

## The Use of Discussion Method in Teaching Climate Change Using Greenhouse Effect, Global Warming and Ozone Layer Depletion to Students in the Tertiary Institutions

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**ABSTRACT:** *Climate change is a very devastating change that is sweeping across the globe. It includes among others, effect on environmental and other areas such as the teaching and learning environment and must be checked as quickly as possible so that education will not seriously be hindered. A society cannot survive if its natural resources are rendered unfit for use. The only hope of salvaging their grave situation is by making the young aware that they need to proactively begin to protect their environment. This paper examined the effects of global warming, green house and ozone layer depletion. It also highlighted a strategy that is suitable in teaching some environmental concepts. It is certain that; climate models that project future conditions shows that global warming will continue if emissions of great trapping gases continue to increase. As a result of this, changing distribution of plants and animals population size, growth rate, timing of planting, flowering and timing of animal migration is necessary. This paper recommends that environmental studies should be taught to the students to alleviate the destruction of the ecosystem and create environmental awareness among learners to know the consequences of their action in the environment.*

**Keywords:** *Climate change, Greenhouse effect, Global warming, Ozone layer Depletion, Environment*

### I. INTRODUCTION

There is a scientific consensus that climate change is occurring. Many people generally begin to realize that there is the problem of the gradual rise in temperature of the earth's atmosphere. This climate change has resulted to a number of environmental problems arising from greenhouse effect global warming. The impact of these has been found to be devastating not only to the ecosystem, but also to the human community. Pertinent fact in the recent development in climate is mostly caused by misuse of the environment resulting from human actions. While there are concerns about automobile and motorcycles emissions in the mega cities, the impact of climate change on catchments scale poses major challenges to water resources management [1].

Climate change effects could include changes in abundance, distributions and change in tropics relationships, reproductive success and ultimately survival. The Environmental Protection Agency (EPA) of United States public health and welfare of the America people. These gases, they said, contribute to climate change, which is causing more heat waves, drought and flooding and is threatening food and water supplies [2].

A society cannot survive if its natural resources are rendered unfit for use. The only hope of salvaging their grave situations is by making the young aware that they need to proactively begin to protect their environment. This can only be realized through teaching of Environmental chemistry as it plays a significant role in the lives of individuals and the development of a nation scientifically and technologically [3].

## II. CLARIFICATION OF CONCEPTS

### 2.1 Climate Change

Climate change is a significant and lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. It may be change in average weather conditions, as in the distribution of weather around the average conditions. i.e more or fewer extreme weather events [2].

It also means a change in climate that persists over a sustained period of time. Climate change is occurring, is caused largely by human activities, and poses significant risk for a broad range of human and natural systems. Human activities largely determine the evolution of the earth's climate, which not only impact the next few decades, but the coming centuries and millennia. It is important to make long-term climate stabilization through improving understanding of the causes and consequences of climate change and expanding the options available to limit the magnitude of climate change [4].

### 2.2 Green House Effect

Light from the sun is absorbed by the earth's surface and a good part of this is later re-emitted as longer wavelength infrared radiation. By this, the earth's temperature does not rise too much to be unbearable. Some gases in the earth's atmosphere, notably water vapour and carbon dioxide however have the ability to absorb the outgoing infrared radiation converting it to heat. The result of this is a higher atmospheric temperature than would be the case in the absence of these gases. This phenomenon has become known as the Green House Effect, in an obvious reference to what happens in a green House used in plant nursery. The gases that absorb IR radiation and bring about temperature enhancement are therefore appropriately called Green house gases. It should be born in mind that without CO<sub>2</sub> and water vapour, the earth's mean temperature would have been -18<sup>0c</sup> instead of 17<sup>0c</sup> [4].

In recent times, there has become serious concern about the high rise of CO<sub>2</sub> emission which would, no doubt exacerbate global warming. Added to this, there are other green house gases liberated into the atmosphere by activities of man. (TABLE 1).

**Table 1: Selection of Some Important Green House Gases**

GAS	1990 concentration	Concentration increases	Green house efficiency	Atmospheric residence times (years)
CO <sub>2</sub>	350 ppm	0.3	1	120
CH <sub>4</sub>	1.68 ppm	0.8	25	7-10
N <sub>2</sub> O	340 ppm	0.2	250	150
O <sub>3</sub>	40 ppb	Small positive trend	3000	0.4
CfCl <sub>3</sub> (cfc-11)	226 ppt	4	17500	75
Cf <sub>2</sub> Cl <sub>2</sub> (cfc-12)	Ppt	4	20000	120
CH <sub>3</sub> CCl <sub>3</sub>	125 ppt	7	2500	5.5-10
CCl <sub>4</sub>	75-100 ppt	1	12500	50

Key ppm = parts of gas per million parts of air

ppt= parts of gas per thousand parts of air

ppb = parts of gas per billion parts of air

In TABLE 1 above, I have highlighted some of the major anthropogenic greenhouse gases and their properties. A number of disturbing revelations is evident in the table: Carbon dioxide is by far the most abundant of all these gases though the other gases may be more efficient heat-absorbers than CO<sub>2</sub>. Finally, it is seen that some have very long atmospheric residence times, so that were all emissions to stop now, we would have to grapple with the greenhouse problem for decades; perhaps centuries.

Greenhouse has been viewed as the problem emanating from the gradual rise in temperature of the earth's atmosphere caused by the increase of greenhouse gases such as carbon dioxide, methane, nitrous oxide, water vapour, and CFC in the air surrounding the earth which trap the heat of the sun. Generally, the greenhouse effect is a natural process. The greenhouse gases generally absorb and reflect some of the earth's outgoing radiation cause the surface of the earth and lower temperature to be warm enough to sustain life. However, as a result of higher concentration of greenhouse gases in the earth's atmosphere due to human activities, there will be an enhanced/increased trapping of infrared. Thus, the enhanced greenhouse effect is additional to the natural greenhouse effect and this changes the makeup of the atmosphere. The enhanced greenhouse effect is often referred to as global warming [4].

### 2.3 Global Warming

There may be alteration in precipitation patterns (rains etc), an increased severity of storms, dislocation of suitable flood plains for agriculture, dislocation and possible extinction of certain biological species as well as ecosystems. The thermal expansion of the oceans, the melting of glaciers and polar ice caps would lead to rise in sea level. This would swallow coastal areas, including many cities such as Lagos, London, New York, Glasgow, Amsterdam, Tokyo, Colombo, etc. that lie on the seashore.

Global warming according to [5] is a natural or human increase in the average global temperature of the atmosphere near the earth's surface.

On the broader sense the rate at which energy is received from the sun and the rate at which is lost to the space determine the equilibrium temperature and climate of the earth. This energy is distributed around the globe, by winds, ocean currents and other mechanisms to affect the climate of different regions [3].

This increase in temperature of the earth's atmosphere, oceans, and landmasses are mostly due to human activities. This include methane, nitrous oxide and chlorofluorocarbons (CFCs) used in refrigerants and foam blowers and aerosols. It is important to note that natural greenhouse gases are carbon dioxide and water vapour. It is estimated that over the next century there would be a raise of about 30<sup>0</sup>C. Global warming is caused by the emission of heat trapping gases more especially carbon dioxide product by vehicle, power plants, industrial processes and deforestation. As these gases build up, they act like a big blanket overheating the planet and threatening our health, our economy and our environment [3].

### 2.4 Ozone Layer Depletion

Ozone depletion has been happening since the late 1970's. It is found that certain processes and consumer products, as a result of human activities, result in the atmosphere containing ozone-depletion gases. These gases contain chlorine and bromine atoms which are harmful to the ozone layer. Important examples are the chlorofluorocarbons (CFCs) and hydrochloride or fluorocarbons (HCFCs). These are human produced gases once used in refrigeration and air conditioning systems. These gases eventually react where they are broken part to release ozone-depletion chlorine atoms. In addition, halogens which are used in fire extinguishers and methyl bromine. Once in the atmosphere, these chemicals destroy the ozone layer which stops the sun's harmful ultraviolet radiation from reaching us.

### 2.5 Remediation Measures

The main sources of the greenhouse gases shown in TABLE 1 include fossil fuel combustion, deforestation and respiration for CO<sub>2</sub>, wetlands, rice paddies, enteric fermentation for CH<sub>4</sub>; natural soils, cultivated and fertilized soils for N<sub>2</sub>O and photochemical stratospheric reactions for ozone. As for the CFCs and the culprits are manufacture of foams, aerosol propellants and refrigeration and air conditioning. They are also extensively used as inert solvents. It is obvious that there are some of the causes we can hardly do anything about. Where we can, much effort has been done, for example in CO<sub>2</sub> vehicular emission. Car exhaust gases emission are trapped by fixing substances that can

absorb the gas, chimneys are provided with scrubbers that dissolve the gas before discharge into the atmosphere. There have been legislations against the use of CFCs in the West, and other countries are signing in.

### III. DISCUSSION METHOD

It is one of the methods of teaching science. It is a method of instruction which give students an opportunity to express their own views or opinions orally on certain issues. It is a method which encourages students' activity. The discussion could be between students as well as between the lecturer and the students. It is student-centered and it is based on the philosophy that "knowledge arises within the person and not from any external source". One person speaks at a time, while others listen. It involves sharing of ideas and experiences, solving problems and promoting tolerance with understanding [6].

Discussion implies talking over subjects from various points of view and the lecturer's role is not to dispense or communicate knowledge but to act as facilitator/moderator. Students' interaction is very high during a discussion. It is the process of free interchanging knowledge between members of a group. The implication in that every participant is equipped with skill, information and knowledge to participate effectively in the discussion [7].

Discussion method stimulates critical thinking. As you establish a rapport with your students, you can demonstrate that you appreciate their contributions at the same time that you challenge them to think more deeply and to articulate their ideas more clearly. Frequent questions, whether asked by you or by the students; provide a means of measuring learning and exploring in-depth the key concepts of the course.

The following strategies should be used when employing discussion method to teach the students.

- Small group discussion: It is better than a whole class discussion because it encourages more students to give their own views through open participation. The size will depend on the time and sensitivity and complexity of the subject. Each group selects a rapporteur to summarize its objectives.
- Whole group discussion: An instructor will stand before a class and present information for the students but the students will also participate by answering questions and providing examples. It provides for greater interaction between lecturer and students and therefore facilitates learning [8].

Some of the things to consider in order to have a successful lesson using the discussion method are;

- Create a comfortable, non-threatening environment.
- Clarify the rules and expectations for discussion at the onset.
- Communicate to students the importance of discussion to their success in the whole course.
- Carefully select questions during lesson planning. Discussion method being students-centered should be brought to the students.
- As discussion must necessarily start with a question, you must avoid vague questions if you expect a reasonable response from the students. The questions should be of sufficient depth to require such critical thinking that is essential to study of science.
- You should be of good moderator. Don't allow few students to dominate the discussion but you should be able to keep the conversation moving throughout the lesson.
- Encourage students to ask questions. When a question asked by a student, throw it back class, encourage further class discussion.
- Summarize frequently in order to guide students towards understanding the main concepts and principles of science subsumed in the topic under discussion.

<http://www.princeton.edu/mcgraw/library/sat-tipsheets/science-engineering>)

### 3.1 Present and Future Challenges of Climate Change

- While land fixed in spaces, the climate is not. Many of the places being protected are selected because they provide the proper habitat and climate for unique and important plants and animals. Unfortunately, with global warming, these places may no longer have the climate for the species and communities that were the reason underlying their selection [4].
- Human communities are at the risk of survival. Evidence has the danger posed by global warming. Villages and cities along coastline are literally crumbling into the sea. As the earth's atmosphere gets warm, the upper layer of the ocean will become warm.
- Change in climate resulting in movement of climate zones several kilometers towards the poles causing serious disruption of ecosystems (leading to loss of biodiversity), agriculture and food production. Climate change is manifested in drought, increased rainfall and storms. Acceleration/rise of sea level caused by melting ice at the poles, which will result in submergence of coastlines and its attendant problems [9].
- Research shows that world has now become hotter than anytime during that past one thousand years and further researches by scientific experts have shown that heat trapping emission from human activities has caused most of the global warming observed.
- Projection suggests a reduction in rainfall in the subtropics, and an increase in precipitation in sub-polar latitude and some equatorial regions. In other words, regions which are dry at present will in general become even drier, while regions that are currently wet in general become even wetter [10].
- Climate models that project future conditions shows that global warming will continue if emission of heat trapping gases continues to increase. As a result of this changing distribution of plants and animal population size, growth rate, timing of planting, flowering and timing of animal migration.
- Future climate change will likely be associated with more hot days and fewer very cold days. The frequent, length and intensity of heat waves will very likely increase over most land area [10].
- Climate change is projected to have a number of effects on the oceans, ongoing effects include rising sea levels due to thermal expansion and melting of glaciers and ice sheets, leading to increased temperature stratification [11].

## IV. CONCLUSION

Presently, the earth's surface is witnessing a high increase in temperature as a result of human activities which has released enough CO<sub>2</sub> into the atmosphere. It is pertinent to note that, the earth layer which protects all life from the sun's harmful radiation is being depleted due to increase amount of air pollutants as a result of human activities. This would definitely have adverse effect on our health, economy and environment.

It is believed that when activity-based instructional strategy such as discussion method is used in the lecturing of science, particularly environmental concepts there will be meaningful and effective learning. Thus environmental issues are global issues demanding international cooperation. The teaching of these concepts will go a long way in changing the perception of the students and developing positive attitudes in them on how best to manage the resources in the environment without posing any threat to the ecosystem.

## V. RECOMMENDATIONS

- It is highly recommended to Lecturers the use of instructional strategies that are activity-based and encourages students' participation such as discussion method in teaching scientific concepts as it leads to quality learning.
- Government and other environmental agencies should create environmental awareness among the learners to know the consequences of their action on the environment.
- At national and international, programmes should be organized on the negative effects of some human activities in industrialization, urbanization, use of different forms of fossils fuels, intensive agriculture etc.
- Environmental studies should be incorporated into tertiary institutions science curriculum or be taught as a subject to the students.
- Projections of future climate change suggest further global warming, sea level rise, and an increase in the frequency and severity of some extreme weather events.

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