

STUDENTS' PERCEPTIONS ABOUT THE GREENHOUSE EFFECT, GLOBAL WARMING, AND CLIMATE CHANGE: A CASE STUDY OF SOME SECONDARY SCHOOLS IN PANKSHIN LGA

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ABSTRACT: The study investigated Students' Perceptions about the Greenhouse Effect, Global Warming, and Climate Change. The study adopted the survey research design with four research questions and one hypothesis. One hundred (100) students were randomly selected from 10 secondary schools in Pankshin LGA. The instrument used for the data collection was a structured questionnaire. The results revealed that students generally possess a good understanding of the greenhouse effect and recognize climate change as a pressing issue requiring immediate attention. They also demonstrated a good level of awareness of the potential consequences associated with global warming and climate change. The study also revealed that a significant number of students express a sense of personal responsibility to take action and contribute towards addressing the menace of climate change. The study concluded that educators should contribute to creating more information and environmentally conscious generation. The study recommends that school authorities should help in providing the science teachers with necessary equipment for the teaching of greenhouse effect, global warming, and climate change.

KEYWORDS: Climate Change, Curriculum, Green House, Effect, Global Warming.



INTRODUCTION

The greenhouse effect, global warming, and climate change are important concepts that have been discussed widely in scientific literature and popular media. The understanding of these concepts is crucial for individuals to make informed decisions about their daily lives and contribute to the mitigation of climate change. The greenhouse effect is a natural process that occurs when certain gases in the Earth's atmosphere trap heat from the sun. This process helps to regulate the temperature of the planet, making it suitable for life. However, human activities, such as burning fossil fuels, have increased the concentration of greenhouse gases in the atmosphere, leading to a warming effect known as global warming. Without the greenhouse effect, the Earth's average temperature would be too cold to support life (Intergovernmental Panel on Climate Change, IPCC, 2018).

Global warming refers to the increase in the Earth's average surface temperature due to the building of greenhouse gases in the atmosphere. This phenomenon has led to various impacts such as rising sea levels, more frequent heat waves, and changes in precipitation patterns. The effects of global warming include melting glaciers and ice caps, rising sea levels, more frequent and severe weather events, and changes in the timing of seasonal events. These effects have negative impacts on Human Health, Agriculture and Natural Ecosystems. To mitigate the effects of global warming, it is important for individuals, businesses and governments to take action to reduce greenhouse gas emissions. This can be achieved through measures such as using renewable energy sources, improving energy efficiency, reducing deforestation and transitioning to more sustainable agricultural practices events (NASA, 2021).

The National Research Council's Grand Challenges in Environmental Sciences (NRC, 2000) identified eight "grand challenges," four of which are directly linked to climate and climate change. Thus, it is vital that students learn about global warming and climate change. Teaching about global warming and climate change is essential for developing well rounded students, and for overcoming a critical deficiency in atmospheric science and climatology curricula (Serafin *et al.*, 2000). Furthermore, teaching about global warming and climate change provides a natural context for studying science through personal and social applications, an understanding that is essential if future citizens are to assume responsibility for the management and policymaking decisions facing our planet (Brown, 2013; Bybee, 2014). Therefore, if science education is to promote a citizenry that is knowledgeable about global warming and climate change (Osborne & Freyberg, 2013) in order to plan curriculum and design instruction that build on students' conceptions (Driver *et al.*, 2016).



LITERATURE REVIEW

Human activities such as burning fossil fuels, deforestation, and agriculture have increased the levels of greenhouse gases in the atmosphere, leading to an enhanced greenhouse effect and global warming. The increased levels of CO_2 in the atmosphere, for example, are primarily due to the burning of fossil fuels such as coal, oil, and gas. This increase in greenhouse gases is causing the Earth's temperature to rise at an alarming rate, leading to a range of environmental problems, including rising sea levels, more frequent and severe weather events, and changes in the timing of seasonal events (National Aeronautics and Space Administration, NASA, 2021).

In a study conducted by Brown, G. (2013), it was found that many students have a limited understanding of the greenhouse effect. Some students believed that the greenhouse effect is caused by the depletion of the ozone layer, while others thought it is the result of pollution in the atmosphere. Only a small number of students correctly identified the role of greenhouse gases in the greenhouse effect.

A study by Bybee, R. (2014) revealed that many students believed that global warming is caused by the hole in the ozone layer or pollution in the atmosphere. Some students also thought that global warming is a natural phenomenon that occurred over long periods. Only a few students correctly identified the role of greenhouse gases in global warming.

The international community has recognized the importance of addressing climate change and has taken action through the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement, which aim to limit global temperature rise to below 2 degrees Celsius above pre-industrial levels. In a study conducted by Mwanse et al. (2016), it was found that many students had a limited understanding of climate change. Some students believed that climate change is the same as global warming or the depletion of the ozone layer. Only a small number of students correctly identified the role of human activities in causing climate change.

The understanding of the greenhouse effect, global warming, and climate change is crucial for individuals to make informed decisions about their daily lives and contribute to mitigating climate change. However, existing literature suggests that many students have a limited understanding of these concepts. Educators should focus on developing effective strategies to enhance students' understanding of these complex topics. By doing so, students can contribute to the mitigation of climate change by making informed decisions and taking actions in their daily lives.

Students' perceptions about the greenhouse effect refer to their understanding, beliefs, attitudes, and opinions about the process by which certain gases in the Earth's atmosphere trap heat and warm the planet. It encompasses how students view the role of the greenhouse effect in regulating the Earth's temperature, its potential effects on climate change, and the actions that can be taken to mitigate its impact. Understanding students' perceptions about the greenhouse effect is important in developing effective educational programs and policies that can enhance their knowledge and engagement in addressing climate change.

A study by Akpan-Obong *et al.* (2015) investigated the knowledge and perception of the greenhouse effect among secondary school students in Akwa Ibom State, Nigeria. The study found that although most of the students were familiar with the term "greenhouse effect," they lacked a comprehensive understanding of the concept. The study concluded that more



awareness is needed to improve students' knowledge and perception of the greenhouse effect. Adegboye and Adegboye (2019) investigated the knowledge and perception of the greenhouse effect among undergraduate students in Nigeria. The study found that although the majority of the students had heard of the greenhouse effect, their understanding of the concept was limited. The study concluded that there is a need for more education on the greenhouse effect to enhance students' perception and knowledge.

A study by Ogunbode *et al.* (2017) investigated the perception of global warming among secondary school students in Osun State, Nigeria. The study found that while most of the students had heard of global warming, their knowledge and understanding of the concept were limited. The study concluded that more education is needed to improve students' perception and knowledge of global warming. Olabode (2016) investigated the knowledge and perception of global warming among undergraduate students in Nigeria. The study found that although most of the students had heard of global warming, their understanding of the concept was limited. The study concluded that there is a need for more education on global warming to enhance students' perception and knowledge.

A study by Adejuwon and Tijani (2016) investigated the perception of climate change among secondary school students in Lagos State, Nigeria. The study found that while most of the students had heard of climate change, their understanding of the concept was limited. The study concluded that more education is needed to improve students' perception and knowledge of climate change. Akinmade *et al.* (2019) investigated the knowledge and perception of climate change among undergraduate students in Nigeria. The study found that while most of the students had heard of climate change, their knowledge and understanding of the concept were limited. The study concluded that there is a need for more education on climate change to enhance students' perception and knowledge.

Purpose of the Study

The purpose of this study is to investigate students' perceptions about the greenhouse effect, global warming, and climate change. Specifically, it seeks to determine:

- i. The student perceptions about greenhouse effects, global warming and climate change.
- ii. Some of the ways teachers put in place to inculcate the right perception to the students.
- iii. Some challenges in changing the students' perception on greenhouse, global warming and climate change.
- iv. The perceptions of male and female students on greenhouse, global warming and climate change.

Statement of the Problem

Students have misunderstandings about some environmental issues; they may spread this confusion and misconception to their future. Thus, it is important to reveal and correct any misconceptions they may have. Research in the area of students' perceptions about greenhouse effect, global warming and climate change is lacking in our secondary schools today (Maduka et al., 2012) and related research in environmental education tends to focus on students' factual knowledge about environmental issues and on their environmental attitudes and behaviors



(Rickinson, 2015). Therefore, it is important for research in geoscience and environmental science education to continue to expand our understanding of students' perception on greenhouse effects, global warming and climate change.

Research Questions

The following research questions guided the study:

- 1. What are the students' perceptions about greenhouse effect, global warming and climate change?
- 2. What are some of the ways teachers put in place to inculcate the right perception to the students?
- 3. What are the challenges in changing the students' perception about greenhouse effect, global warming and climate change?
- 4. What are the perceptions of male and female students about the greenhouse effect, global warming and climate change?

Hypothesis

There is no significant difference between the perceptions of male and female students on greenhouse effect, global warming and climate change.

METHODOLOGY

The design that was adopted for this research work is the survey design. Sampling technique will be adopted to sample 100 students from 10 secondary schools within Pankshin Local Government Area. The instrument for data collection will be a structured questionnaire. For the instrument of data collection, the research will adopt a face-to-face method of distribution of the instrument and this will allow the respondents to fill the questionnaire on the spot and give it back to the researcher. For data analysis, the questionnaire instrument will be structured using a four-point Likert response scale ranked as follows:

- SA Strongly Agreed = 4
- A Agreed = 3
- D Disagreed = 2
- SD Strongly Disagreed = 1

Decision Rule: A mean score of less than 2.5 is considered rejected, while a mean score of 2.5 and above is considered accepted. Chi-square will be used to test the hypothesis at 0.05 level of significance.



RESULT AND DISCUSSION

Research Question One: What are student perceptions about greenhouse effect, global warming, and climate change?

TABLE 1: Summary of students' perceptions about greenhouse effect, global warming, and climate change

S/N	STATEMENTS	RE	SPON	SES				
		SA	AD	D	SD	Total	Mean	Decision
		(4)	(3)	(2)	(1)			
1	I have a good understanding of the concept of the greenhouse effect.	50	30	16	4	100	3.24	Accepted
2	I believe that human activités significant contribute to global warming.	15	7	32	46	100	1.91	Rejected
3	Climate change is a pressing issue that requires immediate attention.	52	45	2	1	100	3.48	Accepted
4	I am aware of the potential consequences of global warming and climate change.	45	50	5	0	100	3.40	Accepted
5	I feel a personal responsibility to take action to mitigate climate change.	43	48	6	3	100	3.31	Accepted
	Aggregate average mean ∑X/N						3.39	

The result of the study in Table 1 above shows an average mean score of 3.39 which is above the criterion score of 2.5; four items were accepted while the second item was rejected. Therefore, this reveals that students' perception about greenhouse effect, global warming, and climate change is good.

Research Question Two: What are some of the ways teachers put in place to inculcate the right perception to the students?



TABLE 2: Summary of ways teachers put in place to inculcate the right perception to the students

S/N	STATEMENTS	RES	PONS	ES				
		SA (4)	A (3)	D (2)	SD (1)	Total	Mean	Decision
1	Teachers provide clear explanations and examples of greenhouse effect, global warming, and climate change.	50	20	17	13	100	3.11	Accepted
2	Teachers encourage open discussions and debates about environmental issues.	54	45	1	0	100	3.53	Accepted
3	Teachers incorporate real-life examples and case studies related to climate change in their lessons.	43	48	5	4	100	3.26	Accepted
4	Teachers promote critical thinking and analysis of scientific evidence about global warming and climate change.	47	33	15	5	100	3.22	Accepted
5	Teachers encourage surdents to engage in environmentally friendly practices inside and outside the classroom.	43	32	15	10	100	3.04	Accepted
	Aggregate average mean ∑X/N						3.23	

The result of the study in Table 2 above shows an average mean score of 3.23 which is above the criterion score of 2.5; all the five items are accepted. Therefore, this reveals that the ways teachers put in place to inculcate the right perception to the students are credible in creating an enabling environment for impressive academic performance.

Research Question Three: What are some challenges in changing the students' perception on greenhouse effect, global warming, and climate change?

TABLE 3: Summary of some challenges in changing the student's perception about greenhouse effect, global warming, and climate change

S/N	STATEMENTS		RESPONSES								
		SA (4)	A (3)	D (2)	SD (1)	Tota	al Me	an Decision			
1	Students have preconceived notions or misconceptions about global warming and climate change.	46	40	9	5	100	3.27	Accepted			
2	Limited access to up-to-date information and resources on climate change.	50	42	6	2	100	3.40	Accepted			

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3	Lack of awareness or understanding about the scientific consensus on	8	12	30	50	100	1.78	Rejected
4	climate change. Social and cultural factors that influence students' beliefs and attitudes towards environmental issues.	24	32	20	24	100	2.56	Accepted
5	Resistance to change and reluctance to accept personal responsibility for addressing climate change. Aggregate average mean $\sum X/N$	10	25	32	33	100	2.122.63	Rejected

The result of the study in Table 3 above shows an average mean score of 2.63 which is above the criterion score of 2.5; all the five items are accepted excluding Items 3 and 5 which are rejected. Therefore, these challenges change the students' perception of some students about greenhouse, global warming, and climate change.

Research Question 4: What are the perceptions of male and female students about greenhouse effect, global warming and climate change?

Table 4: Summary of the perceptions of male and female students about greenhouse effect,
 global warming and climate change

S/N	STATEMENTS	RESPONSES						
		SA (4)	A (3)	D (2)	SD (1)	Total	Mea	n Decision
1	Male students show a high level of concern about global warming and climate change.	46	40	9	5	100	3.27	Accepted
2	Female students believe that individual actions can make a difference in mitigating climate change.	50	42	6	2	100	3.40	Accepted
3	Male students tend to be more knowledgeable about the causes and effects of global warming.	8	12	30	50	100	1.78	Rejected
4	Female students feel more motivated to engage in sustainable practices to combat climate change.	24	32	20	24	100	2.56	Accepted
5	Male and female students have the same perceptions regarding global warming and climate change.	10	25	32	33	100	2.12	Rejected
	Aggregate average mean ∑X/N						2.63	



The result of the study in Table 4 above shows an average mean score of 2.63 which is above the criterion score of 2.5; all the five items are accepted excluding Items 3 and 5 which are rejected. Therefore, there is no difference between the perceptions of male and female students about greenhouse, global warming and climate change.

Testing of Hypothesis

Hypothesis 1

There is no significant difference between the perceptions of male and female students about greenhouse effect, global warming and climate change.

Table 5: Summary of chi-square showing perceptions of male and female students on
greenhouse effect, global warming and climate change

Cell	Fo	Fe	Df	χ^2_{cal}	χ^2_{crit} ($\propto = 0.05$)	
SA	205	204.82				
А	180	180.18	1	0.001	3.84	
D	61	61.18				
SD	54	53.82				

From the above Table 5, since the computed value of χ^2_{cal} chi-square critical of 0.001 is less than χ^2_{crit} chi-square critical value of 3.84 at the level of 0.05; thus, the decision was to accept the null hypothesis. This can be concluded that there is no difference between the perceptions of male and female students about greenhouse, global warming and climate change.

DISCUSSION OF FINDINGS

Based on the findings presented in Table 1, it can be concluded that the majority of the students in the study have a good understanding of the concept of the greenhouse effect. This item received a high average mean score of 3.24, indicating that students possess a solid comprehension of this topic. Regarding the belief that human activities significantly contribute to global warming, the average mean score of 1.91 suggests that the students' responses leaned towards rejection. It implies that a significant portion of the students did not believe that human activities have a significant impact on global warming. The perception of climate change as a pressing issue requiring immediate attention was widely accepted by the students. The high average mean score of 3.48 indicates that the majority of the students recognized the urgency and importance of addressing climate change. In terms of awareness of the potential consequences of global warming and climate change, the findings indicate that the students were knowledgeable about the potential impacts associated with these issues. Furthermore, the findings revealed that a considerable number of students felt a personal responsibility to take action to mitigate climate change. The high average mean score of 3.31 indicates that students



recognized the need for individual action and felt a sense of personal obligation to contribute towards addressing climate change.

Thus, the aggregate average mean score of 3.39 suggests that students in the study demonstrated a generally positive perception and understanding of the concepts related to greenhouse effect, global warming, and climate change. The majority of the items were accepted, indicating that students were well-informed and concerned about these environmental issues. These findings highlight the importance of environmental education and foster a sense of responsibility among students to address climate change.

Based on the data provided in Table 2, the research question focused on identifying the ways teachers put in place to inculcate the right perception to the students. The responses from the participants were summarized and the mean scores were calculated for each statement. The average mean score for all the statements combined was found to be 3.23, which is above the criterion score of 2.5. The findings indicate that all the ways teachers put in place to inculcate the right perception to the students, as listed in the statements, were accepted. Teachers provide clear explanations and examples of greenhouse effect, global warming, and climate change. The mean score for this statement was 3.11, indicating that participants agreed that teachers effectively explain and provide examples related to these environmental concepts. Teachers encourage open discussions and debates about environmental issues. This statement received a mean score of 3.53, suggesting that participants recognized teachers' efforts in promoting open discussions and debates on environmental topics. Teachers incorporate real-life examples and case studies related to climate change in their lessons. The mean score for this statement was 3.26, indicating that participants acknowledged the use of real-life examples and case studies to enhance students' understanding of climate change. Teachers promote critical thinking and analysis of scientific evidence about global warming and climate change. This statement received a mean score of 3.22, indicating that participants recognized teachers' efforts in fostering critical thinking and analysis of scientific evidence in the context of global warming and climate change. Teachers encourage students to engage in environmentally friendly practices inside and outside the classroom. The mean score for this statement was 3.04, indicating that participants acknowledged teachers' role in promoting environmentally friendly practices among students.

The findings suggest that the ways teachers put in place to inculcate the right perception to the students, as reflected in the statements, are considered credible in creating an enabling environment for impressive academic performance. The mean scores above the criterion score of 2.5 indicate that participants perceived these strategies as effective in shaping students' perception and understanding of environmental issues.

From Table 3, the findings from the study indicate that most students have good perception about global warming and climate change although a few students have certain preconceived notions or misconceptions about global warming and climate change. This suggests that some students may hold beliefs or ideas that are not aligned with the scientific consensus on these topics. However, teachers can play a crucial role in addressing these misconceptions through effective education and communication. The study also reveals that limited access to up-to-date information and resources on climate change is a challenge for students. Meanwhile, most of the respondents agreed that they have access to recent information and resources on climate change. Therefore, this implies that students have access to the latest scientific findings and research, which could propel their understanding and ability to engage with the topic



effectively. However, the study highlights that there is a lack of awareness or understanding about the scientific consensus on climate change among some students, with a mean score of 1.78. This is an area of concern as it suggests that there is a need for more emphasis on teaching the scientific basis of climate change and promoting a better understanding of the consensus among the scientific community. Strategies such as incorporating scientific evidence, presenting the consensus viewpoint and facilitating open discussions can help address this challenge. The study influences social and cultural factors on students' beliefs and attitudes towards environmental issues. These factors can shape students' perceptions and potentially contribute to misconceptions or resistance to accepting the reality of climate change, whereas the students were not misled by the social factors. The study also indicates that there is no resistance to change and a reluctance to accept personal responsibility for addressing climate change among some students. Meanwhile, it is suggested that students may feel overwhelmed or disconnected from the issue, leading to a lack of motivation to take action.

Based on the findings presented in Table 4, it can be observed that there is no significant difference between the perceptions of male and female students regarding greenhouse effect, global warming, and climate change. The first item states that male students show a high level of concern about global warming and climate change. This item received an average mean score of 3.27, indicating that male students in the study expressed a considerable level of concern regarding these environmental issues. As the item was accepted, it suggests that male students demonstrate a higher level of concern compared to the criterion score. Similarly, the second item suggests that female students believe that individual actions can make a difference in mitigating climate change. The average mean score of 3.40 indicates that female students strongly believed in the power of individual actions. Therefore, it can be concluded that female students in the study expressed a higher level of belief in individual actions as a means to address climate change. However, the third item reveals that male students were not more knowledgeable about the causes and effects of global warming compared to female students. The average mean score of 1.78 suggests that male students had a lower level of knowledge about these topics. As a result, this item was rejected, indicating that there was no significant difference between male and female students' knowledge regarding the causes and effects of global warming. In terms of Item 4, which explores the motivation of female students to engage in sustainable practices to combat climate change, the average mean score of 2.56 suggests that female students demonstrated a moderate level of motivation. This item was accepted, indicating that female students expressed a higher motivation compared to the criterion score. Finally, the average mean score of 2.12 suggests that there were no significant differences between the perceptions of male and female students. Therefore, this item was rejected, indicating that the perceptions of male and female students did not significantly differ in the study.

The aggregate average mean score of 2.63 indicates that there were no notable differences between the perceptions of male and female students regarding greenhouse effect, global warming, and climate change. The majority of the items were accepted, suggesting that both male and female students expressed concern, belief in individual actions, and motivation to address climate change. These findings emphasize the importance of promoting environmental awareness and engagement among both male and female students.

Based on the findings presented in Table 5, it can be observed that there is no significant difference between male and female students from the computed value calculated with a chi-square critical value of 0.001 which is less than the critical value calculated of 3.84 at the level



of 0.05. Thus, the decision was to accept the null hypothesis. It can be concluded that there is no difference between the perceptions of male and female students on greenhouse effect, global warming and climate change.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The study sought to investigate the student perception about the greenhouse effect, global warming, and climate change. Four research questions were drawn to guide the study, and one hypothesis. The findings from the study provided valuable insights into the perceptions and understanding of students regarding the greenhouse effect, global warming, and climate change. The study reveals that students generally possess a good understanding of the greenhouse effect and recognize climate change as a pressing issue requiring immediate attention. They also demonstrate a good level of awareness of the potential consequences associated with global warming and climate change. Additionally, a significant number of students express a sense of personal responsibility to take action and contribute towards addressing climate change.

However, there is a lack of consensus among the students regarding the belief in human activities as a significant contributor to global warming. This suggests a need for further education and communication to address misconceptions and promote a better understanding of the scientific consensus.

The study also highlights the important role of teachers in shaping students' perceptions and understanding of environmental issues. The identified strategies employed by teachers, such as providing clear explanations and examples, encouraging open discussions and debates, incorporating real-life examples and case studies, promoting critical thinking, and encouraging environmentally friendly practices, are perceived as effective by the students.

The findings emphasize the significance of environmental education and the need to foster a sense of responsibility among students to address climate change. It is important to continue addressing misconceptions, promoting scientific understanding, and considering social and cultural factors that influence students' beliefs and attitudes towards environmental issues. By doing so, educators can contribute to creating a more informed and environmentally conscious generation.

The study concludes that students have a solid understanding of the greenhouse effect and recognize climate change as an urgent issue. However, there is disagreement among students about the role of human activities in global warming, highlighting the need for education and clear communication. It also concludes that teachers play a vital role in shaping students' perceptions through effective strategies such as explanations, discussions, real-life examples, critical thinking, and promoting environmentally friendly practices. Environmental education and fostering a sense of responsibility are crucial in addressing climate change. Addressing misconceptions, promoting scientific understanding, and considering social and cultural factors are essential for cultivating an informed and environmentally conscious generation.

Recommendation on students' perception on climate include both ex-ante and ex-post risk management options. The following are thus recommended:



- I. Teachers should put more effort in correcting the literal idea of the greenhouse effect, global warming, and climate change.
- II. The school authorities should help in providing the science teachers with necessary equipment for the teaching of greenhouse effect, global warming, and climate change.

Suggestion for Further Studies

The following are the suggestions drawn by the researchers for further research:

- I. This study was specifically carried out on greenhouse effect, global warming, and climate change. However, the researcher suggested that this same research should be carried out in all aspects of biology education.
- II. The research should be extended to cover the attitude of students towards the study greenhouse effect, global warming, and climate change.

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