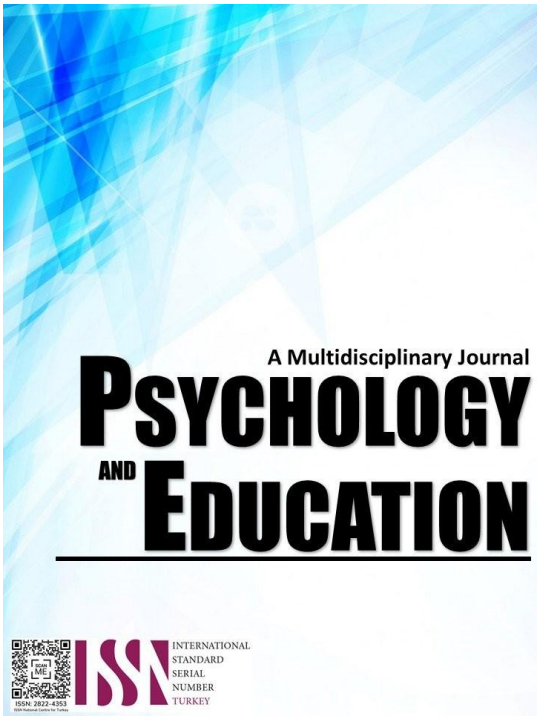
CARBON EMISSION AWARENESS AND PRACTICES OF TEACHERS AND STUDENTS TOWARDS A SUSTAINABLE "GO GREEN" CLASSROOM



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Research Article

Carbon Emission Awareness and Practices of Teachers and Students towards a Sustainable "Go Green" Classroom

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Abstract

The burning of fossil fuels and decayed organic matter emits carbon that could contribute to extreme heat and unpredictable weather conditions which people might not be aware of. This study aimed to determine the level of awareness and practices about carbon emissions among teachers and learners. Recognizing the vital role of school teachers and students in promoting positive attitudes and sustainable behaviors toward achieving a "Go Green" classroom, this study determines the extent to which carbon emission awareness transforms into practical actions within the school setting. A quantitative descriptive design was utilized and data collection gathered through survey questionnaires. Random sampling was employed to determine the sample size using the Cochran formula, and the Mann-Whitney U Test for data analysis to examine the differences between awareness and practices of teachers and students regarding carbon emissions. Findings revealed that participants, both students and teachers, showed a high level of awareness about carbon emissions. The results also showed a statistically significant positive correlation of teachers' and students' high levels of awareness and the sustainable strategies they follow to reduce carbon emissions. In contrast, students demonstrated an average level of practices, and participation in carbon neutrality and carbon footprint reduction initiatives was merely mediocre. It was also found out that there is a significant difference in the level of awareness and practices between teachers and students. The teachers have a higher level of awareness than the students about carbon emissions. The study highlights how critical it is to strengthen the school-based environmental initiatives that actively support environmental preservation. It is recommended to conduct symposiums on the relevance of carbon footprint to increase the level of awareness of teachers, students, and stakeholders. The teachers may collaborate with local organizations and communities to address carbon emissions and promote regular assessments in tracking personal carbon footprint to identify key areas for improvement towards a sustainable "Go Green" classroom.

Keywords: *carbon emission, awareness, practices, go green classroom*

Introduction

The environment that supports human and all biological processes had progressed into vulnerable condition where carbon emission dominates a huge factor and humans experienced sudden heating of the earth's atmosphere, an effect of global warming. The unfavorable weather condition through man-made activities such as burning of fossil fuels, plastics, illegal logging and improper waste disposal. As influenced by the extreme weather felt in M'lang, North Cotabato, carbon compounds are directly the source of these challenges. Mainly these compounds come from tons of improper solid waste disposal, rapid urbanization, the growing population and increasing number of infrastructures leading to respiratory-related diseases and high volume of garbage and pollutants which damages the air.

A total population of 4,079 junior-to senior-high school students and more than 157 teachers and 22 office staff of M'lang National High School in M'lang North, Cotabato is considered a large school that produces a significant amount of garbage debris every day. The burning of trash in each classroom as a method of disposing waste, misused classroom ventilation, a lack of a garbage disposal location, and smoke from car engines are some of the school vulnerabilities that lead to carbon emissions.

Essential to the growing need of education sector to respond to environmental issues, the researcher aimed to implement the concept of a "Go Green Classroom" which mainly focus in reducing our carbon emissions. It targeted on educating sustainability to promote awareness and practices among teachers and students in reducing carbon emissions in M'lang National High School and its community.

It was pointed out by the International Energy Agency (IEA) in 2021 that the global CO2 emissions had increased to the highest levels ever with the increased usage of coal and energy. The continued increase CO2 in the atmosphere is one of the results of lack of awareness and knowledge of individuals about the impact of their daily activities to the environment. It was highlighted by Winterich et al., (2024) that consumers fail to act on climate by not knowing enough about carbon emission. The World Bank in 2021 explored the Philippines transport sector as a source of CO2 emissions, which contributes to a large share of fuel combustion emissions. The results also showed the dependency on fossil fuel and transport. Thus, the world wrestles with the urgent need to mitigate and adapt to the effects of climate change, the education sector has a crucial role to play in promoting sustainable practices and reducing its carbon footprint as emphasized by Kwauk & Winthrop (2021).

Schools, as educational institutions responsible for shaping the knowledge, skills, attitudes, and behaviors of future generations, are uniquely positioned to make a substantial contribution to the fight against climate change as discussed by Molthan-Hill et al., (2019). And by integrating eco-friendly practices and environmental education into the curriculum, could foster a culture of sustainability

among students and teachers, empowering them as catalysts of change in their communities and beyond.

Research Questions

This study aimed to educate sustainability to promote awareness and practices among students and teachers in reducing carbon emissions in M'lang National High School towards "Go Green Classroom". It specifically sought to answer the following sub-questions:

1. What is the demographic profile of the public-school teachers and students in terms of:
    1.1. teachers;
        1.1.1. sex;
        1.1.2. age;
        1.1.3. subject taught;
    1.2. students;
        1.2.1. sex; and
        1.2.2. grade level?
2. What is the level of awareness of the teachers and students on carbon emissions?
3. What is the level of practices of the teachers and students on carbon emissions?
    3.1. personal practices; and
    3.2. school practices?
4. Is there a significant relationship between the level of awareness and practices on carbon emission of teachers and students?
5. Is there a significant difference between the teachers and students' awareness on carbon emission practices of personal and school practices?
6. What plan of action should be proposed for the Go Green Classroom implementation based from the result of the study?

Literature Review

Carbon dioxide emissions mainly come from solid waste, deforestation, increasing livestock farming, fluorinated gases which are emitted from equipment and products that use these gases, burning coal, oil and gas produce carbon dioxide and nitrous oxide. As every ton of Co2 emitted contributes to global warming reducing emissions of other greenhouse gases such as methane can have powerful effect in slowing down global warming. Energy and resource efficiency are the first step for an established school when beginning carbon reduction journey. This section explored studies relevant to carbon emission reduction efforts of agriculture, education, engineering and business sectors that gained insights for the implementation of a "Go Green Classroom" in schools specifically in M'lang National High School. It overviewed the "Go Green Classroom" concept and its significance in fostering environmental sustainability. The concept of carbon footprint originated from ecological footprint discussion developed by William E. Rees and Mathis Wackernagel in the 1990s which was an accounting approach that compares how much people demand compared to what the planet can renew. It was emphasized by EPA (2014) that a person's carbon footprint includes greenhouse gas emissions from fuel that he or she burns directly, such as by heating a home or riding in a car. It also included greenhouse gases that come from producing the goods or services that the person uses, including emissions from power plants that make electricity factories that make products and landfills where trash gets sent.

Methodology

Research Design

A quantitative design using a descriptive method was employed. The study was conducted in a public secondary school in Region XII, Philippines, where the students studied and teachers were employed. 323 respondents participated in this study: 43 teachers and 280 students. The survey was conducted face-to-face. Data collection was obtained and analyzed through the use of the statistical tool.

Procedure

The data gathering procedure for this study begun through obtaining the necessary permissions and approvals from the relevant authorities, the researcher accomplished a written letter of permission to the Schools Division Superintendent, Division Research Coordinator, and Principal. The researcher had provided a detailed description of the study to facilitate the approval process. Furthermore, the researcher had closely coordinated with the school administration for the planning of the logistics of the data collection, such as scheduling the survey administration, identifying suitable venues, and disseminating information about the study to the participants. Prior to the actual data collection, the researcher obtained an informed consent from all the participants, explaining the purpose, procedures, and potential risks and benefits of the study. The participants were assured of the confidentiality and anonymity of their responses and their right to refuse to participate or withdraw from the study at any time without consequences.

On the day of the data collection, the researcher administered the questionnaire to the students and teachers in their respective classrooms or designated venues, providing clear instructions and being available to answer any questions. After the completion of the survey, the researcher collected the questionnaires, ensured that they are properly labeled and organized, and enter the data into a

database or statistical software for analysis. Appropriate measures were taken to ensure the security and confidentiality of the data. Following the data analysis, the researcher had provided feedback to the school administration and the participants on the key findings and recommendations of the study, and was available for any follow-up questions or clarifications. Throughout the data gathering procedure, the researcher had adhered to the highest ethical standards, minimize potential risks or discomforts to the participants, and conduct the study in a manner that is respectful and non-intrusive

Ethical Considerations

This adhered to responsible conduct of the study and will abide by the ethical principles with utmost importance involving students and teachers. Informed consent obtained from all participants, clearly explaining the purpose, procedures, risks, benefits, confidentiality measures, and their right to withdraw without consequences. Strict confidentiality and anonymity protocols was followed and all personal data collected through surveys was anonymized and securely stored with restricted access. Special precautions are necessary when working with minors, potentially requiring parental consent and compliance with relevant regulations. Cultural sensitivity and respect for diversity was maintained throughout the study process.

The study also ensured that no participant experienced harm, discrimination, or undue pressure. Prior to data collection, ethical clearance was secured from the MSU-GSC institutional ethics committee.

The study aimed to protect participants' rights and dignity while ensuring the credibility and reliability of its findings by adhering to these ethical standards.

Results and Discussion

This section presents the results, analyses, and interpretations of the data gathered to provide answers on the problems of the study. Tables, figures, and texts are used for the presentation, interpretation, and analysis of the gathered data of the study.

The findings of the study are as follows:

Table 1. *Level of Awareness of the Teachers and Students on Carbon Emissions*

Indicator	*Teacher*		*Student*	
	WM	*Des*	*WM*	*Des*
1. I am aware of the concept of carbon emissions and their impact on the environment.	4.05	HA	3.05	MA
2. I understand the role of human activities in contributing to carbon emissions.	4.49	HA	3.53	HA
3. I am familiar with the term "carbon footprint" and what it represents.	3.88	HA	3.07	MA
4. I am aware of the various sources of carbon emissions in my daily life.	4.02	HA	3.46	MA
5. I understand the importance of reducing carbon emissions to combat climate change.	4.84	EA	4.99	EA
6. I am knowledgeable about the greenhouse effect and its relationship with carbon emissions.	4.81	EA	4.98	EA
7. I am aware of the global initiatives and agreements aimed at reducing carbon emissions.	4.72	EA	4.96	EA
8. I understand the concept of carbon sequestration and its role in mitigating climate change.	3.95	HA	3.45	MA
9. I am familiar with the term "carbon neutral" and its significance in reducing carbon emissions.	3.91	HA	3.12	MA
10. I am aware of the potential consequences of not taking action to reduce carbon emissions.	4.02	HA	3.54	HA
Mean	4.27	HA	3.82	HA

Legend: 4.50-5.00 Extremely Aware (EA), 3.50-4.49 Highly Aware (HA), 2.50-3.49 Moderately Aware (MA), 1.50-2.49 Slightly Aware (SA), 1.00-1.49 Not Aware (NA)

The study's findings revealed that participants, both students and teachers, showed a high level of awareness about carbon emissions. In particular, teachers demonstrated a very high level of awareness with a mean score of 4.27, while students also manifested a high level of awareness with a mean gain score of 3.82. The data showed that teachers are more aware of the information about carbon emissions than students, even though they got both “highly aware’ descriptions.

The result of the study supported by Punzalan (2019), who stated that there is a need to know how awareness can translate to practical environmental actions among students, which is the concern of the present research. Captive students for environmental education and encouraging students to perform real-life activities help a lot to make sustainable change throughout the education system. The results also show the lack of effective interventions that would help to close the knowledge and attitude gap, which is in line with the attempts to foster carbon reduction practices in classrooms

In Table 2, The teaches evaluated as High practiced in terms of personal and school practices as shown in Table 2. Personal practice (M= 3.84) school practice (M=3.23) this result revealed that they make environmentally choices and efforts to reduce their carbon emissions. For students, it revealed a result that they moderately practiced carbon emission reduction practices on their personal

(M=3.23) and school (M= 3.49) practices which demonstrated only an average level of engagement and reduction strategies. Teachers showed a high level of engagement in carbon emission reduction strategies, both personally and within the school setting.

Table 1. *Level of Practices of the Teachers and Students on Carbon Emissions*

Indicator	*Teacher*		*Student*	
	WM	*Des*	*WM*	*Des*
Personal Practice				
1. I consciously make efforts to reduce my carbon footprint in my daily activities.	3.58	HP	3.01	MP
2. I use energy-efficient appliances and devices to minimize carbon emissions.	3.91	HP	3.12	MP
3. I prioritize using eco-friendly transportation methods (e.g., walking, cycling, public transport) when possible.	3.65	HP	3.48	MP
4. I actively participate in recycling and waste reduction practices to lower carbon emissions.	3.84	HP	3.31	MP
5. I encourage and educate others about the importance of adopting eco-friendly practices to reduce carbon emissions.	3.72	HP	3.61	HP
6. I make conscious efforts to conserve energy in my daily life (e.g., turning off lights, unplugging devices).	4.05	HP	3.41	MP
7. I choose products with minimal packaging to reduce waste and carbon emissions.	3.98	HP	3.17	MP
8. I support and participate in local initiatives and projects aimed at reducing carbon emissions.	3.91	HP	3.07	MP
9. I make environmentally conscious choices when it comes to my diet (e.g., reducing meat consumption).	4.07	HP	3.10	MP
10. I regularly assess and track my personal carbon footprint to identify areas for improvement.	3.74	HP	2.99	MP
Mean	3.84	HP	3.23	MP
School Practice				
1. My school promotes awareness about carbon emissions and their environmental impact.	3.79	HP	3.51	HP
2. My school implements energy-saving measures to reduce its carbon footprint.	3.77	HP	3.57	HP
3. My school encourages the use of eco-friendly transportation among students and staff.	3.65	HP	3.60	HP
4. My school actively participates in recycling and waste reduction programs.	3.93	HP	3.82	HP
5. My school organizes events and activities to promote eco-friendly practices and reduce carbon emissions.	3.86	HP	3.75	HP
6. My school incorporates education about carbon emissions and climate change into its curriculum.	3.95	HP	3.25	MP
7. My school has a dedicated committee or team responsible for implementing eco-friendly initiatives.	4.00	HP	3.46	MP
8. My school collaborates with local organizations and communities to address carbon emissions and environmental issues.	3.58	HP	3.42	MP
9. My school encourages the use of renewable energy sources (e.g., solar panels) to reduce its carbon footprint.	3.84	HP	3.26	MP
10. My school regularly evaluates and reports on its progress in reducing carbon emissions.	3.67	HP	3.29	MP
Mean	3.80	HP	3.49	MP
Over-all Mean	3.82	HP	3.36	MP

Legend: 4.50-5.00 Very Highly Practiced (VP), 3.50-4.49 Highly Practiced (HP), 2.50-3.49 Moderately Practiced (MP), 1.50-2.49 Slightly Practiced (SP), 1.00-1.49 Not Aware (NP)

In contrast, students demonstrated only an average level of engagement in both personal and school-based carbon emission practices. Over-all, the computed mean of 3.82 is described as highly practiced. This indicates that the teachers have high level of practices on carbon emissions.

Winterich et. Al (2024) emphasizes that schools, as fundamental units of learning systems, can champion the effort of addressing such knowledge deficits by incorporating carbon footprint education in their curriculum. Misconceptions about emissions can be corrected, and by doing so, students and teachers can be empowered to make the right choices towards sustainability. The strategies derived from the study are also in line with the idea of knowledge mobilization to enhance practice in schools and enhance community engagement in the reduction of carbon emissions.

Table 3. *Relationship between Level of Awareness and Level of Practices of Teachers and Students on Carbon Emissions*

Variables Correlated	*r*	*r2*	*p-value*	*Extent of Relationship*	*Remark*
Level of Awareness and The Level of Practices of Teachers and Students on Carbon Emissions	.587	.345	.000	Moderate	Significant

Results reveal that there is a moderate positive significant correlation between level of awareness and the level of practices of teachers and students on carbon emission, r (323) = .587, p =.000 < .05, explaining 34.5% of the variations in the level of practices of teachers and students on carbon emissions. The other 65.5% of the variations are due to other variables. These results imply that the level of awareness of teachers and students significantly influence their level of practices on carbon emission. These findings also suggest that as the level of awareness on carbon emission increases and so is their practices on carbon emission.

There is a moderate positive significant correlation between the level of awareness and the level of practices of teachers and students on carbon emissions, as shown in Table 4. The level of awareness of teachers and students significantly influences their level of practice on carbon emissions. As the level of awareness on carbon emissions increases and so do their practices on carbon emissions.

A significant difference between the levels of awareness and practices of teachers and students was also shown. Compared to their student counterparts, teachers were found to have a significantly higher level of awareness and more developed practices linked to reducing carbon emissions. These results demonstrate how awareness affects behavior and the necessity of more effective educational interventions to raise student awareness and encourage involvement in sustainability projects.

In the study of Adanza (2016), he argued that there is a need to enforce green management in the academic community to be more aware of the issue of carbon footprint. Aside from this, the school may promote and maintain advocacies that could mitigate its carbon footprint.

In addition, schools should be concerned with their carbon footprint and the author notes that schools are some of the biggest polluters when they do not embrace sustainability. The study finds out that adherence to green practices like energy conservation and waste management drastically reduces carbon emission and strengthens the environmental consciousness of stakeholders, Schifter (2021).

Table 4. *Difference Between the Mean Responses of the Teachers and Students on their Level of Awareness and the Level of Practices on Carbon Emission.*

Indicator	*Teacher*	*Student*	*Mann-*	*Z-value*	*p- value*	*Remark*
	Mean Rank	*Mean Rank*	*Whitney U*			
Awareness	238.36	150.27	2736.50	5.775	.000	Significant
Practices	228.31	151.82	3168.50	5.004	.000	Significant

Table 4 presents the difference between the mean responses of the teachers and students on their level of awareness and the level of practices on carbon emission. Results reveal that there is a significant difference on the level of awareness of the teachers and students as evidence by the Mann-Whitney U test (2736.50) and a p-value of .000. Results also reveal that the teachers have higher level of awareness than the students on the carbon emission.

Similarly, there is a significant difference on the level of practices of the teachers and students as evidence by the Mann-Whitney U test (3168.50) and a p-value of .000. Results also reveal that the teachers have higher level of awareness than the students on the carbon emission.

There is a significant difference in the level of awareness between teachers and students. The teachers have a higher level of awareness than the students about carbon emissions. Similarly, there is a significant difference in the level of practice between the teachers and students. The teachers have a higher level of awareness than the students about carbon emissions.

Conclusions

Teachers and students manifested a high level of awareness of carbon emissions. Teachers demonstrated a clear understanding of the importance of reducing carbon emissions. Additionally, they demonstrate a thorough understanding of the greenhouse effect and how it relates to carbon emissions, as well as familiarity with global efforts and accords to reduce carbon emissions. Although student participants also exhibit high knowledge in these areas, their understanding of ideas like carbon footprints and carbon neutrality is mediocre.

Teachers exhibit a high level of involvement in attempts to reduce carbon emissions in terms of their practices. Both their personal and school-related behaviors demonstrate this. On the other hand, student participants' carbon emission habits, both individually and within the school setting, are mediocre. Teachers' and students' knowledge and practice levels were shown to be positively correlated in a moderate but statistically significant way. This implies that a rise in the adoption of sustainable practices is correlated with a rise in knowledge of carbon emissions. As a result, behavioral practices linked to reducing carbon emissions are significantly predicted by awareness.

Furthermore, the study found a substantial difference in teacher and student awareness levels, with teachers demonstrating a higher degree of awareness. A similar large disparity was noticed in their different practices, with teachers once again outperforming students. These findings underscore the need to improve students' understanding and participation in carbon emission reduction initiatives, emphasizing education's role in fostering environmentally responsible behavior.

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