTATION

Over the years, there has been huge gap between policy formulation and policy implementation. Beautiful policies are put forward on paper but they fail at the level of implementation (Abraham 2004). Successive governments in Nigeria most of the time are insensitive to the plight of the

people even when there are means for improvement and development. Bad policy or poor policy implementation may adversely affect national development.

The world is now said to be a global village due to the discovery of computer and ICT and other related technologies. However, many Nigerians students in secondary schools are faced with various problems in their attempts to computerize science and technology activities. These include negative attitude and procedures, internal and external obstacles.

According to Ogunsola (2008) the real task facing the institutions, among others include to reposition the policy initiatives and priorities of key players to map out a practical and achievable developmental agenda for the introduction and application of ICT in these institutions. Lack of adequate infrastructure to boost new ICT technologies and limited resources in developing nations, has been identified as problems militating against schools to fully participate in international activities arising from ICT induced globalization.

Inadequate external and internal training programs, absence of systematized plans for integrating technology into teaching and learning, inadequate human resources base for implementation or technical projects especially in the rapid and progressing technology field. However, the way forward includes:

- Adequate funds should be provided for in-service training, purchase of ICT resources and its regular maintenance;
- Ministry of education should integrate Information Technology to secondary schools;
- Monitoring bodies (supervisors) should be made up of experts for science and technology development;
- Relevant educational bodies (institutions) should embark on massive in-service training of teachers and technicians and constantly organize national, state and local government workshops, seminars and conferences on science and technology;
- Provision of solar energy to schools and other institutions of technology should be encouraged instead of relying on public power. Electricity is needed to run the machines and equipment in science and technology laboratories and workshops.

BENEFITS/NEEDS FOR SCIENCE AND TECHNOLOGY EDUCATION

Countries in the west (developed countries) place high premium on science and technology. Even economies which we regard as developed are not very comfortable with where they are and as such are continuously seeking ways to better their lots (Ololube, 2006a).

Sustainable national development can be achieved through enhanced science and technology education programs. The core concerns created in teaching science and technology education to students is for them to take more responsibility for themselves and their learning, to try to achieve their goals, be creative, discover existing opportunities and in general cope with the complex environments they find themselves (Ololube, 2006b).

Science and technology is an all-embracing concept that will boost sustainable development and create wealth through industrialization for everyone. Training in science and technology has been used by countries (e.g., Japan, France, Germany, Norway, China, Finland, UK, USA.) to set up unique educational oriented outfit programs, inculcating discovery and innovating spirit, deliberately targeted at youths. These potential youths (students) are encouraged to seek out ideas, and subsequently develop the promising ones from invention phase to commercialization.

Science and technology have played prominent role in the development of human resources. It is generally agreed that technology cannot be bought, borrowed, stolen or even transferred, but a culture that has to be developed from within (Geofrey, 2012). Geofrey further argued that if technology has to take place, grow and come to fruition, it has to be implanted right from the primary school stage. For the development of human resources in Nigeria, the Ashby Commission Report gave an encouragement to the development of science and technology by directing that university enrolment should be in the proportion of 60 to 40 percent for the Arts-based course. With science and Technology programmes, instructions in schools are now made easier with provision and precision of video-visual devices like radio, television, projectors, film etc. It also helped to broaden the fields of knowledge to the extent that human resources are developed to the fullest.

Specialization and quality of products are the aftermath of the emergence of science and technology. Nigeria can now boast of producing thousands of medical doctors, engineers, lawyers, teachers, architects and technologists.

Science and technology has empowered students with the competencies and skills necessary to prepare them to respond to their life needs including running their own business, so that they become productive citizens etc. Science and technology has varied models to suit each country; not one-size-fits all approach and to give young people the opportunity to develop skills.

A well implemented science and technology program will aid the expansion of economic activities of the nation and equip the youths with the knowledge and skills that will enable them compete favorably in the technologically driven globalized societies. George (2009) observed that the introduction of science and technology education programs in the nation's education curriculum stands to benefit several stake holders in education system, among them are students, teachers, school administrators, the government and humanity as a whole. He included that it will offer the much needed functional education to the youths and makes them self-reliant. While Greg (2011) also presents the benefits of science and technology education to include, offering graduates with adequate training that will enable them to be creative and innovative in identifying novel opportunities and providing them with adequate training in risk management. He agreed that the benefits will embrace fostering economic growth, increase productivity, creation of new technologies, produce services and rejuvenate better approach to prevailing environmental problems. Science and technology education therefore should be universally available to provide students with opportunity to explore and fulfill their potentials.

CONCLUSION

Science and technology is a lifelong experience that opens opportunities for self-reliance. A nation that has science and technology deficiency will find it difficult to industrialize and grow economically. Therefore youths should be encouraged to embrace science and technology education studies with open mind because it is a sure way that will benefit the entire nation. The government on their own part should be aware that this generation, by all means, want to play significant role in eliminating poverty, improving their communities vis-à-vis the nation and creating the future through innovation, imagination and opportunity recognition. Subsequently science and technology education is the answer to national dreams and thereby need to be properly guided, managed and funded for effective implementation for national economic growth.

7.1 Recommendation

However, for the programs of science and technological education to thrive in Nigeria, serious support and commitment by government is highly required. The ultimate goal of government should be to enhance technology studies by ensuring high quality teaching, provision of adequate funds, facilities and materials for students to practically demonstrate their knowledge. Without mincing words:

- Government should adequately fund science and technology education, so as to train and retrain professionals and qualified teachers for functional science and technology education;
- Government should equip science schools with laboratories and technological facilities and equipment for effective science and technology education programs;
- Non-governmental organizations should join hands together in sponsoring teachers for both national and international conferences;
- There should be awareness campaign to sensitize the citizenry on the benefits of technology education;
- Secondary school principals should try as much as possible to establish school industrial linkage for effective practical.

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Implementation of Environmental Education (EE) in History in Seychelles: The Case of the Beau Vallon Secondary School

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Abstract

This study explored the implementation of Environmental Education (EE) in History at Beau Vallon Secondary school. The objectives were to establish the extent to which teachers are knowledgeable of their role of History in EE, the frequency in the incorporation of EE in the teaching of History, and the obstacles History teachers face towards effective implementation of EE. A case study design informed the research. The study reveals that there is very limited implementation of EE in History at the institution despite the Ministry of Education's effort to have it infused in all subjects. Teacher training in EE has helped to increase their environmental knowledge but not the translation of this knowledge in teaching practice. The obstacles of EE implementation include low participation in environmental associations; examinations oriented teaching; lack of assessment of lifelong skill imparted by EE; and teachers' perception that EE belongs to science related subjects.

Keywords: Beau Vallon, Secondary, History, Environmental Education, Eco-School.

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INTRODUCTION

Presently we have witnessed environmental problems arising out of a number of issues. These include over population, depletion of natural resources, and climate change. Therefore, there is need for students to be educated on these issues. Education involves learning, and learning, is seen when the experience or set of experiences changes behaviour patterns. Whatever subject you teach you can contribute to greater environmental awareness amongst students. Even if the subject does not lend itself to environmental content, you can still play an important role in providing students essential skills that will enable them to recognize and solve environmental problems (Simpson, 2011).

Therefore, there is the need for History teachers to make teaching of History more environmentally oriented by constantly implementing Environmental Education (EE) in their teaching and learning. Implementation is the process of putting into practice ideas, programs or a set of new activities to the people expected to change (Ndaruga, 2013). In this regard, as EE is implemented in teaching and learning there needs to be ways of assessing the extent in which these knowledge are put into practice. Noteworthy, is that EE can permeate all subject areas in the curriculum and that many environmental problems depend on complex economic, social and political consideration. These considerations are clearly visible in the topics within the History curriculum (Sinha, 1985).

Problem Statement and Purpose of the Study

Personal experience at the Beau Vallon Secondary entails that there has been inadequate implementation of EE in the learning of History. Evidently, EE is ordinarily implemented as an exhibition in instances where there are national competitions to merely provides superficial evidence of it being implemented in the classrooms. As such, the present paper is a product of a study that explored the extent of the implementation of EE in History at Beau Vallon Secondary School with focus directed towards the factors which affect its implementation.

As a result, this research sought to determine:

- The extent to which teachers are knowledgeable of their role EE in History;
- The frequency of the incorporation of EE in the teaching History; and
- The obstacles faced by History teachers towards effective implementation of EE.

UNDERPINS FROM LITERATURE

EE in the modern world has become as important as reading, writing and arithmetic. For this reason, there is the need to create ‘environmentally literate’ citizens so that we can look after our environment in such a way that will support our future, because it is presumed that what people do not know, they do not care about. That is why learning about, and for the environment is important (Kethoilwe, 2013; Sinha, 1985). According to Sundar (2010), EE is more than an essential part of the school curriculum. It is important to our survival and to the future of our planet. EE is also interdisciplinary, the knowledge and skills learned are readily transferable to other disciplines.

In addition, Archie (2001) posits that facilitating EE in the learning of all subjects rather than isolating it, models for the students how the environment is connected to their daily lives and relationship within their daily communities. Interdisciplinary nature of environmental concepts can lead students towards a deeper engagement with environmental learning.

Sundar (2010) says that traditionally we have studied History in order to understand the present. However to solve environmental problems, we need to think about the future. It should be noted that the future is that part of history that we can change. In fact, a large chunk of EE deals with history. Sample topics in History include how the environment has shaped human civilization and different cultures and how humans have impacted the environment through history. More particularly, it deals with how soil erosion, loss of trees, water pollution, species extinction and so on has influence History. Furthermore, History deals with aspects such as how events in History had impact on the environment, the importance of natural resources to a nation's community's economy and stability; how a country's political process works and how citizens get involved in issues concerning the environment and health; how past leaders have dealt with environmental issues (Neal, 1990). However, there are numerous challenges that history teachers face. This has made them reluctant to incorporate EE in their teaching and learning. Some of these challenges include; lack of teacher preparation in EE, lack of courses in EE teaching methods and lack of prior course work on EE (Archie, 2001). Despite these challenges, teachers need not be experts on environmental issues, but they should identify those who are and make use of their expertise. When implementing EE, teachers should ensure that there is a planned sequence of learning and that all students are introduced to a range of challenging experiences that encourage them to maintain an active interest in the environment. EE is best approached as an across-curriculum strategy. If EE is integrated across the key learning areas in primary and secondary schools, students will learn to care for the environment as part of their normal daily lives (Dibley, 2012).

EE in Seychelles

According to Emilie (2015), in Seychelles the Ministry of Education attempts to implement EE through the Eco-School programme. All state schools were registered for the programme. The programme is co-ordinated by the Environmental Education Unit within the Ministry of Education. The programme ties into virtually all school topics. She further says that Eco-school provides great way of introducing environmental topics in the National Curriculum. As such, it helps to develop a creative learning environment for all students involved. Eco-schools help to deal with environmental issues and deliver cross curricular themes such as water use, healthy eating amongst others. The schools provide a context for learning to students by serving them to appreciate how diverse issues are linked together. It is widely recognised that there are many different learning, working and thinking styles. The activities Eco-Schools focused on is an amalgamation of aptitudes which are often ignored in the classroom. Practical, real-life activities have the potential to develop thinking skills, as such, offering vital opportunities to make students make connections between subjects. Experimental learning outside the classroom also has the capacity to raise levels of learning across a range of subjects (Ndaruga, 2013; Emilie, 2015).

METHODOLOGY

A questionnaire was used for data collection. The questionnaires were sent to each of the respondents via e-mail. All the seven teachers of History at the Beau Vallon secondary school were involved in the study. However, only five teachers managed to complete and return the questionnaires. The said school was chosen for the research because of its active involvement in the Eco-School project and had more than once won the Eco-Schools' competition organised by the Ministry of Education. The implementation of EE in the teaching and learning of various subjects is one aspect in the competition.

It should be noted that ambiguous questions on the questionnaire were clarified through e-mail communication to respective respondents as advised by Powell (2014). The data were analysed manually which involved simple frequency count on the responses of teachers.

RESULTS AND DISCUSSIONS

The first objective of this study was to examine the extent of the knowledge of History teachers regarding the role of History in EE. Firstly, the objective was pursued through establishing the frequency of teachers that had participated in EE training. The results are presented in table 1.

Table 1: Participation in EE Training

Response	Frequency (N)	Percentages (%)
Yes	4	80
No	1	20
Total	5	100

Table 1 show that the majority (80%) of the respondents had prior training in EE while only 20% stated that they had not received training. Therefore, by implication most of interviewees were familiar with EE and what is expected under the subject. It is not a surprise that 80% were able to successfully provide the definition of EE when required to do so. However, they demonstrated limitedness in their understating of EE when it came to stating the role of History in the subject (EE). In this regard, only 20% of the respondents gave a satisfactory, though vague answer to the question. Sadly, the remaining 80% could not say anything regarding the role of History in EE to the extent that they ended up leaving the question unattended to by leaving the answer slot blank. From this background one is forced to begin to wonder the quality of EE that the above (80%) of the respondents claimed to have received. This is because it is quite uncommon that teachers who received some training on EE about History would ultimately fail to state the relationship of the two subjects. Perhaps the problem could also be traced to the motive of the teachers under study to attend the workshop where EE was being introduced to them. It would not be overstating the truth by speculating that they attended the training simply to satisfy other hidden agendas and not necessarily to acquire meaningful competences or reasonably articulate EE in relation to History. In this case, it could actually be rightfully contended that the preceding predisposition is a necessary condition for the failure of these teachers to effectively implementation of EE in their teaching of History. In fact, it would be a defying reason for

teachers who cannot link EE to their teaching subject to be able to meaningfully incorporate EE in their teaching process (Ketloilwe, 2013).

Membership of Teachers to Environmental Groups

One of the questions in the study required the respondents to state if they belonged to any of the three environmental groups at Beau Vallon secondary school namely the Eco-School, Save Our Seas Foundation, and the Wildlife Club. The results indicated that only 20% of them were members of at least an environmental group at the school while major of the proportion (80%) of the study participants did not belong to an environmental association. The low participation of History teachers in environmental groups suggests that the teachers have poor interest or motivation for the environment. As such, their apathy in joining these environmental groups has hindered their opportunity to increase their knowledge on various environmental issues. According to Silo (2015) membership of environmental groups at the school level may help the teachers to better appreciate the environment, draw the link between the environment and topics in the History curriculum together with helping them come up with various ways on how they could incorporate EE in the teaching and learning of History.

Frequency of Implementing of EE in Teaching and Learning by Teachers

An investigation was conducted on the frequency for which teachers implement EE at the different levels in Secondary. The study found that across all levels of secondary school, majority of the respondents (60%) claim that they never implement EE in the teaching and learning in History. In fact, concerning EE teaching at Junior Secondary school level, the study shows a balance (10%) between briefly included, and included as a major topic. However, implementation at senior secondary level indicates that 90% do not include EE in their teaching while only 10% said they merely briefly infused the concept of EE the teaching of History. In view of the foregoing findings, it could be articulated that the failure of most teachers to implement EE at senior level (secondary 4 and 5) in History is due to their focus on the International General Certificate of Secondary Education (IGCSE) syllabus. In this case, as will be shown later, teachers mostly focus on completing the syllabus and preparing the students for the international examinations rather than incorporating EE in their teaching and learning (Emilie, 2015). This is particularly so because they felt EE is not emphasized during the final examination.

Teachers' Involvement in Implementing EE

The present study endeavoured to establish the extent of teachers' involvement in the implementation of EE. The focus was mainly to find out the extent to which teachers are involved in EE apart from just including it in teaching. Accordingly, 60% of the respondents include it in their lesson objectives and the rest (40%) did not. However, one would wish that the percentage of those including in their teaching objectives should be higher as teachers need to play a more active role in the implementation of EE as it affects all learners, including those taking History. Besides, EE is an interdisciplinary subject; hence, each subject has a role to play to ensure its holistic implementation (Kimaryo, 2011). According to Neal (1990), it is crucial for

History teachers to network with teachers of other subjects in order to enable smooth-edged implementation of EE.

Moreover, only 10% of the respondents had taken the initiative for networking with other stakeholders for the proper implementation of EE. By implication, it is only 10% of History teachers that collaborated with other subject teachers in the implementation of EE. The study further revealed that 10% has discussed the teaching of EE with other teachers while 20% have made use of EE materials in their teaching and learning processes. Furthermore, only 10% has designed educational materials to use for EE. The factors that are hindering teachers from taking a more active role in EE will be given later in this paper.

Additionally, respondents were asked to indicate the subject(s) in which EE has been implemented and to justify their response:

Teacher 1: *Science and Geography. Because it has links more with environment. Thus the two subjects have no option but to implement EE.*

Teacher 2: *It should be a subject on its own. But I believe it can be incorporated in all subjects.*

Teacher 3: *Geography, since there is already a branch that talks about the environment but it does not give much overview since the curriculum restricted only to certain topics.*

Teacher 4: *All*

Teacher 5: *Geography because of its direct relationship.*

An analysis of the above perspectives indicates that basically 20% of the teachers feel that EE can be incorporated in all subjects. This implies that only one respondent perceive that it is acceptable to infuse EE in all subjects, History inclusive. Besides, majority (60%) of them are of the view that it should be in either Geography or Science. Thus, they justified their arguments by positing that Geography and Science are more related to environmental issues than any other subject. The attitude of the majority (60%) of the respondents revealed above will definitely have an effect on whether or not teachers will efficiently and effectively implement EE in their teaching of History. This is particularly so because they understand EE as the responsibility of other subject teachers rather than their own. According to Martha et al. (2007), this attitude can be the result of teachers not knowing the role of History in EE, as we have seen in the earlier sections. Ndaruga (2013) contents that such lack of knowledge by teachers stands as a critical hindrance in the implementation of EE in the subject.

Teaching Strategies used by Teachers in Implementing EE

One of the study objectives was to investigate the most common teaching and learning strategies used in implementing EE. Essentially, the respondents were asked to state how often they used the following learning and teaching methods to teach EE: Exposition, text book, notes and worksheets, exposition and visual aids, class discussion, group work discussion, design, brochure, bookmark, and posters. Also included were dairy keeping and record keeping, fieldwork and visits, project, role playing, letter writing, and essay writing. The study discloses that the methods which are most popular amongst the teachers, because they are the most

commonly used by the majority of them include Projects, followed by Class discussions, field work and visits, together with role playing. However, when considering the methods which are most often used by the teachers, the results show exposition, textbook, notes, worksheets, visual aids and group discussion.

The difference in the methods used is probably due to the fact that the methods used by the teachers more occasionally are suitable for implementing EE in teaching and learning, however, they cannot be used more often because they require long preparation time or it will take quite a considerable amount of time for the teachers to mark the students' reports which they write after participating through these methods (Silo, 2015; Neal, 1990). In contrast, the strategies, outlined above, used most often by the teachers in teaching EE neither demand a lot of preparation time and resources nor do they require much time for the teacher to make correction or follow-up of the products of their use (Martha et al., 2007; Ndaruga, 2013).

Factors Hindering the Implementation of EE in History

Among the aspects that were of concern for this study, was to explore the obstacles faced towards successful implementation of EE in History. The results of this inquiry are as illustrated in table 2.

Table 2: Main Factors Affecting the Implementation of EE in History

Factor	Frequency	%
Lack of materials	5	100
Lack of training	4	80
Heavy teaching load	4	80
Lack of emphasis in examination	3	60
Unclear curriculum guidelines	2	20
Lack of financial help	2	20
Lack of support from management	1	10
Insufficient teaching time to diversify strategy	1	10

According to table 2, the main (100%) hindrance to the implementation of EE in History at the Beau Vallon secondary school is the lack of materials for the teaching of the subject (EE). Also, featuring very prominently (80%) are lack of training in EE and heavy teaching load, while lack of emphasis of EE in examination follow in importance (60%). These factors definitely impacts directly on the teacher's preparation. For instance, lack of materials might prevent teachers from implementing EE in History because it prevents them from producing the resources needed for the particular lesson or in some cases series of lessons. Included among such materials are resource text books, and Information Technology Communication (ICT) gadgets (Kethoilwe, 2013). Furthermore, heavy teaching load will only allow teachers to concentrate on what is seen as 'important' that is the subject matter, thus, the incorporation of EE might not be seen as a priority (Scoullou & Malotidi, 2004). Teachers also feel that lack of training is hindering them from efficiently incorporating EE. As a matter of fact, it cannot be denied that training gives confidence in the implementation of EE; however, it is not essentially a necessary condition for the infusion of EE in History. According to Sinha (1985), one does not need to be an environmental expert to effectively teach EE. He further argues that teachers can learn right along with students as they infuse environmental themes and learning activities into the teaching. Therefore, one can argue that despite the lack of training, if the teachers had the motivation or

saw the importance of EE in the teaching and learning lack of training could be easily overcome by teachers doing their own research or experimenting with various strategies.

With regard to the lack of emphasis of EE in final examination, the focus is about most teachers of History paying particular attention on preparing or rather drilling student for examinations rather than training them to become more responsible citizens who would be able to exploit the environment in a sustainable manner and contribute to resolving environmental problem (Ndaruga, 2013). Besides, even if EE is not assessed during examination, teachers need to know the importance of teaching EE the classroom. In this regard Kanene (2014) and Neal (1990) advise that teachers need to look at the bigger picture, that is, helping student to 'recognise the value and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness amongst man, his culture and his biophysical surrounding which also entails practice in decision making. Nevertheless it cannot entirely be blamed on the teachers for their neglect of incorporating important lifelong aspects such as EE, experience and indeed literature, has revealed that the expectations of society, particularly parents and school management, is that the worth of the teacher is demonstrated through the pass rate of his class. In fact, it is out of student performance during final examination that teachers will be praised or condemned (Neal, 1990). Actually some teachers have been promoted on the basis of their production of high pass percentage among their students at final examination level (Kimaryo, 2011). As such, EE, though important, loses its place and importance within the teaching and learning process (Kanene, 2014).

CONCLUSION AND RECOMMENDATIONS

The research has revealed that to a limited extent EE is being implemented at the Beau Vallon Secondary School in History. A number of strategies are being used to implement EE; however, EE is not being implemented on a consistent basis. Even if teachers have had prior training on EE and can attempt to define the term, the research shows that they do not really appreciate the role and importance of History in EE. The study has revealed several reasons that are associated with the failure to successfully implement EE in the teaching and learning of History. It has come out overtly that teachers of History at Beau Vallon have a very low participation in environmental associations that are available within the school. As a matter of fact, this limited participation could be cited as one of the reasons why they have very limited appreciation and knowledge of the importance of their subject in EE. This is particularly so because environmental associations are generally credited with boosting interest among their members towards the integration of environmental issues in their subject areas (Silo, 2015). The study has further established that teachers of History are mostly focussed on completing the syllabus and preparing the students for the international examinations rather than incorporating EE in their teaching and learning which rarely features in examination questions. This scenario could heavily be attributed to the demands of society, school management, and the Ministry of education who basically assess teacher performance mainly on the basis of pass percentage of students at national examination level. Sadly, the school system does not seem to have any interest to measuring the level of attainment of lifelong skill such as those imparted by EE (Neal, 1990). The study further shows that despite EE being interdisciplinary, there is minimal collaboration and networking between History teachers and teachers of other subjects for effective implementation of EE. Essentially, most teachers of History perceive EE as the responsibility of other subject teachers, such as science and geography, rather than their own.

This is to a greater extent a function of these teachers not fully understanding the role of History in EE which has been cited as one of the major hindrance in the implementation of EE.

Other obstacles that have been revealed concerning the implementation of EE in History include inadequate teaching and learning materials, lack of training, and heavy teaching load. An analysis of these factors reveals that lack of training has led to limited initiative among the history teachers to use locally available teaching and learning materials that could have eliminated their view of teaching materials as a major hindrance towards implementation of EE in History. Nevertheless, it is not an overstatement that the foregoing factors impacts directly on the teacher's preparation in the perspective of EE implementation.

The present paper recommends for the development of a teacher handbook or guide to provide History teachers with means and ways to incorporate EE in their teaching and the use of diverse teaching strategies. Besides, the Government should generate a National Policy that should demand compulsory implementation of EE in teaching subjects (Government of Botswana, 1994) together with a monitoring tool by relevant Ministry of Education Officials. Finally, there should be a mechanism put in place to ensure EE issues account for the final examination History grade.

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Impact of Students' Parental Background on Academic Achievement in Secondary Schools in Obio/Akpor LGA, Rivers State, Nigeria

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Abstract

This study examined the impact of parental background on the academic achievement of secondary school students in Obio/Akpor Local Government Area of Rivers State. The population consisted of 4,752 respondents. A sample size of 1,426 senior secondary school (SSS) 2 and 3 students was randomly selected. A structured questionnaire titled: Students Parental Background Variable Inventory (SPBVI) was used to collect data from respondents. Four research questions and four hypotheses were adopted and tested for the study. To determine the extent of significant relationship that existed between the independent and dependent variables at 0.05 alpha levels, Pearson Product Moment Correlation (r) was employed to analyze the data and reliability of the instrument. The result showed positive relationship between parent socio-economic status, educational status, parents' level of income, family size and students' academic achievement. Based on this finding, it was recommended that parents' should improve on their level of socio-economic status and endeavor to control their family size among others. Students should not allow their parents' position to negatively influence their academic pursuits.

Keywords: Students', Parental Background, Academic Achievement, Secondary Schools, Obio/Akpor LGA, Rivers State, Nigeria.

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INTRODUCTION

The notion that educated parents provide a better environment for their children has been the basis of many interventions. Besides, scientific literature are not so clear, but it is widely believed that, providing education for both parents has broadly similar effects on household income. The external effects associated with education are largely for maternal education than for paternal, because mothers tend to be the main provider of care within the home. For example, a positive relationship between mother's education and child birth weight, which is a strong predictor of child health, is found not only in the developing world but also in US (Currie & Moretti, 2003) and in Nigeria.

The existence of such externalities provides important argument for reducing the education of children, especially in low income homes or by low educated parents. There may be indeed, some multiplier effects since policy interventions that increase educational attainment for one generation may spill over into other generations. Though the existence of intergenerational correlations is not disputed (Ololube, 2012), the type of policy interventions that are suggested depended critically on the characteristics of the intergenerational transmission mechanism, and the extent to which the correlation is informal. Although, it is difficult for inherited genetic factors or environmental factors and if it is the later, what is the real benefit of education and income? For example, ability could be inherited from parents to children or positively associated with more academic effort. The relationship therefore between parents' academic background and that of their children could be due to unobserved inherited traits rather than an informal effect of parental education as such in household production. Parental education may be direct input into the production function that generates a higher quantity of other inputs through the effect of educational levels of household income.

A considerable literature (e.g., Behrman, 1997; Heckman & Masterov, 2004) has focused on the effects of parental background on such outcome for their children as cognitive skills, education health and subsequent income. There is little doubt that economic status is positively correlated across generations. Parents and the family environment in general, have important impacts on behavior and decisions taken by adolescents. There is also the belief that there is a strong link between parents' social class and their children's school achievement. The differences could be traced to the type of occupation in which one is engaged which could also determine to a great extent, one's income and ability to provide enough funds and optional facilities which a growing school child requires for high performance at school (Ololube et al. 2015).

Davie et al. (1972) argued that working class homes are usually associated with overcrowding; and children from overcrowded homes are usually deprived of quietness, privacy and good healthy environment which often do not allow for a healthy living. They added that, such conditions exposes children of working class to different types of diseases and illness, which contribute to their irregular attendance at school, lack of concentration, tiredness and other weaknesses, all of which correlate negatively to school success. Stressing the negative relationship between poverty and school achievement (Battin-Pearson et al. 2000; New-Comb et al. 2001) confirms Davie et al. opinion by adding that, poverty and low socio-economic status directly increases the likelihood for general school failure and early high school dropout. According to Hawkins et al. (1992), poverty is associated with risky health behavior and must be taken care of when evaluating the effect of these behavior and achievement.

Parents' educational attainment is indicated by three highest levels of schooling, which the students' mother completed: primary, secondary and tertiary. These categories are defined on the basis of the International Standard Classification of Education (ISCED, 2011). They posited that children brought up in less favorable conditions obtain less education despite the large financial returns to schooling for an extensive review (Heckman & Masterov, 2004).

Krueger (2004) evaluated various contributions on parents' background supports the view that financial constraints significantly affect educational attainment. On the contrary, Carneiro and Heckman (2003) opined that current parental income does not explain a child's educational choice but that family fixed effects such as parental education levels that involve permanent income, and much more positive role. Positive attitude to school will probably be encouraged by those parents who themselves attained a high level of western education. While the father is away, it is expected that the mother takes care of the children at home and as such, the children are closer with their mother (Chevalier et al. 2005). The educated mother, knowing the importance of education should as much as possible generate in the child interest and curiosity for education at an early age. With this, it is therefore necessary to agree with Mutran's (1980) view that children with more educated parents score higher than children from less education homes (or parents) on the intellectual curiosity which is positively associated with grades.

Random assignment experiments are potentially informative but not common concerning parents' incomes on educational outcomes. Blandon and Gregg (2004) review US and UK evidence on the effectiveness of policy experiments which focused largely on improving short term family finances. These include initiatives such as the moving to opportunity (MTO) experiments in the US which provides financial support associated with higher housing costs from moving to more affluent areas. According to DFES (2002), the pilots of Educational Maintenance Allowances (EMA's) in the UK, provided a reasonable means tested cash benefit condition on participation in education and paid, depending on the pilot scheme either to the parents or directly to the child.

In the absence of experimental evidence, instruments have been used to identify income effects. Shea (2000) uses union status (occupation) as an instrument for parental income and so, assumes that unionized fathers are not more "able" parents than non-union fathers with similar observable skills, while Meyer (1997) uses variation in family income caused by state welfare rules, income sources and income before and after the education period of the child, as well as changes in income inequality. In both studies unanticipated changes were found in parental long-run income, which have modest and sometimes negligible effects on the human capital of the children. However, Shea's (2000) view in using union status as an instrument for income was accepted.

The effect of home background on school achievement of a child or two children families may be compared to that of five or more children families. Conversely, in a large family, the tendency of parents to cope financially with the home as well as school requirements will not be there. Most children from such families might not acquire up to secondary level of education, while some might withdraw before they complete their course work at the primary level. However, Brown and Steinberg (1991) confirmed that high school success was affected by a mixture of family, peer and school influences. Duran and Weffer (1992) supporting this view added that, the academic performance of their sample students was influenced by pre high school attainment, academic skill development, curriculum studied and commitment on school related tasks. But since the relationship among final year school achievement and several variable were explored, the result of their reports was very important.

Statement of the problem

Despite the zeal of parents to send their children to school, academic achievements differ from one individual to another, for example, some children withdraw from school without completing their course work even at the primary level. This situation has attracted a lot of research work into the causes of differences in academic or school achievement among school children. literature have shown that factors like home background, the society, hereditary, the school itself and other factors could be held responsible for this.

Before we look at the part played by parental background in school achievement, which is the main concern of this study, the first thing that should strike our minds is the wrong conception that parental background is synonymous with home location, that is, whether urban or rural. A study involving home background should not consider location only, but also the parental socio-economic status, parental support and encouragement, family size and position in the family. These factors operate severally and in different capacity to affect a child's academic pursuit or school achievement. The aim of this study is to investigate the impact parental background has on the academic achievement of secondary school students.

Research Questions

The following research questions were raised to guide the study.

- How does parents' socio-economic background influence student's academic achievement in secondary schools?
- How does parents' educational background influence student's academic achievement in secondary schools?
- To what extent does parents' level of income affect student's academic achievement in secondary schools?
- To what extent does family size affect students' academic achievement in secondary schools?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance.

- There is no significant relationship between parents' socio-economic background and students' academic achievement in secondary schools.
- There is no significant relationship between parents' educational background and student's academic achievement in secondary schools.
- There is no significant relationship between parents' level of income and students' academic achievement in secondary schools.
- There is no significant relationship between family size and students' academic achievement in secondary schools.

METHODS

Research design

This work adopted a correlational research design approach.

Population

The population of this study consisted of 4,752 respondents from the selected senior secondary schools in Obio/Akpor Local Government Area of Rivers State. The respondents were drawn from SS2 and SS3 classes (3,383 SS2 students and 1,369 SS3 students). The choice of the population of the study was based on the fact that the secondary schools where the respondents were drawn are located within the local government area. The breakdown of the population used in this study is presented in Table 1.

Table 1: Population of the study

S/N	Name of schools	Senior Secondary		Total
		SS 2	SS 3	
1.	Government Girls Secondary School, Rumueme	498	129	627
2.	Akpor Grammar school, Ozuoba	276	197	473
3.	Government Girls Secondary School, Rumuokwuta	864	180	1040
4.	Community Secondary School, Oginigba	425	335	760
5.	Community Comprehensive Secondary School, Rumuokwurushi	455	165	620
6.	Community Secondary School, Rumuolumeu	230	251	481
7.	Army Day Secondary School, Bori-Camp	635	112	747
	Total	3,383	1,369	4,752

Source: Rivers State Post Primary Schools' Board 2011/2012

Sample

Stratified random sampling procedure was adopted to select the sample size using 30% of the population for the study. The sample size comprised 1,426 respondents (1,016 SS2 and 410 SS3 students in Obio/Akpor Local Government Area of Rivers State. The breakdown of the sample size used in this study is presented in Table 2.

Table 2: Sample size

S/N	Name of Schools	Senior secondary		Total
		SS 2	SS 3	
1.	Government Girls Secondary School, Rumueme	149	39	188
2.	Akpor Grammar school, Ozuoba	83	59	142
3.	Government Girls Secondary School, Rumuokwuta	259	54	313
4.	Community Secondary School, Oginigba	128	100	228
5.	Community Comprehensive Secondary School, Rumuokwurushi	137	49	186
6.	Community Secondary School, Rumuolumeu	69	75	144
7.	Army Day Secondary School, Bori-Camp	191	34	225
	Total	1,016	410	1,426

Instrumentation

A structured research instrument was used to collect data for the study tagged “Students Parental background Variable Inventory (SPBVI)”. The first part of the SPBVI contains personal data of the respondents’ gender, age and name of school. The SPBVI is of four-point Likert type of scale and comprised of forty five (45) items which was used in eliciting responses from the respondents concerning their parental background *vis-à-vis* socio-economic background, educational background, level of income and family size. The research instrument has the options of strongly agree (4), Agree (3), Disagree (2) and Strongly Disagree (1).

Validity and Reliability

The instrument was face validated by two experts in educational measurement from the University of Science and Technology, Port Harcourt, Nigeria. To establish reliability of the research instrument, test re-test method was employed. The SPBVI was pre-tested through test-retest using 45 secondary school students outside the selected schools. Also, the instrument was subjected to Pearson’s Product Moment Correlation Coefficient (r) statistics, which produced a reliability coefficient of .78. The instrument was therefore found suitable as it tested what it purports to test.

Administration and Scoring

The researcher personally administered copies of the research instruments (questionnaire) to respondents, and ensured that it was adequately administered and properly filled. The researcher accomplished this through the office of the principals. The administration of the data lasted for two months, after which the data obtained was sent for analyses. There was no loss of instrument in the process but some questionnaire were wrongly filled and mutilated.

Regarding the scoring, score between the ranges of 1-2, represents low level of academic achievement, 2.5 represents average academic achievement and score between the ranges of 2.51-4 represents high level of academic achievement. The data generated was analyzed based on statistical – package for social sciences (SPSS Batch System). This was done with the use of frequency counting of the response scores of the respondents. The mean and standard deviation scores were extracted and presented in appropriate tables to answer the 4 research questions.

Research Question One

Table 3 revealed the computed mean and standard deviation scores of parents’ socio-economic background ($M=2.501$ and $SD=0.248$). This shows that average level of parents’ socio-economic background was found among secondary school students in Obio/Akpor Local Government Area of Rivers State, because the mean score is on the average point of 2.5. The result shows that parents’ average level of socio-economic background influences students’ academic achievement in Obio/Akpor Local Government Area of Rivers State.

Table 3: Mean and standard deviation computation on the extent to which parents’ socio-economic background could influence students’ academic achievement in secondary schools ($N=1,426$)

Variable	Mean	Standard Deviation	Remarks
Parents' socio-economic background	2.501	0.248	Average level
Students' academic achievement	2.500	0.246	Average level

Research Question Two

Table 4 Shows that computed mean and standard deviation scores of parents' educational background are 2.499 and 0.249 respectively. This reveals that the average level of parents' educational background was found among secondary school students in Obio/Akpor Local Government Area of Rivers State since the mean score is on the average point of 2.5. The table shows that the computed mean score and standard deviation scores on the level of students' academic achievement are 2.500 and 0.246 respectively. The results revealed that parents' average level of educational background influences students' academic achievement in Obio/Akpor Local Government Area of Rivers State.

Table 4: Mean and standard deviation computation on the extent to which parents' educational background could influence students' academic achievement in secondary schools (N=1,426)

Variable	Mean	Standard Deviation	Remarks
Parents' educational background	2.499	0.249	Average level
Students' academic achievement	2.500	0.246	Average level

Research Question Three

Table 5 indicates the computed mean and standard deviation scores of parents. level of income which is 2.264 and 0.224 respectively. This shows that low level of parents. income was found since the mean score is less than the average point of 2.5. Also, the table shows that the computed mean and standard deviation scores of level of student academic achievement are 2.500 and 0.246 respectively and the mean score is at the average point of 2.5. The result shows that parents' low level of income influences students' academic achievement in secondary schools in Obio/Akpor Local Government Area of Rivers State.

Table 5: Mean and standard deviation computations on the extent to which parents' level of income could determine students' academic achievement in secondary schools.

Variable	Mean	Standard Deviation	Remarks
Parents' level of income	2,264	0.224	Average level
Students' academic achievement	2.500	0.246	Average level

Research Question Four

Table 6 reveals the computed mean and standard deviation scores of family size, which is 3,781 and 0.368 respectively. This shows that large family size has greater influence of students' academic achievement since the mean score is greater than the average point of 2.5.

Table 6: Mean and standard deviation computations on the extent to which family size could influence students' academic achievement in secondary schools (N=1,426)

Variable	Mean	Standard Deviation	Remarks
Family size	3,781	0.368	Large level
Students' academic achievement	2.500	0.246	Average level

Hypothesis One

Hypothesis one states that “there is no significant relationship between parents’ socio-economic background and students’ academic achievement in secondary schools”. The result in table 7 depicts the calculated r between parents’ socio-economic background and students’ academic achievement to be 0.427* and the critical value of r is ± 0.1946 . This shows that the calculated r is statistically significant at $p > 0.05$ level of significance since it is greater than the given critical value of r . The hypothesis (H_{O1}) is thus rejected. This implies that significant relationship exists between parents’ socio-economic background and students’ academic achievement scores.

Table 7: Computation of the relationship between parents’ socio-economic background and students’ academic achievement

Variable	Mean	Standard deviation	Est. std. Error	r-cal	r-crit.
Parents’ socio-economic background	2.501	0.248	21.456	0.427*	± 0.1946
Students’ academic achievement	2.500	0.246			

N = 1,426

df = 1,424

$p > 0.05$ * = significance

Hypothesis Two

Hypothesis two states that “there is no significant relationship between parents’ educational background and student’s academic achievement in secondary schools” and calculated r between the parents’ educational background and students’ academic achievement was 0.541* and the critical value of r was ± 0.1946 . The calculated r is statistically significant at $p > 0.05$ level of significance since it is greater than the given critical value of r . The hypothesis (H_{O2}) is rejected, the result now reveals that significant relationship exists between parents’ educational background and students’ academic achievement scores (see table 8).

Table 8: Computation of the relationship between parents’ educational background and students’ academic achievement

Variable	Mean	Standard deviation	Est. std. Error	r-cal	r-crit.
Parents’ educational background	2.499	0.238	23.658	0.541*	± 0.1946
Students’ academic achievement	2.500	0.246			

N = 1,426

df = 1,424

$p > 0.05$ * = significance

Hypothesis Three

Hypothesis three states that “there is no significant relationship between parents’ level of income and students’ academic achievement in secondary schools” and the calculated r between parents’ level of income and students’ academic achievement was 0.278* and the critical value of r was ± 0.1946 . Since the calculated value is greater than the given critical value of r , the hypothesis (H_{O3}) is thus rejected, meaning that significant relationship exists between parents’ level of income and students’ academic achievement (see table 9).

Table 9: Computation of the relationship between parents’ level of income and students’ academic achievement

Variable	Mean	Standard deviation	Est. std. Error	r-cal	r-crit.
Parents’ level of income	2.264	0.224	25.332	0.278*	± 0.1946
Students’ academic achievement	2.500	0.246			

N = 1,426

df = 1,424

p > 0.05* = significance

Hypotheses Four

Hypothesis four states that “there is no significant relationship between family size and students’ academic achievement in secondary schools” and the calculated r between family size and students’ academic achievement was 0.379* and the critical value of r was ± 0.1946 . Therefore, the calculated r is statistically significant at p > 0.05 level of significance since it is greater than the given critical value of r , as a result, hypothesis (H_{O4}) is therefore rejected, meaning that significant relationship exists between students’ family size and students’ academic achievement scores.

Table 10: Computation of relationship between family size and students’ academic achievement

Variable	Mean	Standard deviation	Est. std. Error	r-cal	r-crit.
Family size	3.781	0.368	24.221	0.379*	± 0.1946
Students’ academic achievement	2.500	0.246			

N = 1,426

df = 1,424

p > 0.05* = significance

DISCUSSION

In this study, the researcher generated four research questions, which guided the study and she formulated and tested four hypotheses for the study. The result of this study showed that parents’ socio-economic background and average level of income influences students’ academic achievements in school. It also exposed the significant relationship between parents’ educational background and students’ academic achievement scores. The quality of students’ academic achievement in secondary schools is significantly related to parents’ level of income. Same is true of family size, which showed greater significance to students; academic achievement. The

findings in this study are similar to the findings of Ololube et al. (2015), Kainuwa and Yusuf (2013), Okioga (2013), Udida et al. (2012) and Blandon and Gregg (2004).

Correspondingly, children who have a combination of risk factors which are poverty, many siblings close in age, parental neglect and single parents are at greater risk of poor academic performance and other negative child developmental outcome than children from single-parent homes with higher incomes and fewer siblings. In fact, if Nigerian education objectives are to be achieved, students must be serious with their studies, our secondary school managers must be proficient in their job and most importantly too is for the institutions to understand the social setting and background of students *vis-à-vis* the changing of their attitudes. One must understand that there are other forces in our societies that are causing problems in schools, for example alienation, boredom and loneliness, outburst of anger and others.

CONCLUSION

Based on the results of this study, it was concluded that significant relationship existed between parents' socio-economic and educational background, level of income, students' family size and students' academic achievement scores. Students from middle and high level background tend to achieve more than students from low background.

Recommendations

1. Efforts should be made by students not to allow their parents' socio-economic and educational background, level of income and family size influence their academic pursuits. This will assist to improve on their level of academic achievement.
2. Parents should endeavor to control the size of their families to a manageable one. This will enable them make good use of the available resources to care of the education of their children, and could lead to the high level of academic achievement of such students.
3. States and federal government should see to the needs of the adult citizens of Rivers State by providing social amenities. To improve on their socio-economic status, government should also help to supplement their expenditure based on their income.

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The Place of Ecology in Academic Performance as Perceived by Students in Nandi, Kenya.

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Abstract

This study determined the ecological factors, as perceived by students of high and low achieving schools that contribute to the academic achievement in Nandi Central district. We employed causal comparative research design to identify the cause-effect relationship between school ecology of high and low performing secondary schools. Random sampling technique was employed to select the study participants. There were 424 participants. *T*-test, a parametric statistical tool was used to compute the mean of the perceptions of students on the aspects of school ecology in both high and low achieving schools. Secondary schools in Nandi-Central district have a generally favorable ecology, as rated by students. The study concludes that low performing schools have a less favorable ecology compared to the high achieving schools. Thus, school ecology significantly influences academic performance in secondary school.

Keywords: Kenya, Ecology, Learning Environment, Academic Performance, Educational Function, School Administrators.

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INTRODUCTION

Academic achievement and its predictors have been an important topic of study for educational researchers and policymakers for many decades. It remains a subject of research why students of the same intellectual capacity and potential perform differently under different conditions. These researchers have contended that a number of individual-level and school structural variables are consistently connected to academic performance, and school commitment (Battistich, Solomon, Kim, Watson, & Schaps, 1995), school involvement (Brown & Evans, 2002; McNeal, 1995), school attachment (Crosnoe, Johnson, & Elder, 2004; Johnson, Crosnoe, & Elder, 2001), and school climate (Dupper & Meyer-Adams, 2002; Goldsmith, 2004; Lee & Bryk, 1989). Feuerstein (2000) concluded that although both individual-level and school structural variables affect academic performance, the process by which this effect occurs complicated.

This study sought to find out the ecological (physical aspects of the learning environment) factors, as perceived by students of high and low achieving schools that contribute to the academic performance in Nandi Central district. The school climate – student performance has been well-grounded in the research (Freiberg, Driscoll, & Knights, 1999; Hoy, & Hannum, 1997; Kober, 2001; Loukas, & Robinson, 2004; Norton, 2008; Shindler, et al., 2004). Most school administrators do not take seriously matters of school ecology. Likewise few would endorse neglecting the quality of the ecology at one's school, yet the minority of schools have systematic approaches to promoting or maintaining the quality of their climate. In most instances the underlying reasons for this careless approach to ecology is that it is often misunderstood and/or viewed as ecology is that it is not well understood and/or is viewed as a discrete consideration - unrelated to such things as pedagogical practice, achievement goals, curriculum, and teacher development. When school ecology is defined narrowly, it can appear as a relatively independent factor. However, when the general picture is brought in mind, it becomes clear that it relates to the whole. In their research on urban public schools, Jones et al. (2003) found that all of the various aspects of ecology were correlated to one another at most schools. Where one variable on the physical aspects of the school was found to have an effect, the others had a simultaneous effect as well. For instance, in the event that a variable such as discipline was found to be high, a variable such as student interaction was also simultaneously high. These results and others emphasize ecology as an important element in any schools' effort toward successful achievement.

LITERATURE REVIEW

Sporadic and often inconclusive information exists in the literature concerning regarding the impact of ecology on students. Therefore, the need exists for current data either in support or otherwise the perspective behind this discourse (Tanner & Lackney, 2006). In the twentieth century Alexander and coworkers (1977) and Sommer (1969) made significant contributions to this field, with Sommer focusing on personal and social distance and Alexander addressing design classifications and their relationships to people, towns and regions, and the global environment.

A high-density school influences achievement negatively. The concept of density may be perceived through psychological implications by studying territoriality of place, according to Banghart and Trull (1973). It is a fact that students are dependent on the environment for psychological and sociological clues and always interacting with the physical environment. Since

the school is a social system within the general school climate, social distance as it relates to crowding and density is a function of school design making (Tanner & Lackney, 2006).

According to Castaldi (1994), the architectural design of student circulation space has an obvious influence on the educational function of a school building. Space in a room delivers a silent message to students, where the flow and shift of distance between people is large part of the communication process (Duncanson, 2003; Hall, 1959). Fiske (1995) indicated the need for rethinking all aspects of the structure of schooling, including the design of school buildings and other physical aspects of the learning environment. When students attend a school designed with the needs of the students in mind, they notice it and demonstrate a more natural disposition toward respectful behavior and a willingness to contribute to the classroom community (Herbert, 1998).

The need exists in architectural design for the development of spaces that engage, challenge, and arouse. Brain-compatible learning requires much more interaction with the environment than current facilities allow. Taylor and Vlastors (1975) suggest that educational architecture is a “three-dimensional textbook.” This means that the learning environment is a functional art form, a place of beauty and a motivational center for learning. Their research indicates that the architecture of learning environments can kindle or subdue learning, aid creativity or slow mental perception.

The presence of natural light in classroom has received attention from several researchers. An intensive research effort was completed in 1999. In a controlled study of over 21,000 students in California, Washington and Colorado, the Heschong Mahone Group (1999) found that students with the most daylight in their classrooms progressed 20 percent faster on mathematics and 26 percent faster on reading tests over a period of one year than students having less daylight in their classrooms. Similarly, students in classrooms having larger window areas were found to progress 15 percent faster in mathematics and 23 percent faster in reading than students occupying classrooms with well-designed skylights, those diffuse daylight throughout the room and also allow teachers to control the amount of light, also progressed significantly faster than students in classrooms without natural light.

We also identified another window-related effect, in that students in classrooms where windows could be opened were found to progress 7-8% faster than those with fixed windows. This occurred regardless of whether the classroom also had air conditioning. These effects were all observed with 99% statistical certainty (Heschong Mahone Group, p.3)

. . . From this study, we have made a number of important findings: We found a uniformly positive and highly significant correlation between the presence of daylighting and student performance in all three districts. We found that daylighting, provided from skylights, distinct from all the other attributes associated with windows, has a positive effect. (p. 62)

However, not all research favors natural light for learning environments. For example, Romney (1975) studied how windowed and windowless environments affected rote learning tasks, concept learning tasks and perceptual tasks of sixth grade students. No significant relationship was found to exist between the absence and presence of windows on rote learning or perceptual tasks.

Outdoor learning environments have become more popular as curriculum innovation seeks to involve students in the study of ecology and greener environments. Often overlooked considerations for schools include the design and development of green areas, natural quiet areas, and play areas. The developing interest in outdoor learning brings the design of outdoor rooms into focus (Freeman, 1995).

Weinstein (1979) stated that experience has convinced most people that noise can interfere with performance of intellectual tasks, yet research has produced inclusive and often contradictory results on this topic. Acoustics may be a factor in preventing appropriate sound to travel to students. Since Weinstein offered her commentary, more attention has been given to the acoustical environment and a growing body of performance research confirms that many students cannot hear clearly and comfortably in class. School buildings are filled with many different sounds from many different sources. Classroom acoustics are based on three factors: ambient noise level, reverberation time (RT), and the signal-to-noise ratio (S/N). Ambient noise is background noise. Examples include the hum of the heating system, cars passing by, and other students whispering. Reverberation time (RT) is defined as the interval needed for a sound introduced into an environment to reduce its intensity once the sound is turned off. The association between signal and noise is the S/N ratio (Day, 1999). Schools frequently have hard floors, concrete walls, high ceilings, windows and chalkboards, all of which cause a long reverberation time (Scott, 1999). Other factors at school that cause noise are playgrounds, corridors, ventilation systems, scraping of chairs, doors slamming, people's voices, and passing traffic (Day, 1999).

Signals are what people desire to hear; noise interferes with this desire. The signal should be stronger in intensity than the interference noise. In a classroom with an above-average acoustic design, students with no hearing impairments understood 71 percent of what the teacher said. However, students with hearing impairments only understood 48 percent of what was said by the teacher (Day, 1999). Cohen and Lezak (1977) concluded that human energy and efficiency decline due to unwanted noise.

Thermal environment or climate control is another environmental factor that has been the topic of several studies. The comfort index strongly influences the physiological state of the student. A comfortable temperature of 72 degrees Fahrenheit requires a relative humidity of 60 percent. As the temperature of the air rises, the humidity should decrease to maintain comfort level (Castaldi, 1994). In a survey conducted by McDonald (1964), teachers were asked what effect air conditioning had on their attitudes, work classification and classroom conditions. Of the teachers surveyed, 28 percent reported improved grades, 38 percent reported a willingness to do more work and 85 percent reported that their students showed a greater ability to concentrate when functioning within an air-conditioned environment.

McCardle (1966) conducted a study involving forty matched pairs of sixth graders. His study showed that pupils in a thermally controlled room committed significantly fewer errors on conceptual learning tasks than those in the room with no thermal controls. Curtis and Stuart (1964) showed that the gain of student achievement in climate-controlled facilities was superior to those in non-climate-controlled schools. Chan (1980) found that students in schools that were air-conditioned scored significantly higher, at the 0.05 level on the vocabulary section than students in non-air-conditioned buildings.

METHODOLOGY

This study employed causal comparative research design (ex post facto) to attempt to identify the cause–effect relationship between school ecology of high and low performing provincial secondary schools in Nandi–Central district of Kenya and academic achievement of students at Kenya Certificate of Secondary Examination (K.C.S.E.). In this design, the cause –effect linkage is made logically as the research process proceeds as follows: it focuses on the effect and then asks what might be causing that effect, and lastly, attempts to identify and substantiate a plausible connection between the effect and its cause (Gay, 1996). The design requires an identification of a criterion group, which is composed of people who have been observed, judged, or who describe themselves as possessing a certain characteristic that differentiates them from others, and examination of the possible causes for these differences. Kafui (2005) posits that causal-comparative studies are important in education because several educational variables cannot be manipulated and be used for experimental research. Descriptive research analysis was also employed in this study. Fraenkel and Wallen (1993) posit that descriptive analysis involves asking a large group of people questions about a particular issue and drawing conclusions.

In this study, negative and positive school climate were presumed to have already occurred, therefore, data was collected and analyzed retrospectively to establish their relationships or associations and meanings in relation to academic performance of students at the K.C.S.E. level.

Sample Size and Sampling Techniques

Purposive sampling technique was used to identify both the high and low performing schools based on the KCSE examination results of the selected schools. Out of the eight provincial secondary schools; four were reported to be high performers while the other four were poor performers in national examinations for the last five years. The high performing schools in this study were those whose examination mean scores recorded over the last five years to be above 7.0 with a mean grade of C+ and above, while the low performing schools were those whose mean scores were 6.9 and below, with a mean grade of less than C plain in the same period.

Cluster sampling technique was used to involve all the eight schools. The schools selected were of the same category in the sense that they were all provincial secondary schools. Student respondents were selected randomly from forms three and four classes. The two classes were selected to represent the student population because they were assumed to have stayed in those schools for a relatively longer period than the rest of the students and were deemed better placed to give more reliable information. Simple random sampling technique was employed to select the student participants. Three students were randomly selected from every row in each class. The sample in this study comprised of 424 form three and form four students in four provincial boys' secondary schools, three girls' secondary schools, and one mixed sex secondary school.

Research Instruments

A questionnaire was used in this study. The questionnaire was modeled on the four-point scale numbered 4, 3, 2 and 1. The points represented the following responses: 4-Agree, 3-Tend to Agree, 2-Tend to Disagree and 1-Disagree. These points represented the extent of agreement or disagreement by the respondents on the statements that were listed in the questionnaire. The

respondents were asked to tick in the box that provided the point that corresponded with the description that best suited his or her view. These tools sought information to rate their schools on each of the items regarding to their perception of school ecology prevailing in their respective schools.

Development of the Research Instruments

The researchers designed a questionnaire intended for use in this study. The statements that characterize each dimension of school ecology were patterned after the instrument that Halpin and Croft (1963) constructed called the Organizational Climate Descriptive Questionnaire (OCDQ). It contained sixty-four Likert-type items that were assigned to eight subtests delineated to factor-analytic methods. Four subtests dealt with the characteristics of the group and the other four dealt with the characteristics of the principal as a leader. From the scores of these eight subtests, they then constructed for each school a profile, which determined the relative position of the school on the open to closed intensity scale. In the present study, the questionnaire contained 10 items. It was divided into two sections: section A dealt with demographic profile of the respondents and section B dealt with ecology of the school.

Reliability of the Instrument

To test reliability, a pilot study was conducted in three provincial secondary schools; one girls' secondary school, and two boys' secondary schools in the neighboring Nandi-North district. A reliability analysis was done to test whether each item stated in the questionnaire yielded the desired and consistent outcome (Gay, Mills & Airasian, 2006).

Cronbach's Alpha coefficient was obtained to estimate the internal consistency of items. A reliability coefficient of greater than 0.635 was obtained. The results of the pilot study were used to test the reliability of the questionnaire in order to establish the extent to which it was able to elicit the desired information. The instrument was reliable as the coefficient of reliability was found to be greater than 0.60 in the sub-scale that was being studied namely: ecology. A coefficient of reliability of .60 was considered good enough in this study.

Data-Gathering Procedures

During the pilot study, the researchers administered the research instrument to three leading provincial secondary schools in the neighboring Nandi –North district. Two of these schools were Boys' schools and one Girls' school. In the actual study, all the eight provincial secondary schools in Nandi-central district participated in the study: three Girls' schools, four Boys' schools and one mixed gender secondary school.

Statistical Treatment of Data

The data collected was encoded and analyzed using Statistical Package for Social Sciences (SPSS). Descriptive and inferential statistics were employed. Descriptive statistics delved mainly on the students' perceptions on the school climates prevalent in the provincial secondary schools in Nandi-Central district. Comparisons of school climates of both high and low performing

secondary schools in Nandi Central district were made to establish the influence of school ecology on academic achievement. *T*-test, a parametric statistical tool, was used to compare mean differences of the perceptions of students on the aspects of school ecology under study in both the high and low performing schools. A *t*-test was used to determine whether two means were significantly different at selected probability levels (Gay, Mills, & Airasian, 2006). The level of significance was set at 0.05 in this study.

RESULTS AND DISCUSSION

This study investigated students' perception on school ecology; it also tested the null hypothesis that there was no significant difference between the school ecology of high and low performing provincial secondary schools and academic performance in Nandi-Central district.

The following scale of interpretation was used

3.50-4.00	agree/high rating
2.50-3.49	tend to agree/ average rating
1.50-2.49	tend to disagree/ low rating
1.00-1.49	disagree/ very low rating

Ecology

Students' Perception of Ecology

There were 10 items on the questionnaire for students that addressed the aspect of school ecology. Table 1 shows the mean ratings on ecology as perceived by the students in all the eight provincial secondary schools covered by the study.

Table 1: Students' Mean Rating on Ecology

Statements	Mean	Std. Dev.
In this school there are adequate physical facilities such as classrooms, laboratories and library.	2.9835	1.19780
Repairs and maintenance of school buildings and facilities are undertaken promptly.	2.7311	1.20808
The furniture and other facilities and equipment are adequately provided by the school.	2.9528	1.13930
The school is well planned and appropriately located with adequate room for future expansion.	3.1651	1.17946
Vandalism and graffiti on walls and toilets is not a common feature in our school.	2.8656	1.22748
The school compound is neat, decorated and well organized with beautifully manicured lawns.	3.1392	1.12860
The Lighting system and ventilations are in good working condition.	2.9717	1.27687
The buildings are safe, equipped with fire – fighting equipment with clear exit points in case of an emergency.	3.2600	1.06361
The school is located in a serene environment away from noise or any form of disturbance.	2.6038	1.25047
The school surrounding is conducive for learning	2.7925	1.2848
Ecology (overall mean)	2.9464	0.71679

Students in all the schools studied rated their schools' ecology as favorable, recording an overall mean of 2.9464. Students' rated their school buildings as being generally safe, equipped with fire fighting equipment and with clear exit points in case of emergencies, recording an overall mean of 3.2600. Students also reported that their schools were appropriately located in quiet and serene environments, recording an overall mean rating of 3.1651 and that their school compounds were

well kept, recording an overall mean rating of 3.1392. Students also rated favorably their schools as being well planned and appropriately located with adequate room for future expansion, recording an overall mean rating of 3.1651.

Generally, the ecology in all the eight provincial schools was rated by the students as favorable. The physical infrastructure in all the schools was perceived by the students as being favorable and therefore, ideal for learning. These schools were fairly safe and conducive for learning.

Ecology

Differences in ecology as perceived by the students

Table 2 illustrates test of differences on students' ratings on ecology between high and low performing schools. The test obtained a t-value of 8.923 with *p*-value of 0.000, which is less than the set significance level of 0.05, indicating that there was a significant difference between the ecology of the high and low performing provincial secondary schools in Nandi-Central district as perceived by students.

Table 2: Test of Differences on Ecology Between High and Low Performing Schools (Students' Ratings)

Performance category		N	Mean	Std. deviation	Std. error mean
Ecology	High performing schools	214	3.2298	.52811	.03610
	Low performing schools	210	2.6576	.76787	.05299

Independent samples test		Levene's Test for Equality of variances		t-test for equality of means				95% confidence interval of the difference		
		F	Sig.	T	Df	Sig. (2-tailed)	Mean difference	Std. Error difference	Lower	Upper
Ecology	Equal variances assumed	44.326	.000	8.953	422	.000	.57213	.06390	.44653	.69774
	Equal variances not assumed			8.923	369.859	.000	.57213	.06412	.44605	.69821

This implied that high performing schools had a better ecology than their counterparts in the low performing schools as indicated in their average overall mean ratings of 3.2298 and 2.6576 for high and low performing schools, respectively.

Table 3 shows comparisons of means of specific items on ecology as rated by the students in the high and low performing schools. Students in high performing schools reported fewer cases of vandalism and graffiti on walls and toilets in their schools, recording a high mean rating of 3.5187 compared to low performing schools who recorded a mean rating of 2.2000. The lighting system and ventilations were also reported to be in good working condition in high performing schools recording a mean rating of 3.4953 as opposed to a mean of 2.4381 recorded in low performing schools. The buildings in high performing schools were also reported to be safe, equipped with fire fighting equipment and had clear exit points in the event of emergencies, recording an average rating of 3.3568 compared to a mean of 3.1619 for low performing schools.

Table 3: Comparison of mean ratings on ecology of high and low performing schools as perceived by the students

Statements	Means	
	High performing	Low performing
In this school there are adequate physical facilities such as classrooms, laboratories and library.	3.0037	2.9619
Repairs and maintenance of school buildings and facilities are undertaken promptly.	2.9299	2.5286
The furniture and other facilities and equipment are adequately provided by the school.	3.1028	2.8000
The school is well planned and appropriately located with adequate room for future expansion.	3.5421	2.7810
Vandalism and graffiti on walls and toilets is not a common feature in our School.	3.5187	2.2000
The school compound is neat, decorated and well organized with beautifully manicured lawns.	3.4766	2.7952
The Lighting system and ventilations are in good working condition.	3.4953	2.4381
The buildings are safe, equipped with fire fighting equipment with clear exit points in case of an emergency.	3.3568	3.1619
The school is located in a serene environment away from noise or any form of disturbance.	2.6916	2.5143
The school surrounding is conducive for learning.	3.1822	2.3952
Ecology (overall mean)	3.2298	2.6576

From these mean ratings, students in high performing schools had a more favorable ecology as perceived by students compared to their counterparts in the low performing schools. These findings concur with studies conducted by Cash (1993) who found that high achievement was associated with schools that were air conditioned, enjoyed less noisy external environments, had less graffiti on walls and classroom, and furniture and students' lockers were in good state of repair. In this study, repairs and maintenance of school buildings and facilities were undertaken promptly in high performing schools recording a mean rating of 2.9299 compared to 2.5286 mean rating recorded by low performing schools.

CONCLUSIONS AND RECOMMENDATIONS

Provincial secondary schools in Nandi–Central district have a generally favorable ecology, as rated by students. The study also reveals that low performing schools have a less favorable ecology compared to the high performing schools. Thus, school ecology significantly influences academic achievement in secondary school. From this study, we conclude that physical characteristics of the learning environment do affect academic achievement and that it is important for educational decision makers, school boards and planners to consider the design classification as discussion in the study.

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