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Knowledge, Attitude, and Practices of Students Toward Global Warming

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Abstract. The study aimed to determine the students' knowledge, attitudes, and practices towards global warming and their relationships. The researcher utilized a descriptive-correlational design and the systematic sampling technique. The respondents of the study were 340 students from grades 7 to 12 at Sibulan National High School. The researcher used validated questionnaires and employed weighted mean, Spearman's Rank Correlation Coefficient, mean, and percentage in treating the data. The study revealed that students' knowledge about global warming is "very satisfactory." Students' attitude towards global warming is also "very positive" and their extent of practices to minimize global warming is "high." Moreover, the study found that there is a significant and positive relationship between the students' knowledge about global warming and their attitude towards global warming. The student's attitude towards global warming is also significantly and positively related to their practices to minimize global warming. However, no significant relationship is found between students' knowledge about global warming and their practices to minimize it.

Keywords: Global warming; Attitude; Knowledge; Practices.

1.0 Introduction

Global temperatures continue to rise due to human activities that pump greenhouse gases into the atmosphere. The National Aeronautics and Space Administration (NASA) has recorded that the global average temperature is 2.1°F higher than it was in 1880. This record explains the global issues of melting ice, rising sea levels, drought, floods, increased natural disasters, and wildfires, and is the cause of the possible extinction of some thriving animals and plants (Marder, 2023). The temperature anomaly causes the worst drought in some countries, leading to a decline in crop production and an increase in the price of market products (Kogan, 2023). In addition, this problem of crop production is leading to malnutrition in some countries where populations are growing rapidly (Kogan, 2023). Global warming also threatens public health and causes disease in living organisms on Earth. In an article published in the journal Wetenskap Health, climate change is also affecting water, air, and soil composition, which has a major impact on human health. The decrease in heart rate is also associated with the increase in air temperature and therefore the risk of suffering a heart attack increases every day (Hodambia & Dandala, 2020).

The Philippines is located on the equator and, like other tropical countries, is vulnerable to severe effects of global warming. The country is highly vulnerable to various impacts of global warming, such as rising sea levels, droughts, public health threats, altered tropical cyclones, food security issues, and threatened biodiversity. To prevent future generations from bearing the impact of the past, the government and other authorities are working together to combat these global events. The Department of Education (DepEd) is one of the government agencies committed to helping in the fight against global warming. Activities such as DepEd Memorandum (DM) No. 069, S. 2023 establish the rules for the implementation of the "DepEd's 236,000 Trees – A Christmas Gift for the Children" project, an effort to promote environmental protection and instill environmental responsibility among

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Filipino children. Another example is the Climate Change Act (Republic Act No. 9729), which promotes the inclusion of global warming and climate change in the teaching of various academic subjects (Federigan, 2022).

Several studies (IPCC, 2021; Ripple et al., 2019; Diaz et al., 2019) have warned about the escalating impacts of human activities on the environment. Despite this, it remains a mystery why the effects of global warming continue to become more severe over time. Several research studies on student awareness (Cavdar, 2023; Kumar et al. as cited in Salman, 2023; Olarewaju et al., 2023), its relationship with attitude (Abdu-Raheem & Adeosun, 2022; Deshiana et al., 2022), and the relationship between attitude and behaviors (Ballew et al., 2024) were conducted. However, these studies failed to examine the significant relationship of the three components essential in addressing the challenges of global warming. To the researcher`s knowledge, this quantitative research is less explored.

Therefore, as a public school science teacher, the researcher wants to investigate how aware secondary students at Sibulan National High School are about climate change. The researcher's aim is to survey secondary school students at Sibulan National High School to determine their level of knowledge, attitude, and practices towards mitigating global warming and how these correlate with each other.

2.0 Methodology

2.1 Research Design

The researcher used the descriptive-correlational survey. It was descriptive because it (a) identified students' level of knowledge, (b) examined students' attitudes and perceptions, and (c) determined students' practices or behaviors. On the other hand, it is correlational because it examines the relationship between (a) knowledge and attitudes, (b) knowledge and practices, and (c) attitudes and practices.

2.2 Research Participants

The respondents of this study were high school students enrolled from grades 7 to 12 at Sibulan National High School for the school year 2023–2024 school. The researcher used systematic sampling techniques in which every fourth student on the list was the respondent. The respondents were selected randomly. The researcher used a 5% margin of error and a 95% confidence level to determine the sample size.

2.3 Research Instrument

The researcher used a self-made questionnaire to collect relevant data. The questionnaire consisted of four parts. Part I contains the disclosure statement indicating that the respondents allowed the researcher to collect information provided that all information was treated with the utmost confidentiality. Part II consists of 20-item test questions on the student's level of knowledge about global warming. Part III includes a 5-point scale assessing students' attitudes toward global warming. Finally, Part IV displays the 5-point assessment of students' practices or activities to mitigate global warming. The questionnaires were validated by three science teachers who hold Master's degrees. To ensure the reliability of the item, a dry run was carried out. There were 30 selected students who were not among the respondents from Sibulan National High School who acted as respondents to the said dry run. Test-retests were used for students' knowledge and Cronbach's alpha test was used for students' attitudes and practices. The results were 0.701 for knowledge, 0.760 for attitude, and 0.854 for practice. All values are above 0.70, meaning the items are reliable.

2.4 Data Gathering Procedure

The researcher asked for the approval of the Dean of the Foundation University Graduate School, and a letter of request to conduct a study was sent to the Schools Division Office of Negros Oriental. The signed and approved letter was presented to the principal and students' advisers/subject teachers. During the distribution, the researcher explained the purpose and significance of the study to the students. The researcher emphasized that all information given would be treated confidentially and that they had the right to withdraw at any time. Once the students finished answering the questionnaires, the questionnaires were retrieved immediately. The findings were tallied using MS Excel and analyzed using JAMOVI software.

2.5 Ethical Considerations

The researcher obtained ethical approval from the DepEd's Schools Divisions Office of Negros Oriental and the Ethics Committee of the Foundation University. The ethical considerations are also derived from RM No. 228, s. 2020 on the *Policy Guidelines on the Adherence to Ethical Research Principles and Responsibilities in Studies involving Teaching, Teaching-related, Non-Teaching Personnel, and Learners*, which follow strict confidentiality and therefore ensure the confidentiality of the information shared. In order to comply with the ethical protocols established by the Foundation University Ethics Committee, the researcher carefully followed the required procedures. Consultations were undertaken to ensure that the research topic is sound, meaningful, and ethically appropriate. Throughout the process, the researcher maintained an unbiased attitude and aimed to avoid any form of censure. In addition, before conducting the study, respondents were fully informed about the purpose of the study and their informed consent through the disclosure statement included in the questionnaire. It was emphasized that respondents could answer, not answer, or withdraw from the questionnaires at any time without intimidation.

3.0 Results and Discussion

3.1 Knowledge of Students about Global Warming

Table 1 illustrates the knowledge of students about global warming based on a sample size of 340 students.

Table 1. Descriptive statistics of students' knowledge of global warming (n = 340)

Rating	Verbal Description	Frequency	Percentage
90 – 100	Outstanding (O)	107	31.47
85 – 89	Very Satisfactory (VS)	60	17.65
80 – 84	Satisfactory (S)	103	30.29
75 – 79	Fairly Satisfactory (FS)	42	12.35
≤ 74	Did Not Meet Expectations	28	8.24
Mean = 85.26% (Very Satisfactory)			
SD = 7.22			

As shown in the table, the average percentage of students' knowledge of global warming is 85.26 percent, indicating a "very satisfactory" performance. The standard deviation is 7.22, indicating that students' ratings are far from the mean. Most students (31.47%) fall into the "outstanding" category and a significant proportion of them (30.29%) have a "satisfactory" level of knowledge. A smaller proportion of students (17.65%) are rated as "very satisfactory," and a smaller number of them fall into the "fairly satisfactory" (12.35%) and "did not meet expectations" (8.24%) categories.

Based on the indicators for identifying students' knowledge, simple questions such as "What is global warming?" and "Which of the following is a greenhouse gas?" have the most correct answers. On the other hand, broad questions such as "Which human activity is primarily responsible for the increase in methane emissions (CH_4)?" and "Without the natural greenhouse effect, the Earth would be like this on average?" are usually overlooked. This means that educators should not only focus on deepening basic knowledge, but also on exploring more nuanced topics. This is supported by Olarewaju et al. (2023) who assume that students' basic understanding of global warming is good, but their comprehensive knowledge is below average. Furthermore, Cavdar (2023) revealed that although students' awareness of global warming is strong, they know less about the underlying causes.

3.2 Attitude of Students Towards Global Warming

Table 2 presents data on student attitudes toward global warming based on the sample size of 340 students. The table indicates that majority of the students' responses fall into the "strongly agree" category, indicating a generally "very positive" attitude towards global warming, as shown by the composite mean of 4.34. The data indicate that students are "very positive" in expressing strong concern about the consequences of global warming for future generations ($w\bar{x}$ = 4.61), taking action to combat global warming by using renewable energy ($w\bar{x}$ = 4.55), recognizing that global warming is a serious global issue that requires attention from government and other agencies ($w\bar{x}$ = 4.24), and asking questions willingly to fully comprehend global warming ($w\bar{x}$ = 4.24). Similar to the study by Mazo and San Juan (2019), students who have information about the causes and consequences of global warming tend to participate in activities aimed at reducing or mitigating its impacts. These student behaviors reflect their proactive stance toward understanding and addressing this critical global issue and indicate promising potential for informed advocacy and decision-making in the future.

Table 2. Descriptive statistics of students' attitude towards global warming (n = 340)

	Indicators	$w\bar{x}$	VD	AI
1.	I feel like our generation should be concerned about global warming because of the continuous habits that destroy our mother Earth.	4.61	SA	VP
2.	I think it is important for every community to start using renewable energy to lessen the effects of global warming. This will give us a sense of a safer and brighter future.	4.55	SA	VP
3.	I am concerned about the consequences of global warming especially for the next generations to come.	4.53	SA	VP
4.	I feel that the issues of Global warming are very alarming.	4.46	SA	VP
5.	I feel it is important to take action to reduce greenhouse emissions which is essential to lessen the impacts of global warming.	4.33	SA	VP
6.	I feel like Global Warming is a global issue that the government and other agencies should focus on.	4.24	SA	VP
7.	I feel worried and afraid of the future consequences that I have watched and read in the media.	4.24	SA	VP
8.	I have to ask questions about global warming for me to fully understand this global issue.	4.24	SA	VP
9.	I think that it would be worth the cost to take significant actions to combat global warming.	4.17	A	P
10.	I have a feeling that human activities are amplifying or increasing the Earth's natural gases.	4.07	A	P
	Composite	**4.34**	**SA**	**VP**

Legend:	Scale	Verbal Description (VD)	Attitude Interpretation (AI)
	4.21 – 5.00	Strongly Agree (SA)	Very Positive (VP)
	3.41 – 4.20	Agree (A)	Positive (P)
	2.61 – 3.40	Moderately Agree (MA)	Moderate (M)
	1.81 – 2.60	Disagree (D)	Negative (N)
	1.00 – 2.60	Strongly Disagree (SD)	Very Negative (VN)

The table further shows that students "agree" that it would be worthwhile to take significant action to combat global warming ($w\bar{x}$ = 4.24) and they feel that human activities are increasing the Earth's natural gases ($w\bar{x}$ = 4.07). These two indicators got the lowest weighted mean and there is a need for educators to sway students to be more vigilant in this crucial issue. This result is supported by the studies of Khozin et al. (quoted by Hillary et al., 2023), Istoqomah et al. (2020), and Calculli (2021), which hold that students' attitudes regarding global warming improve with increasing knowledge. This is in line with what Yacek (2022) emphasized, to continually persuade learners to take action against detrimental habits that lead to global warming.

3.3 Practices of the Students to Minimize Global Warming

Table 3 provides data on the extent of students' practices to minimize global warming.

Table 3. Descriptive statistics of students' extent of practices to minimize global warming (n = 340)

	Indicators	$w\bar{x}$	VD	EoP
1.	I turn off lights and other electronic devices when not in use.	4.41	SA	VH
2.	I turn off the taps while washing my hands with soap or when I brush my teeth.	4.28	SA	VH
3.	I help segregate waste materials and recycle plastics	4.15	A	H
4.	I am a fan of using second-hand clothes or "ukay-ukay" to lessen the textile waste that may drastically contribute to global warming.	4.04	A	H
5.	I choose products with minimal packaging to reduce waste.	3.82	A	H
6.	I participate in activities that will help the environment (e.g., tree planting, clean up drive, earth hour, or reducing electrical consumption).	3.80	A	H
7.	I prefer to use a bicycle when going to school to reduce the burning of fossil fuels.	3.77	A	H
8.	I plant trees at home and in school to help absorb carbon dioxide then reduce the CO_2 level in the atmosphere.	3.68	A	H
9.	I minimize my screen time to help save energy and help lessen heat and carbon emissions.	3.66	A	H
10.	I share information about global warming and its impact with my classmates.	3.63	A	H
	Composite	**3.92**	**A**	**H**

Legend:	Scale	Verbal Description (VD)	Extent of Practices (EoP)
	4.21 – 5.00	Strongly Agree (SA)	Very High (VH)
	3.41 – 4.20	Agree (A)	High (H)
	2.61 – 3.40	Moderately Agree (MA)	Moderate (M)
	1.81 – 2.60	Disagree (D)	Low (L)
	1.00 – 2.60	Strongly Disagree (SD)	Very Low (VL)

The table shows the overall student responses, as indicated by the composite mean of 3.92, fall into the "agree" category, indicating that students are highly engaged in the various practices to minimize global warming. The students expressly demonstrate "very high" proactive behavior, such as turning off lights and electronic devices when not in use ($w\bar{x}$ = 4.41) and conserving water ($w\bar{x}$ = 4.28). They also "highly" practice segregation of waste materials ($w\bar{x}$ = 4.15) and participation in any environmental activities.

The table also reveals that these student actions indicate a strong commitment to personal responsibility and taking action to mitigate the effects of global warming. This finding is also similar to that of Genezira et al. (2020) and Nath et al. (2020), who found that students expressed their willingness to participate in the fight against global warming. It is important to continue to raise awareness and give students the opportunity to get involved in environmental initiatives to empower them to make a positive impact on the planet.

3.4 Relationship Between Variables

Table 4 shows the data on the relationship between the correlated variables such as (a) students' knowledge and attitude towards global warming, (b) students' knowledge and practices to lessen the problem of global warming, and (c) the students' attitude and practices to mitigate global warming.

Table 4. Correlation analysis for the relationship between variables

	r_s	p	Decision	Remark
Knowledge vs. Attitude	0.375	<.001	Reject H_{o1}	Significant
Knowledge vs. Practices	-0.043	0.430	Fail to reject H_{o2}	Not significant
Attitude vs. Practices	0.361	<.001	Reject H_{o3}	Significant

Spearman Rank Order Correlation at 0.05 Level of Significance

Using Spearman Rank Order Correlation, the data reveal that there is a significant relationship between the students' knowledge about global warming and their attitude towards global warming (p<.001). This finding implies that enhancing students' understanding of global warming through education can lead to more positive attitudes and potentially drive proactive actions to address climate change.

The result confirmed that of Calculli et al. (2021) who revealed that there is a positive relationship between respondents' awareness of global warming and concern about global warming. They also stated that as people became more knowledgeable about global warming, they would become more concerned about its negative impact on the environment. They also added that the higher the students' knowledge, the better their attitude towards global warming. Filho (2022) also emphasized that students' awareness of climate change increases as their concern increases.

The table also indicates that a significant relationship exists between students' attitudes toward global warming and their practices to minimize global warming (p<.001). This signifies that student who display better attitude towards global warming tend to have higher practices to mitigate global warming. This suggests that a favorable mindset can lead to concrete steps in safeguarding the environment. This is supported by the study by Kurup et al. (2021) who stated that as people become more knowledgeable about global warming in the future, they will become more motivated to adopt positive behaviors that enable them to make informed decisions and take responsible actions to raise awareness of the negative impacts of global warming. The results are also consistent with research by Malay (2019), which indicates that students' strong positive attitudes toward climate change issues are a strong predictor of their propensity to actively participate in addressing this global challenge.

Furthermore, the table reveals that there is no significant relationship between the students' knowledge about global warming and their practices to minimize global warming (p=0.430). This suggests that being aware of global warming does not always equate to actively reducing its consequences. This implies that people's actions to mitigate global warming may be influenced by causes other than awareness. The findings are in opposition to the study of Shikangalah (2019) as she revealed that students' level of knowledge will influence the way they feel about global warming, and this motivates them to act against global warming.

4.0 Conclusion

There is a promising trend in environmental education and awareness among students. The connection between students' knowledge of global warming and their attitudes toward it highlights the importance of education in shaping individuals' perceptions and concerns about climate change. Furthermore, the observed relationship between students' positive attitudes toward global warming and their practices to minimize it underscores the need to foster a sense of responsibility and proactive engagement among individuals.

While knowledge serves as the foundation, it is the attitude that ultimately drives action. Therefore, it is important to talk to the younger generation about topics that first raise awareness about the global warming crisis. Their belief in the origins and consequences of global warming will leave an emotional impact on them. Students are therefore expected to work responsibly to protect the environment.

However, the lack of a significant relationship between students' knowledge about global warming and their actual practices to minimize it reveals a critical gap between intention and action. Although students have a high level of knowledge about global warming, they may face barriers to translating this acquired knowledge into tangible behaviors.

5.0 Contributions of Authors

This study has a single author and his adviser reviewed and approved the final version of this paper.

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7.0 Conflict of Interests

The author declared that he has no conflicts of interest as far as this study is concerned.

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