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Environmental Literacy Education: A Means for Curbing the Effect of Climate Change

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Abstract

This paper sought to bring to light the truth that environmental literacy education is the process of displaying a set of understanding, skills, attitudes and habits of mind that empowers the individuals to relate to their environment in a positive fashion as to maintain or restore sustainable relationship with others and the entire environment; the ability and willingness to make environmental decisions which are consistent with both quality of the environment and quality of human life. It examined the characteristics of an environmentally-literate person and the levels of environmental literacy. It also exposed the essence of climate change such as man's radical exploration and exploitation of the environment; causes of climate change as rapid industrialisation; agriculture; emission of carbon-dioxide among other things; its effects like ozone depletion, desertification, deforestation, biodiversity Loss among others; and why environmental literacy education could be employed as a tool to curb the effect of climate change in Nigeria and the world in general. The following among others were seen as a way forward to protect the lives and the environment against the effects of climate change: those who are vulnerable to flood should open drainages around them; reconstruct roads with better drainages and stop building along water ways to prevent reoccurrence of the effects of climate change.

Key Words: environmental literacy education, climate change

Introduction

Environmental Literacy education is the process of displaying a set of understanding, skills, attitudes and habits of mind that empowers individuals to relate to their environment in a

positive fashion and to take day to day and long term actions to maintain or restore sustainable relationships with other people and the biosphere (Earthlore Associates and The Centre for Environmental Education). Environmental Literacy is defined as “the capacity to perceive and interpret the relative health of environmental systems and take appropriate action to maintain, restore, or improve the health of those systems” (Disinger and Roth, 1992). Environmental Education and Training Partnership (EETAP), 2002), asserts that Environmental Literacy is the “ability and willingness to make environmental decisions which are consistent with both quality of the environment and quality of human life”. Erdogan, Kostova and Marcinkowski (2009) cited in Mbalisi and Nzokuru, (2010) define environmental literacy as “basic functional education for all people which provides them with the elementary knowledge, skills and motives to cope with environmental needs and contribute to sustainable development”.

Environmental literacy education as a potential tool is readily needed in issues that concerns the environment because it takes an environmentally-literate individual to understand environmental issues. For the environment to be free from degradation there should be quality education which EE is able to provide (Schreuder cited in Loubser, Swanepoel, & Chacko, 2001) and this avenue will help individuals to act and promote an environmental ethic so that they can take part in the wise use of natural resources and good management of the environment (African National Congress (ANC) cited in Loubser, Swanepoel & Chacko, 2001). In as much as it is believed that the teacher can do a lot to bring about the solution to environmentally related issues, the acquisition of environmental literacy through environmental education is the bedrock because nobody can give out what he does not have; hence the necessity of the components of environmental literacy which talks about **Awareness, Knowledge, Attitudes, Skills, and Action**; (**Knowledge**: knowledge of natural history and ecology; knowledge of environmental issues and problems and socio-political-economic knowledge), **Skill**: cognitive skill, **Affective**: affect and additional determinants of ERB, **Action**: environmentally responsible behaviours (ERB).

Climate Change

Climate Change is a central environmental challenge facing the world today. Climate Change is defined by United Nations Framework Convention on Climate Change (UNFCCC) as “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods”. Climate Change is seen as “a change in the state of the climate that can be identified by changes in the mean and or the variability of its properties and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity” (IPCC, 2007, p. 30 cited in Osumanu, 2010).

McCaffery, et al 2010 cited in Mbalisi and Nzokuru, (2010) sees climate change as long-term changes in the climate. United Nations Development Programme (UNDP, 2008) defines climate change as “an alteration of the earth’s general weather conditions”.

Climate change is the resultant effect of greenhouse effect (GHE) through man’s interaction with the environment through industrialisation, urbanization, pollution which adversely affect the whole resulting to the rise on sea; increase in carbon dioxide emission; increase in global temperature; flood in the coastal areas causing massive soil erosion, contamination. It is a long-term shift in the climate of a specific location, region or planet (Ephraim, 2012).

Causes of Climate Change

The whole essence of climate change is bordered on man's radical exploration and exploitation of the environment. Man's aggressive interaction with the environment through the following:

- i. rapid industrialisation;
- ii. agriculture;
- iii. emission of carbon-dioxide;
- iv. emission of other toxic gases from factories and vehicles;
- v. burning of fossil fuel;
- vi. bush burning;
- vii. construction of roads, houses, bridges etc.

These activities bring about environmental problem. Problems like ozone layer depletion, desertification, deforestation, biodiversity loss, pollution are the causes of climate change, the cause for everyone's worry today.

This phenomenon (climate change) is caused by the effect of human's activities which have resulted to Green House Effect and Ozone layer Depletion. The Green House Effect is caused as the greenhouse gases such as Carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and water vapour emitted into the atmosphere trap the heat from the sun to the earth and prevent it from escaping into the atmosphere; thereby causing global warming (the exposure of the earth to excessive heat). This exposure results to various danger which man experiences since the Ozone Layer (O₃) which was originally created by nature to act as a shield or protective cover to the earth against the heat (ultra-violet radiation) from the sun became depleted (Dhameja, 2007)

The earth became vulnerable to the effects of the ultraviolet radiation from the sun; hence the marked rise in cases of skin cancer, reduced resistance to diseases, cataract (eye-ailment), shorter life of paints and plastics, restricted growth and crop damage, destruction of aquatic life and many more. This is why at the global conferences such as those held in Vienna (Austria), (1985), the Montreal Protocol in (1989) and many others called for a gradual reduction in Chlorofluorocarbons (CFCs) and in latter conferences nations agreed on the total ban on chemicals that cause Ozone depletion; substituting with such environmentally-friendly Chlorofluorocarbons (CFCs) like dichloro-methane, Freon etc. (Dhameja, 2007, p. 311).

Effect of Climate Change in Nigeria

Climate change has caused a lot of hazardous effects in Nigeria among which are:

- i. Ozone depletion
- ii. Desertification
- iii. Deforestation
- iv. Biodiversity Loss
- v. Erosion
- vi. Longer and hotter summers and shorter and warmer winters
- vii. Desertification, droughts and famine

- viii. Rapid depletion of nutrients from the soil as a result of the increase concentration of carbon dioxide which caused increase in growth and yield of plants
- ix. Disruption of the ecosystem by increase in rainfall
 - x. Altered crop patterns and adverse effects on flora and fauna
 - xi. Rise in sea-level
 - xii. Reduction in access to food and drinking water
- xiii. Flood
- xiv. Change in seasons
- xv. Outburst of diseases

Components of environmental literacy

Awareness: This has to do with a general impression or consciousness one holds about something. One may be aware of an issue without knowing much about it. Hence environmental awareness may spring up from different activities much more than education. This is to say that for it to be claimed that someone has an awareness of a particular issue, it also means that the individual does not know much about the issue. Therefore, awareness is one level of the component of environmental literacy where such an individual may not be out rightly trusted with the issue of the management of the environment, knowing that he will have but little to offer as far as the environment is concerned.

Knowledge: This component has to do with orderly comprehension, application, analysis, synthesis and evaluation of that material as well as the intellectual framework within which new information can be placed and manipulated. To develop knowledge something that is absent in simple information transfer is needed; which is a formal methodology for constructing knowledge with student.

Attitudes: This has to do with developing attitudes of appreciation and concern for the environment. Education see attitude change with time and experience which is mostly acquired through informal and non-formal means of gaining environmental literacy.

Skills: It could be considered to be a practical exercise with the orientation towards a future career or development.

Action: This is the aspect of environmental literacy programme aimed at developing the capacity for action and participation (Five essential campaign for environmental literacy.www.fundee.org>facts>envlit>compo...). In the same vein, Erdogan, Kostova & Marlonkowski, (2009) outlined the following as the six main components of environmental literacy:

- i. **Ecological knowledge:** This component has to do with knowledge and understanding of major ecological concepts, principles and theories as well as knowledge and understanding of how natural systems work and how they interact with social systems
- ii. **Socio-political knowledge:** This includes an understanding of the relationship between beliefs, political systems and environmental values of various cultures. Social political knowledge also includes an understanding of how human cultural activities such as religious, economic, political, social and others influence the environment from an ecological perspective. This also includes knowledge related to citizen participation in

issue resolution. It is often referred to as cultural literacy which is made up of environmental action strategies.

- iii. **Knowledge of environmental issues:** This includes an understanding of environmental problems/issues caused as a result of human interaction with the environment. It also includes knowledge and understanding which is related to alternative solutions to issues and to major sources of environmental information.
- iv. **Affective skills:** This refers to factors within individuals which allow them to reflect on the environmental problems/issues at the interpersonal levels and to act on them if they judge that the issue/problem warrant action. Affective skill is expressed in the intention to act.
- v. **Cognitive skills:** These are those abilities required to analyse, synthesize and evaluate information about environmental problems/issues and to evaluate a selected problems/issues on the basis of evidence and personal values. It also includes those abilities necessary for selecting appropriate environmental action strategies and for creating, evaluating and implementing an action plan. It is the action competence that is the major constituent of functional environmental literacy.
- vi. **Environmentally responsive behaviours:** This includes active and considered participation aimed at solving problems and resolving issues. Categories of environmentally responsible actions are persuasion, economic and consumer action, eco-management, political and legal action (Volk & Mcbeth cited in Erdogan et al. (2009) accompanied by strong conviction of personal commitment and responsibility.
- vii. **Additional determinants of environmentally responsive behaviour** according to Erdogan et al., (2009) include locus of control and assumption of personal responsibility

Necessity of Environmental Literacy education

Following the above definitions, we can see the necessity of environmental literacy education; that

- it will enable or empower the individual to relate sustainably with the environment, take appropriate action to maintain, restore or improve environmental system and make environmental decisions which will benefit or work for the quality of the environment and that of human life. This will make it possible for man to have the knowledge, skills and the way withal to cope and contribute sustainably to the development of the environment.
- Environmental literacy provides awareness about the environment to the individual, gives him opportunity to act on issues that benefit the entire ecosystem and takes up the fight for the sustainable dealings with the environment as well as making decisions on issues that bother about the improvement of the environment at all levels.

In this light, Disinger and Roth cited in Loubser, Swanepoel, Chacko, (2001), declare that the creation of environmentally literate citizenry is an important aim of environmental education. They also stated that

- Environmental literacy is a prerequisite to maintain and improve the quality of the environment. Therefore, the necessity can only be led on citizens who are competent to take action on critical environmental issues and this can only be possible if the citizens are knowledgeable about the environment they interact with.
- With the acquisition of environmental literacy, it is believed that adult population will develop an awareness and sensitivity to the environment thereby helping them to understand how the environment functions; how people interact with it; how environmental issues and problems arise and how they can be solved. Without the knowledge of environmental literacy, they (the individual citizens) may not be able to proudly leave or pass on a legacy for the generations yet unborn.
- Roth, (1992) sees environmental literacy as essentially the capacity to perceive and interpret the relative health of the environmental system and to take appropriate action to maintain, restore or improve the health of those systems; and also as a crucial step to take if citizens are to make sound decisions to improve the quality of life and the quality of the environment.
- He also noted that stewardship of our environment requires knowledge, attitudes and skills which are based on a commitment to shape the world in which lives exist through thoughtful and active participation. This means that, the individual must understand that whatever action taken on the environment, has a precautionary effect on the entire global ecosystem.

Characteristics of an Environmentally-Literate Person

It might be difficult to define environmental literacy since people with their different opinion may define it in their different perspectives. But the description of an environmentally literate person may help for the understanding of what is expected of an environmentally literate society. It could be suggested that an environmentally literate person should:

- Have a sound knowledge about the environment (Harvey; Hurry; Roth; Subbarini, in Loubser, Swanepoel, Chacko, 2001);
- Be able to understand, appreciate and enjoy the world, to make personal choices, to contribute to his local environment and to effectively care for the planet and work to improve it (Harvey; Hurry; Roth; Subbarini, in Loubser, et al. 2001);
- Be aware of the environment and its resources, have some understanding of renewable resources; have feelings for the interrelationship in nature; be sensitive towards environmental problems; have positive attitudes and values; gather information as environmental problems arise; investigates environmental issues; finds solutions to basic environmental problems; be willing to sacrifice individual privileges; and possess basic skills and take part in active and thoughtful action (Clacherty; Hurry, cited in Loubser, et.al. 2001); and
- Explore how culture, social and political organisations and the stage of development of groups of people contribute to environmental effects; explore ethical issues involved in environmental protection and management; and explore decision making on environmental issues in scientific, economic, legal, social, and political context

(Nickerson, 1992 cited in Loubser, et al. 2001). This group of persons called environmentally-literate persons may be identified as we look through their environmental literacy level to know who is actually qualified to be called environmentally-literate in the guidelines below:

Level of Environmental Literacy

It might be easy in a way to say that somebody has some awareness and an understanding of the basic relationship in the environment but might also be dangerous to assume that an individual is either totally literate or illiterate about environmental issues. Therefore, looking at the levels of environmental literacy, we will be able to distinguish between someone who is totally ignorant or unaware and that who has deep, thorough understanding and concern about the environment. These levels shall be distinguished according to Roth (1992) by observable behaviours; and by this one will be able to relate with people according to their individual level of environmental literacy (from zero to very high expectation). This is functionally divided into three working levels such as; nominal, functional and operational.

Nominal Level of Environmental Literacy

This level shows that the individual is able to recognise many of the basic terms used in communicating about the environment and is able to provide rough, if not unsophisticated, working definitions of their meanings. Individuals on this level can only be seen developing an awareness and sensitivity towards the environment for the nature and magnitude of human impacts on them (Disinger & Roth, 1992; Roth, 1992) On this level the individual is at the surface of what environmental awareness is, the person is not in any way committed to the issues of the environment; at this level, he is carefree about what he does or what happens to the environment. Individuals in this context, close their ears against the fight against the effects of their activities which cause climate change. They litter the environment without any remorse; clear-clean the forest without any feeling of concern and many other acts of degradation and devastation.

Functional Level of Environmental Literacy

This shows a person who has a broader knowledge and understanding of the nature of relationships and interactions that exist between human, social system and other natural systems. They are aware and concerned about the negative interactions between these systems in terms of at least one or more issues and have developed the skills to analyse, synthesise, and evaluate information about them using primary and secondary sources. They evaluate a selected problem on the basis of sound evidence, personal values and ethics. They communicate their findings and feelings to others. On issues of particular concern to them, they may observe a personal investment and motivation to work towards remediation using their knowledge of basic strategies for initiating and implementing social and technological change (Disinger & Roth, 1992; Roth, 1992). Here, the individual is totally committed to the extent of being able to identify the problem, analyse, synthesise and evaluate and communicate to others with a bid to changing the behaviour of others in respect of the fight to solve or curb the existing crisis.

Operational Level of Environmental Literacy

The individual at this level has moved beyond functional literacy in both the breadth and depth of understandings and skills which routinely evaluate the impacts and consequences of actions,

gathering and synthesising pertinent information, choosing between alternatives and advocating action, positions and taking actions that work to sustain or enhance a healthy environment. People at the operational level also demonstrate a strong, on-going sense of investment in and responsibility for preventing or remediating environmental degradation, both personally and collectively and are likely to be acting at several levels from local to global in so doing. They are routinely engaged in dealing with the world at large (Disinger & Roth, 1992; Roth, 1992). This is to say the individual can go any length to fight for the sustainability of the environment without minding the risk involved.

Environmental Literacy Education for Curbing the Effect of Climate Change

When the adult population becomes aware of environmental issues like climate change, their orientation about the environment will change. Their understanding about issues such as climate change and its effect, and other environmental challenges will not be attributed to some superstitious things. For instance, the environmental mishap like the recent flood in some parts of Nigeria was attributed by some people to the end of the world, the gods are angry and so on; not knowing that it was the resultant effect of human induced impacts on the physical environment. A number of prominent scientists claim that CO₂ emissions have already caused global warming and must be severely curtailed to prevent future climate catastrophe (Ray, 2006).

Carbon dioxide (CO₂) is necessary for the survival of plants in our environment, to curb the effect of climate change; it means we all need to pick up with Penn cited in Cummingham & Cummingham, (2010) who said that for every four acres of land cleared for any purpose, one acre of trees should be planted to enable the absorption of carbon dioxide emitted into the environment. Muir, Leopold, Maathai, cited in Cummingham & Cummingham, (2010) and many other environmentalists had fought for the sustainable environment in their different ways all to save the environment from the effect of climate change. It must be understood that, once the climate change issue sets in, it rather comes to stay (constant). The excess exposure of life to carbon-dioxide is dangerous to life so the implementation of decarbonisation policy is very necessary (Ray, 2006).

Factors that Facilitate Changes in Human's Behaviour towards the Environment

There are many factors that can facilitate the changes in human as it could affect their activities, behaviour, attitudes and sensitivity towards the environment. These are:

1. **Staying informed about climate change.** This attitude could be facilitated by the knowledge they have; which environmental literacy at the nominal level can afford them. This can also be hastened through the use of cloud computing resource which allows them access what effect climate change is causing or creating in other parts of the world.
2. **Supporting efforts to slow the progress of climate change on the earth.** This is in line with Roth's idea of the benefit of environmental literacy which means that when an individual is aware and has the knowledge of the basic terms used in the environment, and has a broader knowledge of the happenings in the environment, his attitude towards the environment will change. He will at the same time seek to support the fight against environmental issues like climate change which has come in as a cankerworm to affect the environment the world over.

- 3. Taking action on climate change.** Such actions that could range from monitoring the production of waste, management of waste, pollution control, greenhouse gases and many more could bring about economic development, growth and job creation (Ray, 2006). Environmental literacy according to Roth, (1992) sees an individual at this level as being able to take action on environmental issues at the operational level of environmental literacy.

Way Forward for Protection against the effect of Climate Change

Since the environment is already saturated with the greenhouse gases, there is need to take other measures by taking care or building a blanket of protection around the habitat of the earth to avoid more catastrophes through the following means:

- 1. Adapting to such changes:** This is a process whereby the societies make themselves better able to cope with an uncertain future. This has to do with taking the appropriate measures to mitigate/reduce the negative effects of climate change. This is a better option because it is necessary to know that the issue of climate change has come to stay so the best way to handle it is to adapt to the changes; and
- 2. Taking action to minimise the negative impacts of climate change and taking advantage of new opportunities that may arise.**

The adaption measures that would be suitable would depend on the type of impact of climate change the individual, group, community or the entire society experiences. The level or capacity of the adaption step taken will determine the attack of the climate change on the environment, economy and the social life of the people involved. For instance, a community that has always fallen victim of flood or erosion, which are evidences of climate change should not sit and fold its hands or continue to do the same thing over and over again and expect a different result. Such affected individuals or groups should rise up and make enquiry to find out what people who have had such experiences have done to escape the danger. Example of this could be that those who are vulnerable to flood should open drainages around them; reconstruct roads with better drainages and stop building along water ways to prevent reoccurrence of the effect of climate change.

Conclusion

The whole essence of climate change is bothered on man's unsustainable exploration and exploitation of the environment resources. It therefore behoves that man who has aggressively interacted with the environment through rapid industrialisation, agriculture, emission of carbon dioxide, and other toxic gases be educated through environmental education. This is in order to acquire environmental literacy as to enable him develop such knowledge that would move him to the operational level of environmental literacy that fight for the welfare of the environment. Having discovered that the impact of climate change has come to stay, this paper encourages individuals, groups and the entire society of Nigeria to learn to adapt with measures that can reduce the effect of climate change on the entire ecosystem. This means that for example, those who are vulnerable to flood, should open drainages around them, reconstruct roads with better drainages and stop building along water ways to prevent reoccurrence of the effects of climate change.

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