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Knowledge of Climate Change Mitigation and Adaptation Strategies among Secondary School Students in Benin City

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Abstract

Climate change is both a global environmental and development issue, and a matter of social, economic, and intergenerational justice, it poses a great threat to humanity. Despite this, knowledge of climate change is neither widespread nor suitably detailed among secondary school students in Nigeria. Gaining a complete understanding of climate change causes, effects, mitigation and adaptation strategies is the first step towards developing a powerful strategy for action. The study examined the knowledge of climate change mitigation and adaptation strategies among secondary school students in Benin City. These were with a view to providing information that could enhance awareness level among students and improved educational policy within the state. Data were sourced from senior secondary school students (SSI, SS2 and SS3) within Egor and Oredo local government areas of the state. 339 questionnaires were retrieved from the students and analysed. The results indicated that majority (80.5%) of the students had knowledge of climate change at the surface, when it came to specific cause of climate change, less than half of them had were knowledgeable (36.6%) while only 12% of them had knowledge of mitigation and adaptation strategies. The study concluded that there is need to improve the curriculum to ensure that climate change causes, effects, mitigation and adaptation strategies are well taught across Art, Social science, and Science classes in secondary schools within the state.

Keywords: Climate Literacy, Mitigation, Adaptation Strategies, Environmental and Sustainability Education, Benin City

Introduction

Background of the Study

Climate change was established by the United Nations Framework Convention on Climate Change (UNFCC) "as a change of climate which is attributed to human activity either directly or indirectly and alters the composition of the global atmosphere which is in addition to natural climate variability observed over comparable time periods". According to The United Nations habitat, climate change is a change in the average weather and weather variability of a region or the planet over time. It is measured by changes in temperature, precipitation, wind, storms and other indicators. Other important indicators, including sea level rise, are also used to measure climate change. Climate change is a concern that has been given extensive global interest within the past three decades. This global interest can be attributed to the present and anticipated impacts of the changing climate, as well as the present and potential future contribution of human activities.

One of the key functions of schools, apart from passing structured essential knowledge to the students, is to shape, direct, and modify students' thoughts and behaviours. In developing nations, little effort is being put into incorporating essential structured knowledge on the causes and implications of climate change, it's possible means of mitigation, and adaptation measures into their secondary schools' curricula. There is a deficiency in structured knowledge regarding the causes and effects of climate change among teachers and resources to teach these topics. Zeeshan et al (2021 as cited in Andersson and Wallin, 2000; Skamp et al., 2009; Taber and Taylor, 2009; Kılınç et al., 2011) asserted that 'environmental education to students of all levels is the most efficient way to raise awareness among the public about important environmental issues and engage them in adaptive actions concerning climate change and global warming'.

Despite this, knowledge of climate change is neither widespread nor suitably detailed among secondary school students. It is insufficient to enforce and sustain behavioural responses when limited understanding exist regarding the causes and effects of climate change. Gaining a complete understanding of the factors that are driving climate change is the first step towards developing a powerful strategy for action. It is nevertheless apparent that students in secondary schools have differing levels of understanding on the causality of climate change. Though decades of research have been dedicated to finding better ways to explain climate change to the public, little is known about how young people think about and react to a problem that will define and influence their generation (Corner, Roberts, Chiari, Völler, Mayrhuber, Mandl, & Monson, 2015; Ratinen, 2021). Therefore, mitigation and adaptation to climate change requires knowledge of climate change, its causes and effects.

Enhancing curricula to encompass multipronged consequences of climate change including health implications, socio economic implications and not only environmental or ecological implications is crucial. During the 2021 Copenhagen Climate Conference, the environment and education ministers pledged to integrate climate change education into all schools, acknowledging "the significant gaps in

ensuring that everyone has the knowledge, abilities, values, and attitudes necessary to actively engage in the shift towards climate-positive societies." However, it was observed that less than half of the countries studied by UNESCO in that same year had any mention of climate change in their educational policy (Cho, 2023). The world bank which is the biggest multilateral funder of climate action in developing countries, in 2022, asserted that Education is the most reliable indicator of climate change awareness, which is necessary to achieving effective, sustained climate action. Hence the urgent need for climate change education in our schools.
This study's impetus comes from the expanding interest on the necessity to incorporate the teaching of climate change in Nigerian secondary schools' curriculum, as this action is important to empower the future generations on climate change issues. Most studies on climate change and education were focused on other countries (Antronico, Coscarelli, Gariano, & Salvati, 2003; Zeeshan, Sha, Tomlinson, & Azeez, 2021;). For instance, Rayhan, Rayhan and Kinzler (2023) noted that a comprehensive study of these impacts allows us to anticipate challenges and devise effective strategies for mitigation and adaptation. The information inadequacy on knowledge of climate change causes and effects, mitigation and adaptation strategies among students in Nigerian secondary school has motivated the researcher to investigate into this study. Result from this study will no doubt help present and future generations to prepare for and mitigate the negative effect from climate change while promoting a more sustainable environment. It will also help educators and policy makers make informed decisions that will tackle loopholes in the educational sector relating to climate change knowledge.

Empirical Review

In Italy, Antronico, Coscarelli, Gariano and Salvati (2003) examined young people's awareness, perception and preparation on Climate Change and landslide/flood risk, the study focused on high school students between ages 13 to 20, findings showed that the students surveyed were aware of the Climate Change issues and were more concerned about the impacts of Climate Change on nature and the environment than adults, and generally believed that human actions and lifestyle affect Climate by the societal actors aiming to pay attention to negative emotions associated with CC.
In India Zeeshan, Sha, Tomlinson & Azeez (2001) examined the factors shaping students' perception of climate change with consideration to awareness, advocacy, and action on climate change. The category involved students in private and public schools, urban versus rural areas, secondary versus higher secondary levels, the study showed there was very pro-active in their advocacy, had a high level of understanding of climate change, and was eager to get engaged in environmental efforts. nonetheless, were not involved in adaptation and mitigation actions. However, this study was conducted in India and not Nigeria.
Filho, Ayal, Wall, Shiel, Paco, Pace, Mifsud, Salvia, Skouloudis, Moggi, LeVasseurj, Antonio, Azeiteiro, Ioannis and Kovaleva (2023) assessed the attitudes and perceptions of international university students across selected countries suggested that university students' awareness of climate change is the result of their direct exposure to climate-related risks, participation in climate change-related events, dialogue and news. To determine the most significant trends among the universities' various geographic locations, this study surveyed a

sample of institutions worldwide and applies statistical analysis to the data. According to the survey, college students understand the risk related with climate change. The university students think that learning about climate change will help them to develop a positive mindset and provide them with the necessary information and abilities to influence others. Students' participation in numerous CC activities and their course of study is strongly tied to their awareness of climate change. Students' awareness of the dangers associated with climate change also differs depending on their gender, age, and level of academic training. However, this study was conducted on among university students and not secondary school students.

In Nigeria, Olatumile (2013) assessed environmental professional's perception on the usefulness of awareness and knowledge of climate change. A total of 110 environmental specialists were chosen. To gather information, a systematic questionnaire was employed. Pearson After applying the product moment correlation, frequency counts, percentages, and chi-square were used to analyse the data. Environmental professionals may find personal and professional benefits from having knowledge and understanding of climate change. Gender did not significantly influence opinions on the value of understanding and being aware of climate change. However, this study was focused on environmental professionals and not secondary school students.

In Pakistan, Khayyam, Bano and Alvi (2021) investigated university students' perceptions of and motivation for Pakistan's capital city climate change mitigating and adaptation. Using logistic regression analysis, the respondents were categorized into three groups: social sciences, applied sciences, and natural sciences. According to the findings, students had 1.57, 4.98, and 1.63times higher likelihood of implementing mitigation strategies and 1.47, 1.14, and 1.17times higher likelihood of implementing adaptation tactics. If students believed they could shield themselves from the negative consequences of climate change, they were more likely to employ mitigation strategies and less likely to adopt adaptation tactics, felt they had barriers to overcome, and came from wealthy homes. However, age, gender, and field of study had little bearing on mitigation or adaptation. The study was conducted on university students in Pakistan, and not on secondary school students.

In Northeast India, Upadhyaya, Puthiyakath, Kalai and Goswami (2023) evaluated the degree of climate change knowledge and readiness to implement mitigation steps among 657 students enrolled in higher education. Furthermore, the study endeavours to determine if any associations exist between the degree of media use and the knowledge of the changing climate, in addition to their awareness of climate change and the readiness to implement mitigation measures. The findings indicate that Tripura's higher education students are highly conscious of climate change, and that television, newspapers and the Internet are the main information source on the subject. The most trusted sources were the scientists, then mass media, the results also show that students are prepared to take additional financial risks to implement CC mitigation strategies. More than 70% of the students who took part in the survey were those who are willing (7.6%) and highly willing (65.4%) to support climate change mitigation measures. The study's findings indicate that, in situations where the media plays a vital part in the information-dissemination approach, the willingness to adopt mitigation measures for CC is significantly connected with one's awareness of the consequences of the phenomenon. In

contrast, there is no correlation between one's knowledge of the causes of CC and their comprehension of its solutions.

In Nigeria, Ede, Nwajioha, Njoku, and Benjamin (2023) conducted a study to determine the level of climate change awareness among secondary school teachers in the state of Ebonyi. For the study, the researcher used a survey design. The study was led by three null hypotheses and three research questions. A self-made, 24-item "Climate Change Awareness Questionnaire" (CCAQ) was given to 300 teachers from eight secondary schools within communities in Ebonyi State where there are obvious signs of the effects of climate change. The sample was created by the researcher using random and purposive sampling techniques. The study issues were addressed using the mean (x) score, and the hypotheses were examined using the t-test to compare two means of separate samples. The findings demonstrated how little knowledge Ebonyi State's secondary school teachers have regarding the causes, consequences, and adaptation/mitigation techniques of climate change. However, the study was conducted on educators and not students.

In summary most of these studies focused on knowledge and perception of climate change, including Antronico, Coscarelli, Gariano and Salvati (2003); Filho, Ayal, Wall, Shiel, Paco, Pace, Mifsud, Salvia, Skouloudis, Moggi, LeVasseurj, Antonio, Azeiteiro, Ioannis and Kovaleva (2023); Ravi, Baby, Elias, Thomas, Veerabhadraiah & Pareek (2024); Olatumile (2013); Furthermore, most of these study were focused on nursing students (Lee, Huang, Yan, Lui, & Ye, 2023; Ravi, Baby, Elias, Thomas, Veerabhadraiah & Pareek 2024) and university students (Harrod & Rolland, 2020;) but not secondary students. These studies were also conducted in other countries like India, Italy and not Nigeria.

Conceptual Framework on Climate Change

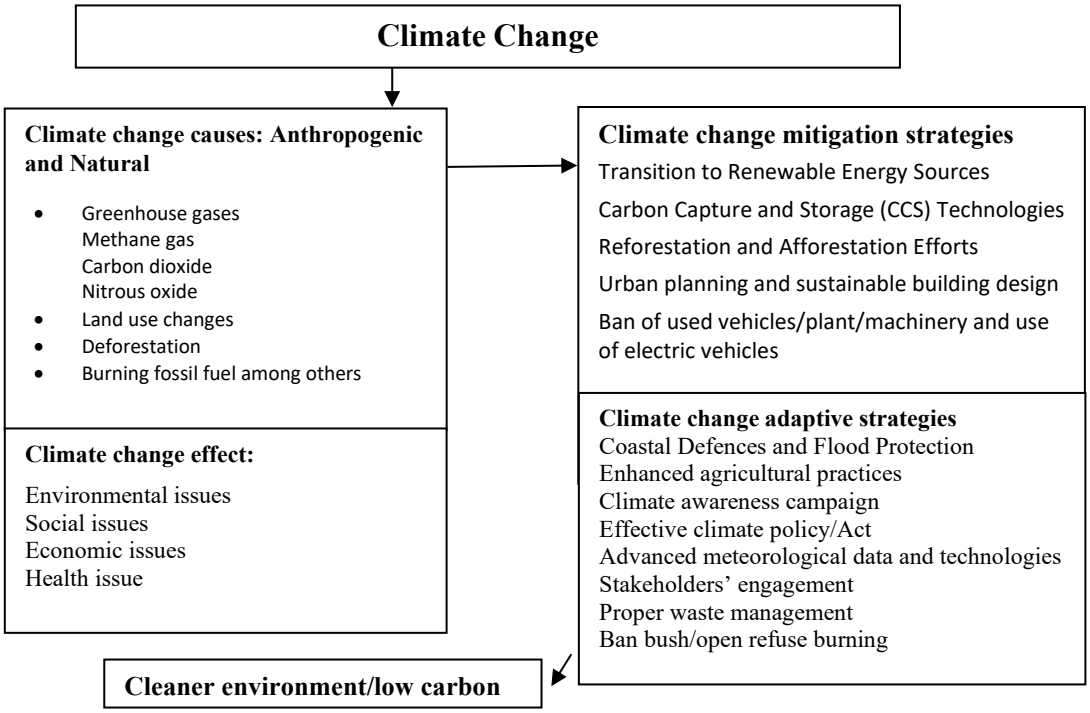


Fig 1: Conceptual framework on Climate Change

Methodology

The study adopted a quantitative research survey design. For the sample frame two of the three local government were selected using convenient sampling method, after which two schools (comprising of one public and one private school) were selected from each local government area chosen, totalling four schools. To determine the sample size, the total population of the selected schools was derived and then the formula for sample size determination for known population was adopted in estimating the minimum number of respondents to survey. This was further be broken down by level using stratified sampling by grouping into levels SS1, SS1, and SS3 and public and private. Informed consent was obtained from the ethical review committee, University of Benin, and the governing body of public and private schools within the state. Edo state secondary education board and Ministry of Education. The researcher was commitment to upholding the highest ethical standards in this research study. All participants were treated with respect, their confidentiality was strictly maintained, and their voluntary participation was prioritized.

Using Taro Yamane Formula to determine the sample size, as follows:

$n = N / (1 + Ne^2)$

Here:

- n is the sample size
- N is the total population size
- e is the margin of error (expressed as a decimal 0.05)

$n = 1650/ (1 + 1650*0.05^2)$

Sample size = 320

The minimum sample size for the study is three hundred and twenty. However, the researcher distributed 350 to give allowance for missing questionnaire and not properly filled questionnaires, eleven were not properly filled, while 339 properly filled was adopted as the sample size for the study.

Knowledge of Climate Change

The level of knowledge of climate change among the respondents was accessed. Fig 2 shows students' knowledge on climate change and their taught on how climate change as a topic is well taught

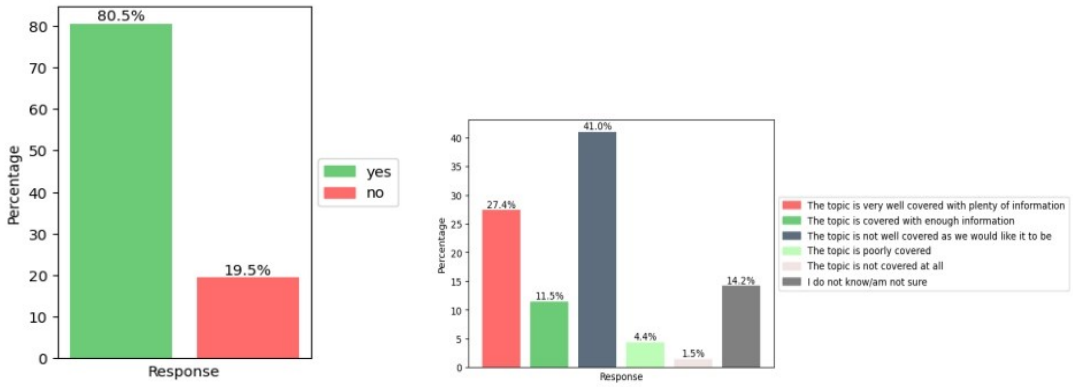


Fig 2: A bar chart showing student's knowledge of climate change.

From the chart, 80.5% of the students have knowledge of climate change while 19.5% do not have knowledge of climate change. Majority (41.0%) of the students say the topic is not well covered as they will like it to be, 27.4% says the topic is very well covered with plenty of information, 11.5% are of the opinion that the topic is well covered with enough information 4.4% say the topic is poorly covered, 1.5% say the topic is not covered at all while 14.2 are not sure if climate change as a topic is well covered.

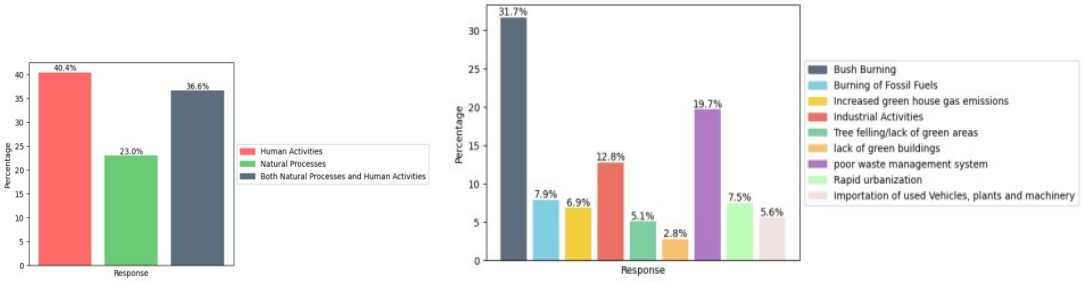


Fig 3: A bar chart showing student's thought on the causes of climate change.

From the chart, 40.4% of the students think that the climate change is caused by human activities, 23.0% says climate change is caused by human processes, while on 36.6% ore of the opinion that climate change is caused by both natural process and human activities. In Benin City, the respondents attributed the major causes of climate change to bush burning 31.7%, followed by poor management waste systems 19.7% and next was industrial activities 12.8%.

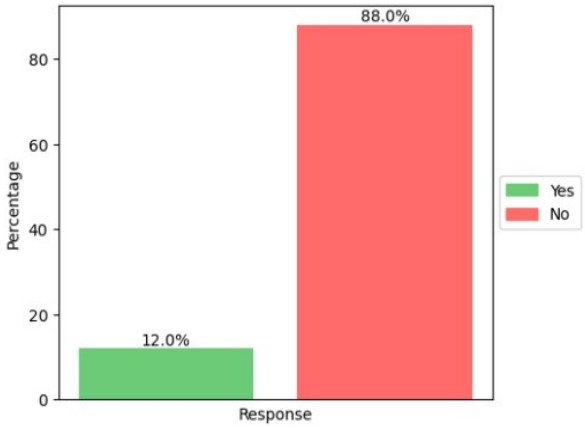


Fig 4: A bar chart showing student's knowledge of climate change mitigation and adaptation strategies

In fig 4, the level of awareness of climate change mitigation and adaptive strategies among the respondents were evaluated. It was observed that the respondents do not have much knowledge about some of the mitigation and adaptive strategies of climate change. The survey data revealed that majority of the respondents (88%) are not aware of climate change mitigation and adaptive strategies. Meanwhile, the other 12% of the respondents claim to have some

knowledge about the control measures and adaptive strategies of climate change. Of these respondents, very few have knowledge of mitigation strategies such as transition to renewable energy sources (11.3%), reforestation & afforestation efforts (10.6%) and urban planning & sustainable building design (7.8%) carbon capture and storage (CCS) technologies (6.1%), non-importation of used vehicles/plant/machinery (6.0%) and use of electric vehicles. Concerning the adaptation strategies of climate change, a few of the respondents are aware of the coastal defence & flood protection (8.5%), enhanced agricultural practices (7.2%), climate awareness campaign (9.2%), proper waste management (8.1%), stopping of bush/open refuse burning (10.3%) effective climate policy/Act (6.6%), advanced meteorological data and technologies (4.3%), and stakeholders' engagement strategies (4.2%). This is presented in the fig. below.

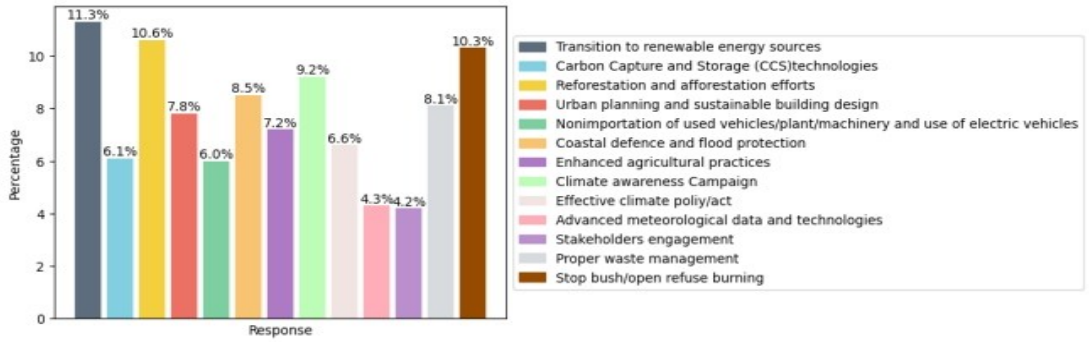


Fig 5: Students knowledge of specific mitigation and adaptation strategies for climate change.

Conclusion

Knowledge of climate change among secondary school students in Benin appeared high, but when asked about the causes of climate only about 36.6% knew the cause of climate change. Students had knowledge about specific causes and effects of climate change but were not concerned about its effect on them and the environment. Again, the level of awareness of mitigation and adaptation strategies among secondary school students in Benin was previously not known. The result showed that the level of awareness of mitigation and adaptation strategies was low. This study was able to provide comprehensive data on influence of factors on knowledge of climate change among secondary school students in the study area. Generally, this study will not only reduce the gap in literature but will also help policy makers make strategic decision that will help to improve the educational policy on climate change among secondary schools in the state and probably Nigeria.

Recommendations

This research work has provided information for relevant stake holders in Nigeria. This study will help policy makers, environmental professionals, educators, researchers and the government among others in making informed decisions that will help to improve the educational policy on climate change in Nigeria, as there is the need for more in-depth teaching on climate change in Nigerian secondary schools.

The following recommendations are suggested:

- The Nigerian educational curriculum should integrate climate change across various subjects, including Geography, Science, Social Studies, and Economics. This interdisciplinary approach will help students understand the multifaceted nature of climate change and develop specialized modules on climate science, effects, and mitigation strategies.
- Teacher training and capacity building should be organized, including workshops, online courses, and collaboration with environmental organizations, so that climate change can be taught extensively.
- Climate change club and debate should be established and encouraged in secondary schools.
- Climate change topics should be taught at both primary and secondary school levels especially in public schools and not only in senior secondary school one (SSS1).

By implementing these recommendations, Nigeria can empower students not only to understand the challenges posed by the changing climate change but also be proactive agents of change in their communities and beyond. This initiative will contribute to building a sustainable future in the face of a rapidly changing climate.

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