



Sensitization of Students on the Need for Healthy Environment for Sustainable Development.

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Abstract

This is a study aimed at effecting significant behavioural change in young people to help them take conscious steps to engage themselves in local environmental campaign to help promote healthy environment for sustainable development. This research work was carried out in Riis Presbyterian Model Junior High School in Koforidua municipality. With regards to the intervention design used, a well-tailored educational package was systematically administered. Specifically, forty-five (45) students from different geographical locations were used for the study. Environmental sustainability concepts such as environmental awareness creation, prevention of bushfires to enhance rural livelihood and curbing our developmental activities that simply exploit the Earth's raw materials and release large quantities of waste energy and toxic materials back into the system were considered under this study. The findings confirmed that if a well-tailored educational package is used to sensitize the citizenry, our quest to achieving healthy environment for sustainable development will not only be a success but sustainable.

Keywords: sensitization, students, need, healthy environment, sustainable development

INTRODUCTION

As early as 1864 in *Man and Nature*, George Perkins Marsh called attention to a growing worldwide need for environmental protection. Marsh emphasized that humans were making global and often permanent and disastrous changes in the environment. He urged, that disturbed environments be allowed to heal naturally or be restored by additional alteration or management. However, the world only started to open its eyes with the occurrence of environmental disasters, such as the vast land degradation caused in the United States by over-farming and drought during the 1930s, and the Minimeta Bay tragedy in Japan in 1953, where mercury was discharged into a river.

In the 1960s, and early 1970s, the world became acutely aware of the need to protect the environment. In *Silent Spring* (1962), the American biologist and writer Rachel Carson Showed that setting aside wilderness areas and wildlife refuges did not protect them from the effects of pollution. Carson wrote about the strong link between living resources, pollution and human health. There is widespread destruction and degradation of the environment. As a result there has been a global call for the integration of environment protection and development. Too many people who are concerned about the environment, some of the answers lie with sustainable development, and we all have a part to play. Sustainable development centers on improving the quality of life of human beings. It is designed to enhance the ability of humans to meet their socio-economic needs without damaging the environment.

Concern about the consequences of global warming, the destruction of rain forests, and the melting of polar ice caps has sparked great interest in environmental issues. Popular magazines now publish articles with titles like "The Great Climate Flip Flop," "The World's Hottest Year in More Than a Century," or "Too much Hot Air" that discuss evidence obtained from ice cores that indicates drastic past changes in climate or the relationship between atmospheric chemistry and climate. Such topics were formerly discussed only in technical journals. People are better informed than ever, and many are aware of the urgent debates about global warming, the ozone hole, and climate change. With little access to alternative and affordable energy sources African communities continue to rely on firewood for heating, cooking and lighting. Ghana has lost 79% of forest cover since the early twentieth century. In the forest ecosystem, fire is practically the cheapest means available for clearing slash and felled trees from fields to create a larger planting area for crops. Burning is essential for a good crop with minimum labour. Farmers share the opinion that when the vegetation is burned, large quantities of nutrient-rich-ashes are deposited on the soil surface which provides the newly planted crops with the benefits of the biomass that has grown on the site. Sometimes fire becomes a good management tool for facilitating and promoting the introduction of exotic species such as improved forage species into the vegetation. Most herders believe that bush burning improves the acceptability and nutritional value of trees and grasses for grazing and browsing. Hunters may use bush burning as a means of forcing animals to flee the bush in a particular direction, easing the capture or killing of these animals. However, the effects of bushfire on rural livelihoods and on the ecosystem in Ghana are increasingly becoming extensive and damaging.

Many bushfires in the forest zone are deliberately started by bush burning during the dry season, which can be very destructive not only of vegetation but soil structure and composition, and it increases soil erosion. In the worst cases, some farmers, of which a higher proportion are women, become trapped in the blaze and lose their lives. Fires often become unmanageable and destroy far greater areas of vegetation than intended, devastating natural resources and fields of crops on which most rural Ghanaians depend for their subsistence living. Accidental bushfires are frequently sparked by palm wine tappers and hunters. The palm wine tappers bore a hole in a felled palm tree, and then use palm branches to fire the region of the new hole in order to facilitate the free flow of liquid. They are sometimes careless with the burning palm branches, discarding them in the bush before the fire has completely died out. Hunters, as well as palm wine tappers, are accused of smoking while in the bush and disposing of glowing cigarette butts amongst the vegetation. Meals prepared on open fires in the bush are also cited as responsible for starting bushfires.

When we talk about sustainable development we are talking about using our intelligence and scientific knowledge to satisfy our needs while maintaining the physical environment. Unfortunately, most of our developmental activities have simply exploited the earth's raw materials and released large quantities waste energy and toxic materials back into the system. With the Industrial Revolution, human became capable of dramatically changing the face of the earth, the nature of its atmosphere, and the quantity of its water. Today, because of rapidly increasing human populations and advancing technology, ever-growing demands on the environment are causing a continuing and accelerating decline in the quality of the environment and its ability to sustain life. Sustainable Development is often an over-used word, but goes to the heart of tackling a number of inter-related global issues such as poverty, inequality, hunger and environmental degradation.

The idea of sustainable development grew from numerous environmental movements in earlier decades and was defined in 1987 by the World Commission on Environment and Development (Brundtland Commission 1987) as *development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

This contributed to the understanding that sustainable development encompasses a number of areas and highlights sustainability as the idea of environmental, economic and social progress and equity, all within the limits of the world's natural resources. As "unsustainable situation" occurs when natural capital (the sum total of nature's resources) is used up faster than it can be replenished. Sustainability requires that human activity only uses nature's resources at a rate at which they can be replenished naturally. The term "healthy environment" is a huge one, encompassing many different meanings. To complicate the matter, environments that are healthy for one population aren't always healthy for another. This makes it hard to agree upon what is needed in order to create a healthy environment, and to determine what has priority in this environment, such as humans, other animals, insects or plants. Usually, when people use this term, they refer to a human environment that would pose few risks for disease or health hazards. Rivers and streams serve as the primary water supply for most rural areas in Ghana and are thereby essential for survival and sustainable development. However, in recent years, many streams have dried up and

water levels in rivers have reduced. Year on year, the rainy season produces less rainfall in a shorter period, and the dry season extends its hold and increases in intensity.

Global warming is considered to be a major factor in this, but the loss of trees and other vegetation along the riverbanks, which otherwise provide shade for the river, also plays a significant part in declining water levels. As the river becomes exposed to the direct heat of the sun, water evaporates off the surface, and the heated mud of the riverbanks draws water away from the river itself. Trees and other vegetation are lost to land clearance for farming and access to sand, which is used along with trees for building materials. Trees are cut down for firewood and trees along riverbanks are in particular demand for charcoal burning, which requires water and mud for the process. Bushfires are often responsible for severe damage and destruction of vegetation along riverbanks in the dry season. Environmental problems are a reality in today's culture that cannot be ignored. Growing environmental troubles that the world is facing today include: global warming, pollution, habitat devastation, overpopulation, waste disposal, diminishing resources. As you can see, education is the key to reaching environmental sustainability. In this instance, sustainability is defined as "developing a way of human living that will ensure an enduring and sufficient level of support from the earth's resources" (Parker and Towner, 1993). Teaching young adults about the natural world is not just a nice thing to do - it is vital for the future of our young adults and the future of all life. Young adults are naturally curious and open to learning about nature, but in an increasingly urban society we often need to consciously create opportunities to help young adults bond with nature and learn about the environment.

These days, learning about nature is inextricably tied up with learning about climate change and other environmental problems. Climate change is now the subject of much concern and discussion amongst adults, and is often the subject of alarming and catastrophic news reports in the media. These problems are large, complex to understand, and have the potential to bring up strong feelings like fear, anxiety, frustration, anger or despair. It is likely that many young adults are aware of the threat of climate change. However it is also quite likely that they are confused about the facts and the extent of the threat they personally face, and might feel anxious, concerned or confused. Worries and anxieties about these threats can become difficult for children of all ages to deal with. On the other hand, young adults can also be very quick to grasp problems and are able to apply great energy and enthusiasm to putting solutions in place. The good thing about environmental problems is that we know what many of the solutions are, and many of them are very simple. Indeed, children are often reported to be better at getting going with environmental solutions than the adults are! Creating a new, climate-friendly energy future is a daunting task. But in reality, small steps by many people will change the world and protect the planet. In a sense, part of achieving a healthy environment is to determine how to live in total surrounding conditions with minimal or improving effects upon it.

Given the complication of trying to create a healthy environment, it would seem almost futile to try. Many argue that this is not the case. Studying the environment helps people understand which issues may be causing the greatest problems. Time is running out for the

world to avoid serious harm from climate change. Scientific reports show that the levels of carbon dioxide in the atmosphere are rising faster than anticipated and that the effects are already far-reaching. The answer of how to create a healthy environment is not likely to come from a single source, but instead it comes to humans in bits and pieces, like a puzzle. Each human then has the responsibility of deciding how to fit those pieces together to create a healthier world. Ghana has a long history of attempting to safeguard the environment from being abused by enacting and including environmental protection in appropriate legislation. The best result from all of these attempts is the establishment of an organization solely responsible for the environment, Environmental Protection Agency (EPA). It is the researcher's concern in promoting sustainable development that this educational package was developed to raise students' awareness as far as environmental issues are concerned.

Apart from the limited environmental concepts in students' textbooks, a relatively little or no efforts are made to organize environmental campaigns that involve students, particularly teenagers, even though, they appear to be the most active and potential manpower of every nation. Illiteracy coupled with lack of awareness of environmental issues and legislation has also contributed immensely to environmental problems in the country. These pressures notwithstanding, significantly legislative and institutional reforms have taken within the past decade. Many institutions for regulating the environment were established after 1990 including Environmental Protection Agency, Water Resources Commission, Forestry Commission, Energy Commission and a host of others. In spite of all these conscious efforts by the government and many non-governmental organizations, the records on moving towards sustainability so far appear to have been quite poor. It is in view of this that the researcher developed an educational package to sensitize these students to help bring crucial environmental issues to the lime light.

To enable the researcher to achieve the purpose of the project the following objectives were set to:

- Instill in young adults a knowledge of environmental problems and their causes;
- Encourage young adults to develop the skills to engage in social activism to combat those problems;
- Sensitize young adults to acquire the attitude of respect and connection to the natural world;
- Encourage young adults to have a desire to change current practices to protect the Earth.

The research is set out to answer the following questions:

- To what extent will environmental awareness through sensitization instill in young adults knowledge of environmental problems and their causes?
- To what extent will environmental sensitization encourage young adults to develop the skills to engage in social activism to combat those problems?
- To what extent will sensitization help young adults to acquire the attitude of respect and connection to the natural world?

- To what extent will environmental sensitization encourage young adults to have a desire to change current practices to protect the Earth?

LITERATURE REVIEW

The literature has been reviewed under the following headings; theoretical framework and empirical framework

The United States was one of the first countries to officially recognize environmental education. During a joint House-Senate session in 1968, Congress acknowledged the importance of environmental education and in 1970 passed the Environmental Education Act, which established the Office of Environmental Education (American Geological Institute 2000). From the classroom to the forests, fields, streams and prairies, Environmental Adult Education is a relatively new and unique field of study and practice. It is a community-based method in which educators listen and respect the input of learners, and all participants are considered essential (Haugen, 2006). During the last thirty years, environmental adult education has evolved. For more than a century, environmental and conservation organizations taught adults environmental education with very little structure. Wilson (1996) in a brochure, *Starting Early: Environmental Education during the Early Childhood Years*, says; the rationale for environmental education during the early childhood years is based on two major premises. First, children must develop a sense of respect and caring for the natural environment during their first few years of life or be at risk for never developing such attitudes. Second, positive interactions with the natural environment are an important part of healthy child development, and these interactions enhance learning and the quality of life over the span of one's lifetime. Children who are close to nature relate to it as a source of wonder, joy, and awe. Wonder -- rather than books, words, or learning all the facts -- provides the direction and impetus for environmental education in early childhood. Environmental education during the early years should be based on this sense of wonder and the joy of discovery. As you can see, education is the key to reaching environmental sustainability. In this instance, sustainability is defined as "developing a way of human living that will ensure an enduring and sufficient level of support from the earth's resources" (Parker & Towner, 1993).

According to Meadows (1992) in *Beyond the Limits*, with every breath we inhale, a part of the environment becomes a part of us. When we exhale, a part of us becomes a part of the environment. There is a direct connection between the air we breathe and our lungs or more generally, our human health. As humans, we are connected to all the cycles -- water, carbon, nitrogen, oxygen, etc. Our link to the environment can be seen as a system. Two important characteristics of a system are that each part has a function to play and each part is connected to another one. Therefore, thinking of our connection to the environment in systematic terms is important. It reinforces the point that each component of a system has a special function to carry out and that each component is connected to another component. Many of the ideas that are now embedded in the concept of sustainable development have been around for a long time; since the work of Malthus on population growth in the late 1700s. But the concept actually emerged during debate in the early 1970s following a range of key publication to man's over-exploitation of the environment, focusing on economic

development and the growing global concern about development objectives and environmental constraints, and examining the inextricable link between environment and development.

Adeyeri (2002) refers to the classic definition of sustainable development. This was proposed in the World Commission on Environment and Development (1987) report, *Our Common Future*: often referred to as the Brundtland Report. Sustainable development is the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs. This definition embraces three dimensions: environmental responsibility, economic return and social development. Harris (2001) endorses the recognition of these aspects of sustainable development; by indicating that successful developing countries pass through a series of stages from traditional society, through economic development to maturity and high mass consumption. This implies an unbounded and sustainable process of continued economic and social growth.

In 1972, the United Nations held a conference on the Human Environment in Stockholm, Sweden. At the conference it was recognized that pollution was the major concern for the developed countries while poverty was the major concern for developing countries. The latter were willing to adopt Western models of development and accept the environmental problems as part of the package. The conference concluded that there was the need for global efforts and that nations and industries needed to work in harmony with an international understanding and action which would aim at raising the standard of the ecological health of the planet, by improving the physical and spiritual qualities of our relations to the earth. One of the outcomes of the Stockholm Conference was the establishment of the United Nations Environmental Program (UNEP). Drummond and Marsden (1999) indicate that, in environmental terms, sustainability is more narrowly related to the resilience of ecosystems: that is their ability to withstand varying types of stress. Ideally, sustainability is achieved where an activity occurs without damaging its supporting ecological systems.

Shiva (1992) goes further by stating that true sustainability demands that ecological principles are incorporated into production processes to reshape them and that conservation has to be both the basis and the foundation of production. Sustainability is therefore a term that can have different and often opposing meanings when applied to economic, social and environmental situations. Shiva (1992) identifies two kinds of seemingly mutually exclusive sustainability, one situated in nature and the other situated in the marketplace. In nature, sustainability is said to refer to regeneration of nature's processes and subservience to nature's laws of return to provide sustenance to indigenous people.

According to Carroll (2002) one study alone has identified over 500 different attempts to define sustainable development. The concept is by no means modern even the Magna Carta of 1297 contains a clear statement of the importance of environment conservation in relation to intergenerational equity. Crabbe (1997) cynically describes sustainable development as a political Utopia developed by the UN initially to entice Third World countries to subscribe to the environmental agenda of the North. Beckerman (1994) adds to the controversy by

stating that the concept of sustainable development is fundamentally flawed since it mixes together the technical characteristics of a particular development path with a moral injunction to pursue it. He concludes that the optimal choice for society is to maximize welfare over whatever timescale is regarded as appropriate for intergenerational justice and that sustainability should be interpreted as merely a technical aspect of a project. Jacobs (1999) describes it as a fashionable phrase that everyone pays homage to but nobody cares to define. He continues by inferring that it is this lack of fine definition that has frustrated policy-technocrats, greens and academics alike. A pragmatic approach coined by Sir Crispin Tickell (2000) the former Chairman of the UK Government Sustainable Development Panel. Its effectiveness lies in its simple appeal for humanity not to despoil its own environment; treating the Earth as if we intended to stay there. In 1991, the World Conservation Union (IUCN), United Nations Environment Programme (UNEP) and the World Wildlife Fund/Worldwide Fund for Nature (WWF) published *Caring for the Earth – A Strategy for Sustainable Living*, after a wide process of consultation. Most poor African communities are vulnerable to these impacts mainly because they rely disproportionately on natural resources for their basic needs, such as food, water, and shelter, lacking the financial resources to meet these needs through the market. Environmental degradation undermines the capacity of poor people to make decisions that contribute to their well-being. At the local level, individuals and communities contribute to environmental degradation through personal and commercial practices that destroy forests and crops, and make water supplies from rivers and streams vulnerable to declining water levels and pollution. *Caring for the Earth* is often described as a strategy for a kind of development that improves the quality of human life as well as conserving the vitality and diversity of the earth. It is important to note that the protection of the global environment has been pushed to the top of many political agendas and that the message of international effort has been accepted by world leaders of both the North, South, East and West.

A research conducted in Pakistan by Sindh Rural Women's Uplift Group was on Sustainable Agriculture. The Sindh Rural Women's Uplift Group owns 108 acres (43 hectares) of fruit orchard in which they use 'organic and sustainable cultural practices' to fight against the use of synthetic pesticide and insecticide. The Group believes in maintaining soil and plant health to reduce disease attacks. Their objectives were to create greater awareness about, and promote the concept of sustainable agriculture. Eventually the group provided wind-breaks, restored the balanced pruning for admission of sun-light, mowed weeds and dumped them under trees as mulch for weed control, supplied micro-nutrients as foliar sprays. They also evolved their own system of irrigation by planting trees on ridges and applied water in the furrows between the two ridges and limited water application to optimum needs, created biological activity under the mulch put under the trees for soil's health. Reduced water application to 40% as against flood irrigation used 15 years ago. Obtained yields three times those of their neighbors or others in Pakistan and increased the income many folds.

The group was able to extend the use of these techniques to reduce soil, air water pollution from use of chemical, which also have direct effect on the health of the living biotic life on land and water. Another research was conducted in Ahmedabad City, Gujarat State, India,

by a responsible organization called Ahmedabad Abhiyan. Their research was on 'Zero Garbage on Road'. The Clean Ahmedabad Abhiyan Committee was formed by concerned Citizens, Voluntary Organizations and the Municipal Corporation to research and find permanent and sustainable solution to the health hazard and sanitation problems caused by the decomposing garbage on urban roads. Through public awareness, households were involved with segregating wet and dry garbage. A special bag with three compartments was developed to segregate and store recyclable-paper, plastic and miscellaneous. The heavy duty bags were reusable and last for two years. Segregated recyclables are collected from each house by 'rag-collectors' who have been each assigned to 100-200 houses. The increasing multi-story apartment societies use 'community bins' for collection of kitchen waste from 30 families. A specially designed truck removes and replaces full bins. A low-cost kitchen waste digester and composer have also been developed. They were able to address solid waste management; recycling; public health; public awareness and participation. They were able to establish a system of collection of dry and wet waste for recycling and use as compost. They were also able to achieve income generation and confidence building for rag- collectors through a cooperative organization. They eventually involved women's organizations in organizing the collectors. They also succeeded in the improvement of health standards in the community. It was revealed in the course of the project, that the use of media to replay frequent messages on cleanliness is very crucial in environmental sustainability. Organization of voluntary participation for benefit of all levels of the community in promoting sustainable development is also paramount.

METHODOLOGY

The researcher went through the following steps to obtain data on the existence of the phenomenon. The data was subjected to the descriptive analysis using statistical central tendencies. This is because, descriptive statistics deals with methods for summarizing and presenting data in tabular and graphical forms as well as using numerical measures such as percentages, mean, standard deviation, etc. in an informative way.

The researcher used Pretest- Posttest Design for the study. This is because for many true experimental designs, pretest-posttest designs are the preferred method to compare participating groups and measure the degree of change occurring as a result of treatments or interventions. (Martyn Shuttleworth, 2009) It is one of the simplest methods of testing the effectiveness of an intervention.

The population of the school's Junior High School alone, where the project took place is about four hundred and twenty (420). It runs only one shift. The A and B groups are put together as one common stream. But, the accessible group, however, was the JHS 3 pupils of the school.

The researcher used heterogeneity sampling, which is a subcategory of a purposive sampling. Heterogeneity sampling is used when we want to include all opinions or views, and we are not concerned about representing these views proportionately. The researcher used this category of purposive sampling because in many brainstorming or nominal group processes, we use some form of heterogeneity sampling because our primary interest is in getting broad spectrum of ideas, not only identifying the "average" or "modal instance"

ones. The researcher sampled only forty-five (45) pupils representing the Basic Stage 9 class. This comprised of 21 boys and 24 girls.

The researcher used both interview and observation techniques. The researcher proceeded to interview some of the subjects after the pre-intervention to have a deeper insight into subjects' notion about environmental sustainability. Also, the researcher observed the subjects at different stages of the study which included diagnostic, intervention and evaluation stages. The observation technique helped the researcher to get first-hand information about the subjects' fair idea on the environment, how environmental problems are discussed in their locality and assess whether their behaviour have changed during the administration of the research intervention. The data was subjected to the descriptive analysis using statistical central tendencies.

The pre-intervention conducted helped the researcher to diagnose the awareness level of the subjects; on environmental issues, to enable them take conscious effort to change their negative attitude towards the environment for sustainability. Under the pre-intervention stage, subjects were given questions involving crucial environmental issues. Subjects were asked to clearly answer these questions accordingly. This was to aid the researcher know the true capabilities of the subjects in effecting positive environmental change for sustainable development. From the pre-intervention, the researcher was able to painstakingly develop an educational package to sensitize subjects on healthy environment for sustainable development.

The researcher consciously prepared an educational package; tailored to help the subjects in achieving environmental sustainability. It was basically the use of sensitization; using the pre-test post-test research design. The sensitization, which is an educational package comprise of wildfire, emission of heat-trapping gases into the atmosphere which leads to global warming and waste management. Generally, seventy contact minutes were used in three days for the interventional activities. Subjects were encouraged to become involved in the various awareness campaigns in their localities to help spread the word about the need to protect the environment. The first day of the contact period was used to orient pupils on the need for environmental sustainability, after the pre-test had been administered. Pupils were taken through series of activities to sensitize them on how their immediate surroundings can be protected for sustainability.

Subjects were asked to define the environment and their significance to human existence. Majority of the subjects defined the environment as the physical things we see around us. The researcher asked a follow-up question that, by what means can the things we see around us enhance human existence. Subjects provided different answers to this question in bits and pieces. Among these answers are shelter, clothes, food, water and transport subjects were allowed to ask questions to clear doubts. They were reminded that all living things seem to be composed of a significant amount of water which has to be replaced when it is used. Thus, the cycle of water around the planet is crucial to life. Without water, life would cease to exist. Subjects were therefore cautioned to treat our water bodies with care.

A considerable number of the subjects asked questions on the subject matter. For instance, a student asked a question, that what does sustainable development in practical terms mean?

To answer that question, practical approaches were enumerated. That sustainable development involves changing production methods and consumption patterns in the interest of ecological balance. For example, industries can modify or replace their equipment in order to conserve natural resources. The researcher explained that most old equipment tend to consume relatively more energy than new ones.

Subjects were also sensitized to practice bulk ironing to help save hydro-electric power. That they must also switch off all electric gadgets like electric bulbs, radio sets and T.V sets that are temporarily not in use to help save energy; thereby promoting sustainable development. Also, the researcher told the pupils that the minimum condition for sustainable development is that the development process must not endanger the ecological systems that support life on earth.

Considering the fact that, the global ecosystem is closed, and nothing is ever really thrown away. These two facts, coupled with the increasing pressure of human populations for energy and material goods, have led to a number of large-scale environment problems. The remaining contact hours for day 2 and day 3 were used to discuss some of those problem—the degradation of the ozone layer, acid rain and the greenhouse effect. Subjects were told that solutions to these environmental problems entail different levels of natural and international commitment.

It was pointed out that, although the sun gives off most of its radiation in visible light, a certain amount of that radiation comes in the form of the ultraviolet part of the spectrum. The researcher discussed with pupils that ultraviolet radiation can be very damaging to living organisms. One of the subjects asked a question that why is the ultraviolet radiation use to sterilize hospital equipment if they are harmful. The researcher answered that, although the ultraviolet radiation is routinely used to sterilize equipment in hospitals, if the surface of the Earth were not shielded in some way from the sun's ultraviolet rays, life on earth would be very different, if not impossible. It was further explained to subjects that a protective shield of ozone formed high in the Earth's atmosphere several hundred million years ago, and it was only after this shield had formed that life could move onto land in the first place.

Another pupil requested that ozone should be explained to him. The researcher briefly explained that, it is a molecule made up of three oxygen atoms instead of the usual two, absorbs ultraviolet radiation. It was further explained to pupils that, if enough ozone molecules exist in the atmosphere, they will absorb the radiation from the sun and keep it from reaching the ground in any appreciable quantities.

The researcher discussed with pupils that not until the 1950s, the fluid that were used in things like refrigerators and air conditioners were chemicals like ammonia. These chemicals which when released into the atmosphere would cause a noticeable decrease in the quality

of the air. Chlorofluorocarbons (CFCs), on the other hand, last a long time and do not break down readily when they are released into the atmosphere. Unlike the ammonia, danger of the Chlorofluorocarbons (CFCs) is not immediate in the case of accidental leaks. The Chlorofluorocarbons (CFCs) turned out to present a very real danger to the Earth's ozone layer.

The researcher further discussed with pupils, that greenhouse gases such as the Chlorofluorocarbons (CFC's), carbon dioxide, methane and nitrous oxide cause global warming. A significant global warming of the atmosphere would have profound environmental effects. It would speed up the melting of the polar ice caps, raise sea levels, change the climate regionally and globally, alter natural vegetation and affect crop production. These changes would, in turn, have an enormous impact on human civilization. Subjects became amazed after hearing this.

The researcher discussed with subjects, that studies have shown that the ozone layer was being damaged by the increasing use of industrial chemicals which has already been mentioned as CFCs which are used in refrigeration, air conditioning, cleaning solvents, packing materials and aerosol sprays.

The day two came to a closure by educating subjects, that because of the growing threat of these dangerous environmental effects, many nations planned removing the manufacture and use of Chlorofluorocarbons (CFCs) by the year 2000. However, CFCs can remain in the atmosphere for more than 100 years, so ozone destruction will continue to pose a threat for decades to come. Surprisingly enough, most of the subjects received this as complete news.

The researcher used the last day of the sensitization to discuss with subjects about bushfire or wildfire. The researcher solicited for the idea of pupils, as far as wildfire is concerned. Different dimensions of opinions were sampled. The researcher added his voice by saying that; wildfire differs from other fires by its extensive size, the rate at which it can speed up from its original source, its potential to change direction unexpectedly, and its ability to jump gaps such as roads, rivers and fire breaks.

The researcher traveled further on the issue, that wildfires are characterized in terms of the cause of ignition, their physical properties such as speed of propagation, the combustible materials present, and the effect of weather on the fire. It was established in the course of the discussion that, wildfires occur on every continent except Antarctica. Fossil records and human history contain accounts of wildfires, as wildfires can occur in periodic interval.

It was also established that wildfires can course extensive damage, both to property and human life, but they also have various beneficial effects on wilderness areas. Some plant species depend on the effects of fire for growth and reproduction, although large wildfires may also have negative ecological effects.

The researcher told subjects that, strategies of wildfire prevention, detention, and suppression have varied over the years, and international wildfire management experts

encourage further development of technology and research. However, the researcher told subjects that one of the more controversial techniques is permitting or even igniting smaller fires to minimize the amount of flammable material available for a potential wildfire. Altogether, we agreed on the idea that while some wildfires burn in remote forested regions, they can cause extensive destruction of homes and other property located in the urban regions.

The researcher further discussed with subjects that, the wildfire equally poses environmental threat since it also produces excessive heat and carbon monoxide. The excessive heat contribute to global warming while the emission of carbon monoxide into the atmosphere serves as a heat trapping gas, which subsequently traps the heat that is supposed to leave the earth. This also contributes to global warming. The researcher discussed the environmental hazards this excessive heat produced by greenhouse gases will cause humanity and then asked subjects to come out with possible solutions.

The third day of the implementation process was used to extensively discuss burning, which is the chemical reaction of oxidation that inevitably introduces chemical compounds into the atmosphere. Burning produces other sources of pollution. First, when the temperature of the air is raised above about 500 degrees Celsius, nitrogen in the air combines with oxygen to form what are called complex compounds such as nitrogen oxide and nitrogen dioxide. Second, petroleum and coal based fossil fuels usually contain small amount of sulfur, either as contaminants or as an integral part of their structure. The result is that chemical combinations of sulfur and oxygen, particularly sulfur dioxide, are released into the atmosphere as well. The emission of hydrocarbons, sulfur dioxide, and other complex compounds gives rise to a number of serious environmental problems. The most immediate consequences for urban residents are air pollution.

The researcher discussed with subjects that sunlight hitting nitrogen compounds and hydrocarbons in the air triggers a set of chemical reactions that, in the end, produce ozone. And, while ozone in the atmosphere is essential to life on Earth, ozone at ground level is a caustic, stinging gas that can cause extensive damage to the human respiratory system. This so-called "bad ozone" is a major component of modern urban air pollution associated with photochemical smog, the brownish stuff that you often see over major cities during the summer.

The researcher asked subjects to come out with possible solutions to these environmental problems. Most of them mentioned the government and others said it needs collective effort to correct the damage. It was discussed with subjects that urban air pollution is a serious environmental challenge, but it is also an immediate one. This is because if the air quality in a city declines, people know about it immediately. The response of governments to urban air pollution has centered on reducing the levels of emission associated with the burning of fossil fuels. Subjects were reminded that in the state of California, for example, by 1998, two percent of the cars sold in the states will have to be emission-free. In effect, they will have to be electrical cars. Because of the strength of the California automobile market, it is expected that this will lead to the rapid development of electrical cars.

Post Intervention

Under the post-intervention period, pupils were asked to answer questions related to environmental sustainability in a form of test as well as dialogue. This exercise helped the researcher to find out whether or not pupils had improved upon their attitudes toward the environment for sustainability. Frankly speaking, the post-test revealed that pupils' performance were far better than the pre-test. Pupils were able to grasp most environmental concepts; and subsequently exhibited relatively high degree of environmental awareness, especially on heat-trapping gases which eventually lead to global warming. Subjects also updated their information on wildfire and burning which also increase atmospheric temperature.

DISCUSSION OF RESULTS

In order to gather the appropriate information or data needed for the study, a total of forty-five (45) pupils representing the class size were used for the research. This was as a result of the purposive sampling used. The data collected were from two major sources. These included the pre-test at the diagnostic and the post-test scores at the end of the intervention. The sample of these two tests could be found at the appendix columns.

The class of forty-five (45) pupils was made up of seventy (17) girls representing 37.8% of the total class population and twenty-eight (28) boys also representing 62.2% of the total class population.

The table that follows shows the data collected on the pupils from the pre-test scores of forty-five (45) pupils, on the sensitization of students to promote healthy environment for sustainable development. This data were collected at the diagnostic stage of the study.

Table 1
Pretest Scores

Scores (x)	No. of pupils (f)	Fx	Percentages of pupils (%)
0	-	-	-
1	-	-	-
2	-	-	-
3	-	-	-
4	10	80	22.2
5	8	40	17.8
6	14	84	31.1
7	2	14	4.4
8	7	28	15.6
9	2	18	4.4
10	2	20	4.4
	$\Sigma f = 45$	$\Sigma fx = 284$	

Source: Author's Work

$$\text{Mean } (\bar{x}) = \frac{\Sigma fx}{\Sigma f} = \frac{284}{45} = 6.3$$

The table above shows the scores of forty-five (45) pupils on the pre-test marked out of ten (10) marks. From table 1, one could notice that at the time the pre-test was conducted the scores showed that as much as eighteen (18) pupils out of the forty-five (45) representing 40% of the total sample could not score more than five (5) marks out of the ten (10) marks.

It is therefore evident that exactly twenty-seven (27) pupils out of the forty-five (45) pupils in the class could score more than 5 marks, representing 60% of the total class size, a situation which caught the attention of the researcher to actually find a way of sensitizing pupils to create environmental awareness for sustainability. It was realized that only four (4) pupils could score nine (9) and ten (10) marks respectively, and only seven (7) pupils scored eight (8) marks. The problems identified were particularly with test materials that demanded application of environmental awareness, in terms of the negative effects human activities have on the physical environment.

Table 2
Post test Scores

Scores (x)	No. of pupils (f)	fx	Percentages of pupils (%)
0	-	-	-
1	-	-	-
2	-	-	-
3	-	-	-
4	-	-	-
5	-	-	-
6	2	12	4.4
7	6	42	13.3
8	4	32	8.9
9	7	63	15.6
10	26	260	57.8
	$\Sigma f = 45$	$\Sigma fx = 409$	

Source: Author's Work

$$\text{Mean } (\bar{x}) = \frac{\Sigma fx}{\Sigma f} = \frac{409}{45} = 9.0$$

Table 2 shows the scores of the forty-five (45) pupils on the post-test marked out of ten (10) marks. For the purpose of comparison and finding out the success or otherwise of the intervention a parallel test item used at the diagnostic or pre-test stage was used for the post-test exercise. From the table 2 above, one could easily observe that after the intervention was implemented none of the pupils had below six (6) as compared to the scores collected at the pre-test stage where eighteen (18) pupils representing 40% of the total class size had below six (6) marks.

Also a critical look at the table shows that during the administration of the post-test twenty-six (26) pupils representing 57.8 of the class size had all questions correct, thereby getting all the marks as against only two (2) pupils getting all the ten (10) marks in the pre-test. It is

quite evident that there was a significant improvement after the intervention. The mean of 9.09 represents the average marks scored which shows pupils' remarkable performance on the post-test. A close observation of the performance of the subjects over the period of the study revealed that their performance improved considerably after the implementation of the educational package. This is because; it actually stimulated their thinking, as far as environmental issues are concerned, so as to create environmental awareness for sustainability. This answered the question as to whether the use of the sensitization could create environmental awareness. The researcher engaged subjects in a dialogue, as part of the sensitization process. This approach helped to bring a considerable number of pupils who could not see the need to actually engage themselves in local environmental programs as well as explore local environmental problems to promote sustainability to do so. This means that a well-tailored educational package for young people helps encourage young people to explore their local environment for discussion, to improve upon local environmental challenges. The use of the sensitization influenced the perceptions of subjects. This contributed to their sterling performance with a significant improvement of those who had above five in the post-test.

It is believed that the environmental awareness demonstrated by the subjects would promote environmental sustainability. This endorses what Sir Crispin Tickell (2000) the former Chairman of the UK Government Sustainable Development Panel says, that the effectiveness of environmental sustainability is in its simple appeal for humanity not to despoil its own environment by treating the Earth as if we intend to stay here forever.

Secondly, when it came to the question as to whether group activities will help promote environmental awareness for sustainability, by codifying reality. It proved a point to bring on board that the introduction of the first phase of the intervention design still had certain level of difficulty in understanding how human daily activities greatly put pressure on the physical environment number of pupils who after the introduction of the first phase of the intervention design, some students still had certain levels of difficulty in understanding how human daily activities greatly put pressure on the environment until the second phase of the intervention. Subjects eventually understood the need to be environmental friendly; to help promote sustainability.

Finally, when subjects finished taking the post-test intervention it became evident that they have actually acquired a considerable knowledge that would urge them to engage themselves in local environmental campaign for sustainable development. The researcher's approach in engaging subjects in a dialogue did not only help him to diagnose the knowledge level of the subjects but created a rapport that stimulated subjects' interest for effective participation. This really enhanced the proceedings of the project. This validates what Richard Sagar (1992) says that, although interview usually requires considerable time of commitments from both the interviewer and the interviewee, it is an excellent way to collect data. He added that, most people enjoy being interviewed because from that, there is development of good intimacy between the interviewers and the person being interviewed.

CONCLUSION

The environment cannot be protected when growth leaves out of account the cost of environmental destruction. However, if individuals are encouraged to take the responsibility to explore local environmental problems for discussion, we would collectively achieve environmental sustainability. Also, dialogue, observation and campaigns which subsequently lead to environmental sensitization help promote healthy environment for sustainable development. The mean calculated from the total scores obtained out of ten (10) marks were 6.3 and 9.09 respectively. The mean mark for the post-test shows a significant increase over the mean mark, for the pre-test, that is $9.09 > 6.3$. This means that the purpose of the study was achieved, using a well-developed sensitization package to stimulate thinking, as far as environmental issues are concerned.

RECOMMENDATIONS

The following recommendations are made based on the conclusions:

- All stakeholders of education must be encouraged to instill in students the need to explore local environmental problems for discussion.
- The Environmental Protection Agency must assume a collective responsibility to organize periodic environmental campaigns in pre-tertiary institutions; that would create environmental awareness, to help promote a healthy environment for sustainability.
- Community leaders must encourage individual responsibility to protect the environment; by encouraging inhabitants to be environment friendly.
- In our quest to combat environmental menace, teenagers who are the most active and potential manpower of every nation; must not be overlooked. They must rather be an integral part of virtually all our environmental campaigns to eventually achieve effective environmental sustainability.
- Further research is recommended, using the interventions on this study and include more schools.

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