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Exploring the Awareness of Chemistry Students towards Renewable Energy for Energy Conservation and Carbon (IV) Oxide Reduction in Secondary Schools in Lagos District II Environment

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Abstract

Nigeria's dependence on fossil fuels has led to a fuel crisis, making renewable energy better option. Despite rapid advancements, less attention is given to renewable energy education in developing countries like Nigeria. This study was carried out to explore the awareness of secondary school students towards renewable energy for conserving energy and carbon (iv) oxide reduction. The study used a descriptive survey design, randomly selecting six schools from three zones in Lagos District II with a population of 215 SS 2 students. Research questions were analysed using mean and standard deviation, while MANOVA was employed to test null hypothesis. The study found that the respondents are aware of renewable energy, but there is no significant contribution from secondary school chemistry students in reducing carbon dioxide and saving energy. The research suggests that renewable energy sources can serve as a reliable alternative to fossil fuels, reducing environmental impact while conserving energy.

Keyword: Awareness, Carbon (IV) Oxide (CO₂) Reduction, Chemistry Students, Energy Conservation, Renewable Energy

1. Introduction

The global discourse on sustainable development has propelled the need for comprehensive research into environmental awareness and sustainable energy practices. Nigeria, as a populous and rapid developing nation, stands at the intersection of increasing energy demands, environmental degradation, and climate change challenges. Fossil fuels have historically dominated the energy landscape, contributing significantly to carbon (iv) oxide emissions, thereby exacerbating the environmental crisis. These fossil fuels are in the form of crude oil, natural gas and coal, and they have been found to release toxic gases to the environment when combusted (Kehinde *et al.*, 2018). These gases, known as greenhouse gases (Abolhosseini *et al.*, 2014), have seriously damaging effects on the environment, one of which is the gradual, noticeable increase in global temperature, popularly termed global warming (Lu *et al.* 2020). The combustion of fossil fuels, a major contributor to carbon (IV) oxide emissions, has been identified as a primary driver of global warming and climate change (Wang *et al.*, 2016).

Global warming is not the only environmental problem caused by the combustion of fossil fuels; other environmental concerns are air pollution (Lu *et al.* 2020), acid precipitation, ozone depletion, water pollution (Adelodun *et al.*, 2021), forest destruction, and emission of radioactive substances into the environment (Dincer, 2000). Aside from these damaging effects caused by conventional sources of

energy on the environment, these sources of energy have also been found to be heading towards depletion.

Understanding how students perceive renewable energy and their willingness to contribute to sustainability efforts can provide insights into addressing these issues locally (Mochizuki & Bryan, 2015). As Nigeria grapples with these issues, it becomes imperative to investigate the awareness and perception of future stakeholders, particularly chemistry students, regarding renewable energy sources and their potential impact on energy conservation and the reduction of carbon (iv) oxide emissions. Renewable energy resources, also known as non-conventional sources of energy, are inexhaustible and constantly replenished by nature. They generate clean energy without releasing greenhouse gas emission and are continuously consumed by human (Awogbemi & Asaolu, 2008).

Nigeria, like many other developing nations, is vulnerable to the adverse effects of climate change, including extreme weather events, rising sea levels, and disruptions to agriculture (NAPA, 2011). Implementing renewable energy can reduce carbon dioxide emissions to 349 g/KWh, below the year 2030 target (Krapp and Prenzel, 2011). Furthermore, the role of education in shaping environmentally responsible attitudes and behaviours cannot be overstated. Chemistry students, as future scientists and policymakers, hold the potential to drive sustainable practices in the energy sector. Therefore, understanding their awareness and perception regarding renewable energy and carbon (iv) oxide becomes crucial for developing targeted educational interventions and policy measures. Students who do not have good knowledge of renewable energy usually do not know the impact of carbon emissions on their environment and would have negative attitudes towards environmental sustainability plans (Altuntaş and Turan, 2018).

Studies have been carried out by different scholars, such as Jamaludin, *et al.* (2023), Alawin *et al.* (2016), Assali *et al.* (2019), Karasmanaki and Tsantopoulos (2019) and Cvetković *et al.* (2024) to determine the level of awareness and perception of students towards environmental challenges. This research revealed that students have a high level of awareness of energy conservation. They hold a high knowledge level and show a positive attitude with very good energy conservation practices. Vicente-Molina *et al.* (2013) discovered that knowledge of environmental issues has a significant positive impact on individuals' engagement in pro-environmental behaviors. Contrary to the above findings, Razak *et al.* (2019) and Arshad *et al.* (2021) found out that students possessed low awareness and poor attitude toward environmental issues; therefore, it is important to educate young students about renewable energy and CO₂ reduction. This research seeks to contribute to the existing literature by providing insights into the mind set of chemistry students in Nigeria regarding renewable energy for energy conservation and carbon (iv) oxide reduction by studying their perspective and awareness. Hence, the main aim of the present study is to investigate the environmental attitudes among secondary school students and their parents. In addition, this study seeks to indicate the behaviors and daily habits of both students and parents as well as to examine whether the stimuli the students have received through education have affected their environmental behaviour.

Statement of the problem

The likelihood that chemistry students are not sufficiently aware of the environmental problems caused by emissions of carbon (iv) oxide and the pressing need for renewable energy solutions is one of the main causes for concern. The inadequate knowledge of renewable energy themes provided by the current educational system may impede the development of environmentally concerned attitudes in future professions.

Chemistry students may not be aware of the importance that renewable energy plays in reducing climate change and in Nigeria's efforts to achieve sustainable development, which could have an impact on

policy formation and technical innovation. If action is delayed, the environment may deteriorate and people may become more vulnerable to the effects of climate change. With these aforementioned problems, this study seeks to focus on exploring the awareness of Chemistry students towards renewable energy for energy conservation and carbon (iv) oxide reduction in secondary schools in Lagos district II environment

The purpose of the research is to:

- Examine the level of secondary school chemistry students' awareness of renewable energy for saving energy and reduction of carbon (iv) oxide in Lagos State.

Research Question

The question raised in this study is:

What is the level of secondary school chemistry students' awareness of renewable energy for saving energy and reduction of carbon (iv) oxide in Lagos State?

Research Hypothesis

H₀₁: There is no significant contribution of students' awareness of renewable energy to both energy conservation and reduction of carbon (iv) oxide in Lagos State.

2. Materials and Methods

The study adopted a descriptive survey design. The study was carried out in Lagos State, District II environment. The sample for the study comprised 215 senior secondary school science students in District II, Lagos State.

The researcher developed an instrument termed Secondary School Chemistry Students' Awareness of Renewable Energy for Saving Energy and Reduction of Carbon (IV) Oxide in Lagos State (SARESERC) for data collection. The instrument contains 15 items, each rated on a four-point Likert scale ranging from strongly agree, agree, strongly disagree, and disagree. The instrument was validated by experts from the Department Science Education and Educational Foundation from the Federal College of Education (Technical), Akoka, Lagos. Mean and standard deviation scores were used to answer the research question, while MANOVA was used to test the null hypothesis at the 0.05 level of significance.

3. Result and Discussion

The results of the research question show that the items were accepted based on the decision that their mean ratings were greater than $X = 2.50$ cutoff point. For the level of awareness of renewable energy, the mean value is 3.047 and the standard deviation is 0.269. For energy conservation assessment, the mean value is 3.315 and the standard deviation is 0.297. For reduction of carbon (IV) oxide assessment, the mean value is 2.925 and the standard deviation is 0.492. The findings showed that students have a positive awareness of renewable energy sources and the reduction of carbon (IV) oxide in the environment (Zyadin Anas *et al.* 2014).

Furthermore, at the 5% level of significance, using multivariate analysis (Altuntaş and Turan, 2018), the researchers make the following conjecture: there is a significant difference in chemistry student's awareness of renewable energy for energy conservation and carbon (iv) oxide reduction the in Lagos State environment, since the p-value is less than the level of significance for both dependent variables. In addition, the partial eta square (η^2) which is the same as the adjusted R^2 explained by the dependent variable, reveals that 98.1% of the variation of chemistry students' awareness of renewable energy is explained by the energy conservation assessment scale, and 96.0% of the variation of chemistry students' awareness of renewable energy is explained by the reduction of carbon (iv) oxide assessment.

3.1 Discussion of Findings

The study reveals that secondary school chemistry students in Lagos State are aware of renewable energy, which can help reduce carbon dioxide emissions. However, their perception of renewable energy also influences energy conservation and carbon dioxide reduction. The results of the analysis showed that respondents are aware of renewable energy, reducing carbon dioxide emissions, aligning with Wang et al. (2021) findings on students' understanding of energy crises and environmental pollution.

The study's findings on the significance test also showed that those students had a high degree of environmental knowledge; this result, according to Panwar *et al.* (2011), indicates that parents and students had appropriate levels of environmental awareness and that their beliefs were reflected in their adoption of energy-saving measures and habits. Because it can instantly reduce pollution levels, the development of renewable energy sources offers a practical and environmentally responsible replacement for fossil fuels (Lu et al., 2020).

3.2 Recommendations

Nigeria's renewable energy resources are underutilised, despite their availability; therefore, recommendations include revising public education policies, promoting environmental awareness, developing a new school curriculum, providing secondary school teachers training, and offering scholarships. The government should also provide legal instruments for renewable energy development, monitor research performance, and encourage students to engage with renewable energy.

4. Conclusion

The research suggests that renewable energy sources can be a reliable alternative to fossil fuels, conserving energy and reducing carbon dioxide emissions. It encourages reducing dependency on natural energy sources and creating diverse renewable energy sources for economic development and global competitiveness.

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