



ENVIRONMENTAL AWARENESS OF TECHNICAL COLLEGE STUDENTS OF ENUGU STATE FOR MITIGATING OZONE LAYER DEPLETION, GLOBAL WARMING AND THEIR EFFECTS.

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Abstract

The study aimed at determining the level of environmental awareness of Technical College Students in Enugu State of Nigeria, with a view to mitigating ozone layer depletion, global warming and their effects. Two research questions guided the study. Mean scores and standard deviations were used to answer the research questions. Two null hypotheses were formulated to test the level of significance in the mean responses of males and females within 0.05 level of significance. A survey research method was used. A structured 20-item questionnaire was the instrument used for the collection of data. The instrument was validated by two experts from Environmental Sciences and an expert in Measurement and Evaluation from Enugu State University of Science and Technology, ESUT. The reliability of the instrument was determined using test-retest method while Cronbach Alpha was used to establish a reliability coefficient of the instrument as 0.89. 0.89 was considered high enough, according to Griethuijsen, Eijck, Haste, Brok, Skinner, Mansour et al (2014). The entire population for the study comprised 1761 technical college students but purposively, 587 final year students of the Technical Colleges in Enugu State were the respondents. The result showed that most of the were not aware of the effects ozone layer depletion and global warming have on the environment. The null hypotheses tested indicated that no significant difference existed between the male and female Technical College students' mean scores in Enugu State. It is therefore not a gender issue. Following the level of ignorance among the students, the researcher recommended the formation of the Young Friends of the Environment Club (YFEC) in Technical Colleges in Enugu State. In future they may eventually grow to contribute in protecting the Environment thereby mitigating the ozone layer depletion and global warming.

Keywords

Awareness, Ozone Layer, Global Warming, Depletion Mitigating, Environment.

Introduction

Humanity has been facing environmental challenges, these include, atmospheric challenges. The spate of industrialization and economic activities which release such emissions to the atmosphere that are not human friendly is still on the increase. This development is a source of concern to the friends of the environment. This study therefore considered the ozone layer depletion, Global warming, their effects on the environment and mitigation of such effects; as well as the level of awareness of the Technical College students about

such climate issues. There are several situations where human activities have significant effects on the environment. Ozone layer damage is one of them (Harekrushna, 2015).

The Ozone layer, more than 12 miles up in the atmosphere is formed and heated by high energy ultraviolet radiation from the sun (Vingarzan, 2004). When the amount of Ozone is reduced (depleted), more of this sun-burning cancer-causing radiation reaches the Earth, cooling the Ozone layer and warming the Earth (Ward, 2010). The ultraviolet energy is 48 times hotter, 48 times more energetic

than infrared radiation absorbed by greenhouse gases (Ward, 2010). Ozone depletion began increasing in the early 1970s caused by increasing use of human manufactured Chlorofluorocarbons (CFCs). CFCs at that time were becoming widely used as refrigerants, solvents and spray-can propellants. When these gases reach the Ozone layer they are broken down by ultraviolet radiation, releasing Chlorine atoms that deplete Ozone. Global temperature began to rise (IPCC, 2013).

Ozone is also depleted by volcanic eruptions emitting Chlorine and Bromine, Effusive basaltic volcanic eruptions, typical in Hawaii and Iceland, cause global warming. One of the main reasons for the widespread concern about depletion of the Ozone layer is the anticipated increase in the amounts of ultraviolet radiation received at the surface of the earth and the effect of this on human health and on the environment (Sivasakthivel & SivaKumarReddy, 2011). The prospects of Ozone recovery remain uncertain. It is pertinent to know that Ozone layer is a layer in Earth's atmosphere which contains relatively high concentrations of Ozone (O_3). If the ultraviolet radiation from the sun strikes molecules of Oxygen (O_2) and causes the two atoms to split apart, hence a freed atom pumps into another O_2 to form O_3 (IPCC, 2014).

This process is known as photolysis. This layer absorbs 93 – 97% of the sun's high frequency ultraviolet (UV) light, which is potentially damaging to life on earth, Albrtton, 1998 in (Sivasakthivel & SivakumarReddy, 2011).

The Ozone layer is mainly located in the lower portion of the stratosphere from approximately 10 km to 50 km above Earth, though the thickness varies seasonally and geographically, Allied Signal Corporation in (Sivasakthivel & SivaKumarReddy, 2011). The Ozone layer was discovered in 1913 by the French Physicists Charles Fabry and Henri Buisson. Its properties were explored in detail by the British Meteorologist G. M. B. Dobson, who developed a simple spectrophotometer (the Dobson meter) that could be used to measure stratospheric Ozone from the ground. Between, 1928 and 1958 Dobson established a worldwide network of Ozone monitoring stations which continues to operate today (IPCC, 2013).

The amount of the Ozone within the stratosphere varies according to altitude. Ozone concentrations are highest between 19 and 23 km (Intergovernmental Panel on Climate Change IPCC, 2013). Most of the Ozone in the stratosphere is

formed over the equator where the level of sunshine striking the earth is greatest. It is transported by winds towards higher latitudes. Under normal circumstances highest Ozone values are found over the Canadian Arctic and Siberia, whilst the lowest values are found around the equator which is around Ghana. In November 2009, Ozone hole was discovered waning with much of the continent experiencing a stratospheric Spring Warming (NASA, 2013).

Ozone is simply a triatomic form of Oxygen (O_3), found in the Earth's atmosphere. Ozone depleting substances (ODS) are relatively stable in the lower atmosphere of the Earth but in the stratosphere they are exposed to ultraviolet radiation and thus they breakdown to release a free Chlorine atom. This free Chlorine atom reacts with an Ozone molecule (O_3) and forms Chlorine monoxide (ClO) and a molecule of Oxygen (O_2) = $ClO + O_2$. Further, ClO reacts with an Ozone molecule (O_3) to form a Chlorine atom (Cl_2) and two molecules of Oxygen ($2O_2$). The free Chlorine molecule again reacts with Ozone molecule (O_3) to form Chlorine Monoxide. This process continues and this results in the depletion of the Ozone layer (Help Save Nature, 2017). A single Chlorine atom would keep on destroying Ozone (thus a catalyst) for up to two years. This time scale equivalents the time for transport backdown to the troposphere. Were it not for reactions that remove the Chlorine atoms from this cycle by forming reservoir species such as Hydrogen Chloride (HCl) and Chlorine Nitrate (ClNO₂) the process could continue ad infinitum.

On per atom basis, Bromine is even more reactive than Chlorine at destroying Ozone but there is much less Bromine in the atmosphere at present. As a result, both Chlorine and Bromine contribute significantly to overall Ozone depletion. On the average, a single Chlorine atom is able to react with 100,000 Ozone molecules before it is removed from the catalytic cycle (Encyclopedia of Earth, 2011 & National Oceanic and Atmospheric Administration, 2010). The ultraviolet radiation which under normal conditions are absorbed by the Ozone to provide a stable ontological structure in the biosphere are distorted by the various anthropogenic activities of man such as the emissions of CFCs, HCFCs and other organ-halogens which lead to the depletion of the Ozones (Anjali, Reeta, Neeti, Deep, Rishi, Sonal, Kameshwar, Kuldeep, Amit & Brijesh, 2013). The prospects of Ozone recovery remain uncertain (Eze, 2005).

Another major cause of large scale Ozone

depletion is Rocket launches. It has been studied that unregulated rocket launches can result in much more Ozone depletion than CFCs. It is estimated that if rocket launches will be left unregulated, it would cause huge Ozone loss by the year 2050 than the CFCs have done Sivasakthivel & Reddy, 2011 in (Anwar, Chaudhery, Nazeer, Zaman and Azam, 2016).

Similarly, Nitrogenous compounds emitted by human activities in small amounts like NO, N₂O and NO₂ are considered to be greatly responsible for the depletion of Ozone layer (Ravishankara, Daniel and Portmann, 2009) in (Anwar, et al, 2016). Short exposure to ultraviolet – B radiations there would be cryptic transposable elements which may lead towards the mutations which is more dangerous than the immediate DNA damage (Shindell, Rind and Lonergan, 1998) in (Anwar et al, 2016). Ozone layer is continuously depleting which is highly alarming situation today (Anwar et al, 2016). The Ozone layer depletion affects the overall temperature of the earth's atmosphere. This temperature change is generally attributed to the greenhouse effect caused by increased levels of Carbon dioxide, CFCs, and other pollutants.

Technical Colleges are institutions where craftsmen and women are trained in various trades. For instance, trades like Air conditioning and Refrigeration are studied in Technical colleges. Some compressors used in Air conditioners and Refrigerators still use CFCs which has been outlawed (IPCC, 2014). Automobile Craft Practice is also studied in Technical Colleges. Spray-cans like injector cleaners, anticorrosive sprays as well as condemned engine, gear, and transmission oils amongst others are also used by Automobile craftsmen. Machining craft study students used different categories of soluble oils which if not properly disposed could cause environmental degradation. There are internationally prescribed means of disposing such pollutants. Woodworkers are also trained in the Technical Colleges. Continued felling of trees and sowing them into timbers lead to deforestation. Woodwork craftsmen should therefore be advocates of aforestation. The extent of the Technical College students awareness of the causes and effects of all these environmental issues on the society constituted the problem of this study.

Theoretical Framework: There are several theories that explain the climate change phenomena including, the Milankovitch theory which describes the relationship between the sun and the earth as well as the Astronomical theory. This theory was

propounded by a young Serbian Mathematician, Milutin Milankovitch in 1911. Milankovitch hypothesized the long-term, collective effects of changes in Earth's position relative to the Sun are a strong driver of Earth's long-term climate and are responsible for triggering the beginning and end of glaciations periods (Ice Ages) (National Oceanic and Atmospheric Administration, NOAA 2010). The theory emphasizes that the warming will not be globally uniform but will differ significantly between geographical regions. In addition the warming may vary between seasons. As a result, the altered temperature gradients will change the pattern of winds and precipitation distribution regionally.

Although, the exact mechanism that cause Ozone degradation over Antarctica are not fully understood, there are numerous hypothesis including thinning due to forms of Nitrogen Oxide (NO₂), Chlorofluorocarbons (CFCs) and atmospheric dynamics. Scientists have learned that stratospheric Ozone can be decreased by any process that can lead to increased stratospheric amounts of Ozone-destroying catalyst (such as Oxides of Nitrogen, Chlorine, Hydrogen or Bromine). Two graphic examples show this volatility: one molecule of nitric oxide can destroy tens of thousands of Ozone molecules per day. Similarly, one Chlorine atom can destroy almost one hundred Ozone molecules per second (Taubes and Chen 1987) in Garfield, 1988).

Increased penetration of solar ultraviolet-B radiation is likely to have profound impact on human health with potential risks of eye diseases, skin cancer and infectious diseases. UV radiation is known to damage the cornea and lens of the eye. Chronic exposure to UV-B could lead to cataract of the cortical and posterior subcapsular forms. UV-B radiation can adversely affect the immune system causing a number of infectious diseases (Umer, 2015).

UV-B radiation affects the physiological and developmental processes of plants. In forests and grasslands increased UV-B radiation is likely to result in changes in species composition (mutation) thus altering the bio-diversity in different ecosystems.(Anjali et al, 2013).

Astronomical Theory: The theory was pioneered by two scholars – Adhemar (1797-1862) and von Humboldt (1769-1859). However, Croll gave prominence to the theory by 1864 – deducing precession, NH winter at aphelion

1867 – climatic precession, le Verrier

1867 – Obliquity

Darwin 1809 – 1882 corroborated Croll's refinement.

While more than 30% of the world's animal protein for human consumption comes from the sea alone, it is feared that increased levels of UV exposure can have adverse impacts on the productivity of aquatic systems. High level of exposure in tropics and subtropics may affect the distribution of phytoplanktons which form the foundation of aquatic food webs (Gills, 2015).

Increased solar UV radiation could affect terrestrial and aquatic bio-geochemical cycles thus altering both sources and sinks of greenhouse and important trace gases eg. Carbon dioxide (CO₂), Carbon monoxide (CO), Carbonyl Sulphide (COS) etc. Other effects of UV-B radiation include – changes in the production and decomposition of plant matter, reduction of primary production changes in the uptake and release of important atmospheric gas (Adam & Liverman, 2008)

The depletion of the Ozone layer leads on the average to an increase in ground level ultraviolet radiation because Ozone is an effective absorber of ultraviolet radiation. The sun emits radiation over a wide range of energies, with about 2% in the form of high energy, ultraviolet radiation. Some of this ultraviolet (UV - B) is especially effective in causing damage to living beings.(Harekrushna, 2015).

Similarly, reduction of stratospheric Ozone and increased penetration ultraviolet – B radiation result in higher photo-dissociation rates of key trace gases that control the Chemical reactivity of the troposphere. This can increase both production and distribution of Ozone and related oxidants such as hydrogen peroxide which are known to have adverse effects on human health, terrestrial plants and outdoor materials.(Gills, 2015).

Consequently, an increased level of solar ultraviolet radiation is known to have adverse effects on synthetic polymers, naturally occurring biopolymers and some other materials of commercial interest. Ultraviolet – B radiation accelerates the photo degradation rates of these materials thus limiting their lifetimes. Typical damages range from discoloration to loss of mechanical integrity such situations would eventually demand substitution of the affected materials by more photo stable plastics and other materials in future; eg. the unprecedented rate at which plastics expire now. This results in complex alterations to atmospheric Chemistry, the global elemental cycles such as the carbon cycle and impact

on the survival and health of all organisms on Earth, including humans (Ali, Dash, Pradhan, & Mishra, 2012).

The more conscious people are of their environment, the less tendency to exhibit actions that may undermine the environment. For instance, the learning theory propounded by Jerome Bruner (1966) was concerned with how knowledge is represented and organized through different modes of thinking (or representation). In his research on the cognitive development of children, Jerome Bruner proposed three modes of representation:

- Enactive representation (action-based).
- Iconic representation (image-based).
- Symbolic representation (language-based).

Bruner's constructivist theory suggested, it is effective when faced with new materials to follow a progression from enactive to iconic to symbolic representation; this holds true even for adult learners (McLeod, 2019). This theory implies that even the young learners of the Technical Colleges are capable of learning the environmental effects of the Ozone layer depletion and Global warming so long as the instructions are organized appropriately.

Global Warming

Global warming also referred to as climate change is the observed century-scale rise in the average temperature of the Earth's climate system and its related effects (Gills, 2015). Many of the observed changes since the 1950s are unprecedented in the instrumental temperature record (IPCC, 2014). Anticipated effects include increasing global temperatures, rising sea levels changing precipitation and expansion of deserts in the sub tropics (Joyce, 2010). Warming is expected to be greater over land than the oceans. Other likely changes include more frequent extreme weather events such as heat waves, droughts, heavy rainfalls with floods and heavy snow falls (Battisti & Naylor, 2009). Effects significant to humans include the threat to food security from decreasing crop yields and the abandonment of populated areas due to rising sea level (USA, NRC, 2008); and (Battisti & Naylor, 2019). It should be noted that the climate system has a large “inertia” and greenhouse gases will remain in the atmosphere for a long time. Many of these effects will persist for not only decades or centuries but for tens of thousands of years to come (Peter & Clark, 2016). Human activities since the Industrial Revolution has increased the amount of greenhouse gases in the atmosphere, leading to increase radioactive forcing from CO₂, Methane, tropospheric Ozone, Chlorofluorocarbons (CFCs) and

Nitrous Oxide. Coal burning was responsible for 43% of the total emissions, Oil 34%, Gas 18%, Cement 4.9% and Gas flaring 0.7% (Querre, Andre, Boden, Conway, Houghton, House, Marland, Peters, Vanderwerf, Ahlstrom, Andrw, Bopp Canadell, Ciais, Doney, Enright, Friedlingstein, Huntingford, Jani, Jourdain, Kato, Keeling, Klein, Levis, Levy, Lomas, Poulter, Raupach, Schavinger, Sitch, Stocker, Viovy, Zachle & Zeng, 2012).

Statement of the Problem

Emission of greenhouse gases have a global impact, unlike some other forms of pollution, whether they are emitted in Asia, Africa, Europe or the Americas, they rapidly disperse evenly across the globe (UNO, 2017). Many African countries which have their economies largely based on weather-sensitive agricultural production systems like Nigeria are particularly vulnerable to climate change (Dinar et al , 2006) in (Apata, 2012). Effective access to information on climate change is vital for adaptation decision making and planning with a view to planting crops that will be favourable to particular weather condition depending on the hydrologists and climatologists forecasts.

Global warming also leads to Ozone layer depletion. Due to global warming and greenhouse effects most of the heat is trapped in troposphere which is the layer below the stratosphere. Ozone is present in stratosphere so heat do not reach troposphere and it remains cold as recovery of ozone layer requires maximum sunlight and heat so it leads to depletion of ozone layer (Sivasakthivel, et al, 2011). Human activities such as arbitrary disposition of pollutants, hydrocarbons and flaring gases exacerbate the environmental degradation challenges. The potential handlers of these pollutants need to be consciously aware of the possible effects of their activities on the environment. The students of technical colleges will on graduation by practice of their crafts be advertently/inadvertently be exposed to the environmentally unfriendly pollutants. Hence the need for the students to be taught environmental practices that would mitigate the ozone layer, global warming and their effects.

Purpose of the Study

The purpose of the study was to determine the level of awareness of technical college students of Enugu State in respect of Ozone layer depletion, Global warming and their effects. Specifically, the study:

1. Identified the awareness level of the technical education students in Enugu State on Ozone layer depletion.

2. Identified the awareness level of the technical education students in Enugu State on the causative elements of global warming.

Research Questions

The following research questions were posed to guide the study:

1. What is the awareness level of the technical education students in Enugu State on Ozone layer depletion?
2. What is the awareness level of the technical education students in Enugu State on causative elements of Global warming?

Null Hypotheses (Ho):

The following null hypotheses were formulated to guide the study:

Ho₁ There is no significant difference in the mean scores on the awareness level of male and female technical education students in Enugu State on Ozone layer depletion.

Ho₂ There is no significant difference in the mean scores on the awareness level of male and female technical education students in Enugu State on causative elements of Global warming.

Methods:

Research design for the study was descriptive survey design. It was adopted in order to get the opinions of the respondents for collation, analysis and inferential interpretations without manipulation. In addition the information/opinions sought from the respondents were descriptive in nature.

The entire population of the study comprised of 1761 students of Technical Colleges in Enugu State. By purposive sampling technique, 587 final year students of the Technical Colleges were used as respondents. Purposive sampling was adopted because by final year the curriculum of the three-year technical education programme would have been near completion. The sample size was made up of 381 male students and 206 female students.

The instrument used for data collection was a 20-item structured questionnaire. It was used to elicit the level of awareness of the students on the Ozone layer depletion and Global warming vis a vis their effects.

The structured questionnaire was validated by three experts, two from Environmental Sciences. The third was an expert in measurement and evaluation. The three experts were from Enugu State University

of Science and Technology (ESUT), Enugu.

The validated instrument was subjected to reliability test of its internal consistency. A test-retest method was adopted using 30 students of Government Technical College, Abakaliki, Ebonyi State because of the state's contiguity with Enugu State. Both States (Ebonyi and Enugu) have common curriculum for technical colleges. The computation of the scores was done using Cronbach's alpha reliability coefficient method. It yielded 0.89 which indicated the instrument was internally consistent and therefore reliable for the study.

The instrument was administered using four trained research assistants. The researchers and the research assistants were assigned to the various technical colleges according to the six education zones. The questionnaire were administered to the students in their classrooms, filled out immediately and collected by the researchers or the research assistants.

The instrument filled out by the students were collected, collated and tallied appropriately. The research questions were answered using mean scores and standard deviations. Mean scores from 2.5 and above showed high level of awareness, while below 2.5 showed low level of awareness. The null hypotheses were tested using statistical tool of t-test to confirm if significant differences existed between the mean scores of the male and female students of the technical colleges.

Results:

The results of the responses are shown in tables below

Table 1

Mean scores and standard deviations of the awareness level of male and female technical college students in Enugu State on Ozone layer depletion.

| S/No | Description of items. | Mean (x) Male | Mean (x) Female | SD Male | SD Female | Remark |
|---------------------|--|------------------|--------------------|-------------|--------------|-----------|
| 1. | Ozone is a triatomic (O ₃) form of Oxygen located miles above. | 1.75 | 1.62 | 0.67 | 0.64 | LL |
| 2. | Ultraviolet radiation from the Sun heats the Ozone layer. | 1.65 | 1.64 | 0.55 | 0.61 | LL |
| 3. | Chlorofluorocarbons (CFCs) are refrigerants unfriendly to the Ozone layer. | 1.46 | 1.37 | 0.60 | 0.63 | LL |
| 4. | Chlorine atoms deplete the Ozone. | 1.78 | 1.85 | 0.60 | 0.67 | LL |
| 5. | The Ozone layer is located at the lower portion of the stratosphere. | 2.02 | 2.04 | 0.65 | 0.68 | LL |
| 6. | Rocket launches cause large scale Ozone depletion. | 1.81 | 1.71 | 0.43 | 0.47 | LL |
| 7. | The troposphere is the lowest level of the atmosphere. | 1.75 | 1.74 | 0.63 | 0.63 | LL |
| 8. | Human activities affect the atmosphere. | 1.63 | 1.71 | 0.57 | 0.45 | LL |
| 9. | Industrial activities affect the atmosphere/Ozone. | 1.98 | 2.10 | 0.49 | 0.55 | LL |
| Grand scores | | 1.75 | 1.76 | 0.57 | 0.58 | LL |

From table 1 above, the mean scores ranging from 1.37 – 2.10 were all below 2.5, including the grand means of 1.75 and 1.76 for males and females respectively. The decision rule had it that below 2.5 mean score is low level of awareness. Therefore, this is an indication that the students (both males and females) have very low level of awareness on Ozone layer depletion. All the standard deviation scores were less than a unit, which indicates that the mean scores were homogeneous which will generate a normal curve. The scores therefore were recorded by all the class rather than a small number of dull students or small outstanding brilliant ones. It follows therefore that the level of awareness of technical college students of Enugu State on Ozone

layer depletion is very low. This development calls for the inclusion of environmental education scheme of works in the technical education curriculum in Enugu State.

Null Hypotheses

Ho, There is no significant difference in the mean scores on the awareness level of male and female technical education students in Enugu State on Ozone layer depletion.

Table 2

t-test analysis of the mean scores of male and female students of technical colleges in Enugu State on the awareness level of Ozone layer depletion.

| Respondents | Mean (x) | SD | N | df | t-cal | t-crit | Dec |
|-------------|----------|------|-----|-----|-------|--------|-----|
| Males | 1.75 | 0.57 | 381 | 585 | 1.52 | 1.64 | NS |
| Females | 1.76 | 0.58 | 206 | | | | |

From table 2 above, the calculated value of t (t-cal) was 1.52 which is less than the critical table value of t (t-Crit) of 1.64 at 0.05 level of significance. Therefore, we do not reject the null hypothesis. Hence, there is no significant difference in the mean scores of male and female students of technical colleges in Enugu State on Ozone layer depletion.

Table 3

Mean scores and standard deviations of the awareness level of male and female technical college students in Enugu State on the causative elements of Global warming.

| S/No | Description of items | Mean (x) male | Mean (x) female | SD Male | SD Female | Remark |
|---------------------|---|---------------|-----------------|-------------|-------------|-----------|
| 1. | Human influence has been the dorminant cause of Global warming. | 2.18 | 2.22 | 0.67 | 0.61 | LL |
| 2. | Emission of Greenhouse gases cause Global warming. | 1.80 | 1.73 | 0.59 | 0.61 | LL |
| 3. | Carbondioxide (CO ₂) is one of the Greenhouse gases. | 1.86 | 2.19 | 0.70 | 0.68 | LL |
| 4. | Methane is a Greenhouse gas. | 2.09 | 2.05 | 0.60 | 0.74 | LL |
| 5. | In 1990 gas flaring constituted 54% of emissions into the atmosphere. | 2.22 | 1.85 | 0.73 | 0.71 | LL |
| 6. | Second largest source of carbon pollution is the transportation sector. | 1.84 | 1.50 | 0.65 | 0.61 | LL |
| 7. | Reforestation can enhance carbon sinks in order to mitigate Global warming. | 1.79 | 1.84 | 0.59 | 0.37 | LL |
| 8. | Deforestation will escalate Global warming. | 1.60 | 1.58 | 0.60 | 0.50 | LL |
| 9. | Global warming leads to Ozone layer depletion. | 1.70 | 1.67 | 0.49 | 0.52 | LL |
| 10 | Burning of garbage/solid waste contributes to environmental degradation and Global warming. | 1.64 | 1.68 | 0.51 | 0.52 | LL |
| Grand Scores | | 1.90 | 1.83 | 0.61 | 0.59 | LL |

From table 3 above, the mean scores ranging from 1.50 – 2.22 were all below 2.5, including the grand means of 1.90 and 1.83 for males and females respectively. The decision rule had it that below 2.5 mean score is low level of awareness of the causative elements of Global warming. Therefore, this is an indication that the students (both males and females) have very low level of awareness on the causative elements of Global warming. All the standard deviation scores were less than a unit, which indicates that the mean scores were homogeneous which will generate a normal curve. The scores therefore were recorded by all the class rather than a small number of dull students or small outstanding brilliant ones. It follows therefore that the level of

awareness of technical college students of Enugu State on the causative elements of Global warming is very low. This development calls for the inclusion of environmental education scheme of works in the technical education curriculum in Enugu State

Ho₂, There is no significant difference in the mean scores on the awareness level of male and female technical education students in Enugu State on causative elements of Global warming.

Table 4
t-test analysis of the mean scores of male and female students of technical colleges in Enugu State on the awareness level of the causative elements of Global warming.

| Respondents | Mean (x) | SD | N | df | t-cal | t-crit | Dec |
|-------------|----------|------|-----|-----|-------|--------|-----|
| Males | 1.90 | 0.61 | 381 | 585 | 0.04 | 1.64 | NS |
| Females | 1.83 | 0.59 | 206 | | | | |

From table 4 above, the calculated value of t (t-cal) was 0.04 which is less than the critical table value of t (t-Crit) of 1.64 at 0.05 level of significance. Therefore, we do not reject the null hypothesis. Hence, there is no significant difference in the mean scores of male and female students of technical colleges in Enugu State on the causative elements of Global warming.

Discussion of Findings

The findings showed clearly a deficit in the awareness of the technical college students of Enugu State on both Ozone layer depletion and causative elements of Global warming. This finding corroborates the position of Mabogunje 1998 which aluded that Sub-Saharan Africa suffers from some serious environmental problems including deforestation, soil erosion, desertification, wetland degradation amongst others. Mobogunje capped it by saying that efforts to deal with these problems, however, have been handicapped by a real failure to understand their nature and possible remedies. Similarly, Nan-Sinkam (1995) lamented on the magnitude of the problem of land and environmental degradation and desertification in Africa by positing that Nature can be very forgiving – though not indefinitely: persistent abuse usually leads to irreversible degradation. It is interesting to note in 2019 the World Meteorological Organization (WMO) highlighted lessons fo climate action in Africa and identifies pathways for addressing critical gaps and challenges. The report showed increasing climate change threats for human health,

food and water security as well as socio-economic development in Africa. The findings of the present research may not be peculiar to technical college students in Enugu State. The apparent environmental knowledge deficit of the students, call for pragmatic environmental education at all levels to mitigate the challenges of ozone layer depletion and Global warming.

Conclusion

The mean response scores of the respondents indicate that the level of awareness of the technical college students on Ozone layer depletion is very low. Secondly, the technical college awareness level on the causative elements of Global warming is also very low. Consequently, they may , out of ignorance be indulging in acts that would be unfriendly to the environment thereby further degrading the environment. Similarly, from the two null hypothesis analyzed and tested at 0.05 level of significance, no significant difference(s) existed in the mean scores of the male and female students of the technical colleges. Therefore, gender was inconsequential in the mean responses.

Recommendations

Following the findings of the study, the researchers recommended as follows:

1. That a proactive sensitization of the students be embarked on to make them conscious of their environment.
2. That Environmental education should be

included in the curriculum of technical education in Enugu State.

- The researchers also strongly recommend the formation of the Young Friends of the Environment Club (Y.F.E.C.) in the technical colleges in Enugu State in order to inculcate the culture of environmental friendliness.

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