

Carbon Footprint and Climate Change Awareness: Implications for Climate Change Education in a Junior High School

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ABSTRACT

The study used a correlational analysis descriptive survey to identify the relationship between the students' awareness of climate change and their carbon footprint engagement. The study was conducted using validated questionnaires in one of the private universities in Cebu City, focusing on students in levels 7, 8, 9, and 10.

The study's findings showed that the students exhibited an overall partial understanding of climate change. In addition, the students also exhibited understanding on the definition, carbon emission, influences, and impact of one's carbon footprint. In terms of the student's level of engagement in carbon footprint, the students manifested an overall low level of engagement. Moreover, the correlation of the results revealed no significant relationship between the student's level of awareness of climate change and their level of engagement in carbon footprint.

The study recommended that the school administrators and curriculum experts provide innovative and appropriate environmental education interventions such as trainings to educators; teachers be guided in ensuring that their students have a deeper understanding of how to reduce their carbon footprint and the implications of climate change, as well as a true evaluation that places an emphasis on using what they have learned to solve problems in the real world; parents should be informed to make aware of how positive environmental actions at home contribute to mitigating climate change and help reduce carbon footprint; and future researchers should consider expanding the variables involved in the study of climate change awareness and carbon footprint engagement.

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KEYWORDS: *climate change education, carbon footprint engagement, environmental education*

1. THE PROBLEM AND ITS SCOPE

Rationale

Climate change is affecting the entire world right now. Evidence of climate change such as extreme weather occurrences, food shortages (poor crop yield and preservation), the appearance of new illnesses, and hastened sea-level rise are becoming more common in communities worldwide and are affecting every aspect of human socioeconomic activity ("Special report on the ocean and Cryosphere in a changing climate —," 2020).

These aggravating impacts of climate change are accredited to the enormous carbon footprint. Between 1990 and 2005, carbon dioxide emissions grew by 31% and continued to rise by 35% in 2008 ("Effects of carbon footprint," 2018). Since then, emissions have continued to increase quickly ("CO2 emissions,"

n.d.). With this clear scientific evidence, the international community has agreed about the need for more action to address the climate emergency (IPCC, 2018; United Nations, 2015). Several countries such as the UK, Norway, France, New Zealand, and even the Philippines started to address climate change in various sectors.

Scientists, policymakers, and educators emphasized that, in addition to addressing climate change through policymaking, it is crucial first to understand the public's climate knowledge and literacy to promote behavior change and create an influential community (Foss & Ko, 2019). It is highlighted that seeking fundamental, long-term shifts in understanding climate change and carbon footprint could increase

national action and commitment, particularly among the youth (UNESCO & UNFCCC, 2016, p. 14). Help from different sectors, especially students, is significant to achieving this goal. Educational institutions, particularly schools, serve as excellent testing grounds for environmental changes by enhancing ecological education and pursuing certain activities that will nurture the environment.

However, studies outside the Philippines highlighted the difficulties of effectively educating climate change and encouraging students to take meaningful climate action in the future (Boon, 2016; Ho & Seow, 2015). The lack of climate science understanding and misconceptions among students and instructors makes it challenging to realize the importance of their actions entirely (Busch et al., 2018). Given its young nature, the educational response to climate change is highly inconsistent in different countries since the public understanding of climate issues varies widely by different factors such as geographic location and socioeconomic status (Howe et al., 2015; Huxster et al., 2015; Shealy et al., 2017).

Up to date, research concerning students' awareness and engagement regarding the issue of climate change has been done mainly outside the Philippines. Limited to very few are done specifically for a Philippine classroom setting and in line with the recent K to 12 curricula. Given the importance of identifying students' understanding and engagement in climate change and the limited studies conducted in the Philippine classroom setting, this study aims to know the students' level of awareness and identify its relationship to their level of engagement. Understanding the relationship of students' understanding of climate change and their action against it will serve as a tool to help teachers provide students a better deal with this issue and help schools evaluate if their environmental education goals are achieved or not.

The Problem

Statement of the Problem

The study aimed to determine the students' awareness about climate change and correlate it to their carbon footprint engagement. It also aimed to identify what intervention can be done to enhance their awareness of climate change and their engagement in carbon footprint. Specifically, this study sought to answer the following questions:

1. What is the respondents' level of awareness on climate change?
2. What are the respondents' understanding of carbon footprint?
3. What is the respondents' level of engagement in carbon footprint?

4. Is there a significant correlation between the respondents' level of awareness on climate change and their level of engagement in carbon footprint?
5. What intervention may be proposed to enhance the respondents' awareness on climate change and their engagement in carbon footprint?

Hypothesis of the Study

To answer the problems in the study, this was the null hypothesis:

H₀₁: There is no significant correlation between the respondents' level of awareness on climate change and their level of engagement in carbon footprint.

Theoretical Background

Related Theories

This study was anchored on the **Theory of Planned Behavior** (Icek Ajzen, 1985, 1991) **Theory of Environmentally Responsible Behavior** (Jody Hines, Harold Hungerford, and Audrey Tomera, 1987) **Situated Cognition Theory** (Paul Duguid, John Seely Brown, and Allan Collins, 1989) and **Ecological Systems Theory** (Urie Bronfenbrenner, 1898) to support the claims presented.

Theory of Planned Behavior by Icek Ajzen (1985, 1991) features behavioral intentions, which are the primary factor in predicting actual behavior (De Leeuw et al., 2015). The idea of planned behavior identifies three distinct concept determinants of choice. The first is the attitude toward the behavior, which refers to how a person evaluates or appraises the conduct in question favorably or unfavorably. The second predictor is a social factor known as the subjective norm, which refers to the pressure from society to perform or refrain from performing the behavior. The third antecedent of intention is perceived behavioral control, which refers to the ease or difficulty of executing the behavior and is assumed to reflect the prior experience and anticipated impediments and obstacles (Ajzen, 1991). Because attitudes influence behavior, an individual may or may not perform certain behaviors due to a person's characteristics. Nonetheless, perspectives provide a stimulus for the behavior to emerge influenced by personal, social, or informational factors; they assist in evaluating behavior positively or negatively, succumbing to or resisting social pressure, and behaving in one way or another.

Theory of Environmentally Responsible Behavior by Jody Hines, Harold Hungerford, and Audrey Tomera (1987) considers the significant variables that influence the individual adoption of environmentally responsible behavior. According to the theory, the internal control center substantially impacts the

intention to act, significantly affecting an individual's behavior. It also emphasizes a relationship between the control center which directly impacts individuals' attitudes, and will act, leading to a better intention to action and better behavior. For example, in waste management systems, no single element is responsible for current behaviors or sufficient to initiate or cause behavior change. People in large cities, for example, pile up their trash in the center of the streets, despite waste management authorities' policies barring such behavior. Some do it at strange hours when law enforcement is unavailable. Others are influenced to dump these waste materials indiscriminately because they observe others doing so, while some still find ways to dispose of their waste materials properly. It demonstrates that mere knowledge is insufficient to act appropriately toward the environment. In contrast, some people's understanding of the environment and its restrictions may lead to a positive mindset, which translates into excellent intentions to act. Other people may experience internal and external control, such as being influenced by the acts of others or adhering tenaciously to a notion that they are acting correctly despite the actions of others toward their surroundings. Although isolated constructions of attitudes, control center, and intention to act may not be sufficient to generate an intention to act, combined under one overarching idea, they serve as a foundation for forming pro-environmental behavior predispositions (Akintunde, 2017).

Situated Cognition Theory by Paul Duguid, John Seely Brown, and Allan Collins (1989) features knowledge and its acquisition, one of the principal factors in evaluating an action. In this study, the theory, designed to understand that cognitive development occurs through the interaction of "brain, body, and world," emphasizing the role of perceptions, mind, and tool-mediated action (Sezen-Barrie et al., 2019). To assist students in applying and fully synthesizing new knowledge, one must situate the learning process in everyday life. Instead of allowing students to store what they learn, which they will eventually forget, educators must enable students to use and practice their knowledge, which will eventually become useful (Situated Cognition: Theory & Definition, 2016). Unique prior understanding of the situation was also brought up, thus connecting learning to the beliefs, norms, intentions of an individual to act. Furthermore, all skills and activities would be directly applicable to real-world scenarios, at home or in the community.

Ecological Systems Theory by Urie Bronfenbrenner (1898) further supported the students' knowledge

acquisition. This theory claimed that the environment in which an individual grows up influences every aspect of their life (Santa Clara University, 2022). Social factors influence their way of thinking, emotions, and likes and dislikes. This theory emphasized that individuals are typically entangled in various ecosystems, from the most private home environmental system to the more extensive school system to the most comprehensive approach, including culture and society. Each of these ecological systems eventually interacts with and influences individuals' lives in various ways ("What is Bronfenbrenner's ecological systems theory?," 2021). In addition, the systems assisted teachers and school administrators create school environments tailored to their students' needs, characteristics, culture, and family backgrounds (Taylor & Gebre, 2016). The teachers and school administrators can use it to increase students' academic achievement and educational attainment by involving parents and observing other contextual factors (e.g., students' peers, extracurricular activities, and neighbors) that may help or hinder their learning (Schunk, 2016).

Related Literatures

The carbon footprint is the entire volume of greenhouse gases (GG) produced by daily economic and human activities. It is often credited to direct and indirect emissions produced by an individual and related to the individual depending on their location and socio-economic status. Certain people emit carbon dioxide at a higher rate than others ("What is the carbon footprint and why will reducing it help to combat climate change?," 2020). According to the Nature Conservancy, each person on the Earth emits around four tons of carbon dioxide per year on an average while, each person in the United States emits roughly 16 tons of carbon dioxide each year. Personal carbon footprint is what an individual leaves behind due to moving around, consuming, eating, and using resources like energy ("Our priorities: Tackle climate change," 2019). The Global Footprint Network emphasizes that the carbon footprint has not ceased expanding. In fact, since 1961, it has expanded elevenfold and currently accounts for 60% of the full impact of man on the environment ("Climate change," 2016). Over time, the increase in carbon dioxide in an individuals' carbon footprint results in climate change and causes disastrous effects in the community, especially in humans.

Over several decades or more, climate change is described as a significant change in average weather conditions, such as growing warmer, wetter, or drier. Climate change today, especially since the mid-twentieth century, is happening at a far faster rate

than it has in the past, and it can't be explained just by natural reasons ("Global climate change: What you need to know," 2021). The consequences of global climate change have been observed already. Trees are flowering earlier, glaciers have receded, river and lake has broken up earlier, plant and animal ranges have changed, and trees have diminished (Jackson, 2021). Our health, housing, ability to grow food, safety, and job can all be affected by climate change. People who live in small island nations and other impoverished countries, for example, are already more sensitive to the effects of climate change. Sea level rise and saltwater intrusion have forced entire villages to evacuate, and people are at risk of starvation due to prolonged droughts ("Climate change: Evidence and causes," 2020). Ironically, individuals bear the responsibility for reversing this alarming trend. According to Lavorel et al. (2020) understanding how ecosystems adapt to climate change will allow for more proactive management and administration of ecosystem transformation.

In order to find a solution to the global issue, the United Nations Framework Convention on Climate Change initiated a global environmental convention to counteract "dangerous human involvement with the climate system," in part by regulating greenhouse gas concentrations in the atmosphere. The treaty, which is joined by several countries including the Philippines, ensures that ecosystems can naturally adapt to climate change, that food production is not compromised, and sustain economic development ("United Nations Framework Convention on Climate Change," 2001). In addition, nearly every country on the planet oath to take steps to reduce global warming by transitioning away from dirty fossil fuels towards clearer, more innovative energy sources at the 2015 Paris Climate Change Conference ("Climate change," 2020).

At a national level, as a developing country, the Philippines also pledges to assist in preventing environmental problems that could affect the environment. After submitting its Intended Nationally Determined Contribution (INDC) to the United Nations, the Philippines has pledged to reduce greenhouse gas emissions by 70% from the current level by 2030 ("Philippines commits to reduce carbon emissions by 70%," 2015). In addition, the National Climate Change Action plan provides adaptation and mitigation plan for 2011 to 2028 as it prioritizes food security, water sufficiency, sustainable energy, and etc. (Vizzuality, 2011). Furthermore, the Philippines also recognizes the importance of education in promoting action and awareness in order to protect our planet, thus creating the Republic Act No. 9512 or the "National Environmental Awareness and

Education Act of 2008". This law requires environmental education to be integrated into all courses and academic institutions and must promote awareness of environmental issues through environmental education ("Republic Act No.9512 on national environmental awareness and Education Act, 2008," 2008). In order to enhance the environment, individuals must engage in environmental education in which they can investigate environmental issues, solve problems, and act. With these, the individuals gain a better grasp of environmental issues, and they are more equipped to make educated and responsible decisions ("What is environmental education?," 2021).

The international group also recognizes the significance of education and training in the fight against climate change. On the report of the United Nations Framework Convention on Climate Change, the Paris Agreement, and the related Action for Climate Empowerment (ACE) agenda, all stakeholders and critical groups should be educated, empowered, and engaged in climate change policies and actions (UNESCO, 2021). Moreover, in the Philippines, through the DRRMS or the Disaster Risk Reduction Management and Services, the Department of Education renews its commitment to improve climate change education and promote climate action in the primary education sector. To promote resilient and sustainable schools, DRRMS also seeks to develop learners and professionals who are climate-educated and proactive ("Climate change education," 2020).

Climate change and climate change education are global issues that require a combination of local education and action and broader shift in mindsets ("Climate change education in sustainable development," 2021). Thus, quality climate change education should explore and disseminate climate knowledge as well as promote climate protection actions.

Related Studies

The following pertinent studies were reviewed to give the study more depth.

Given the importance of mitigating this climate problem, various sectors, including politicians and scientists, have urged that it is first imperative for everyone to know the underlying aspects behind climate change to combat this environmental problem. Incorporating lessons on climate change and carbon footprint in the curriculum is one method to achieve this. Several articles on environmental education provided directions on promoting environmentally friendly behavior and insights into the relationships between education and behavior

change. Studies have shown that implementing climate change education in the curriculum positively affects the graduates' environmental behavior. Most course graduates on individual carbon emissions reported pro-environmental decisions (e.g., food choices, type of car to buy) that they attributed partly to their course experiences. These course graduates started to have a strong personal connection to climate change solutions, reflected in their daily behaviors and professional careers (Cordero et al., 2020) and were the most knowledgeable about global warming and carbon footprint (Freije et al., 2017). Specifically, graduates from environmental science departments have more class experience on climate change than students from the humanities and other faculties. In addition, Cutter-Mackenzie & Rousell (2018) also emphasized that when climate change education is without exception and led by young people, it can open an entirely new educational experience and inquiry field. The study of Siegner & Stapert (2019) that evaluated a climate change curriculum implemented in a middle school classroom showed that students exhibit high levels of climate literacy, developments in reading comprehension, and an overall engagement on climate change and carbon footprint topics.

Furthermore, Barreda (2018) emphasized that the higher the students' year level, the higher their awareness of the basics of climate change and carbon footprint. A similar idea was observed in the study of Oz-Aydin (2016), where 9th-grade students exhibit high awareness of the aspects of impact – household and transportation components of carbon footprint. These positive environmental behaviors attributed to the student's knowledge of climate change and carbon footprint showed the importance of incorporating climate change studies in schools and universities (Ayanlade & Jegede, 2016). However, on the other hand, Boucher (2016) suggested that as these students graduate and are out in the academic system, only a few are concerned about climate change. The results revealed that only 18% of the surveyed adult population was the most concerned about climate change. These results might have to do with the educational attainment, demands on their job, income, and cultural characteristics of the surveyed population. This emphasized that apart from one's knowledge, other factors play a role in the exhibition of one's pro-environmental behaviors.

Several studies have opposed the idea that knowledge is connected to awareness and then to action and that knowledge and skills are insufficient to change behavior. These studies have reported that for action to be activated, the student must learn, understand, and engage in certain activities concerning the issue

of climate change. Hoffman & Mutarak (2020) emphasized that while there is little evidence linking education to positive environmental behavior, little is known about knowledge concerning students' positive decision-making mechanisms toward the environment. Furthermore, in the study of Busch et al. (2019), it was emphasized that knowledge about the causes and effects of climate change was a poor predictor of behavior. Studies have found that didactic approaches to teaching climate change have had little impact on students' attitudes and behaviors (Rousell & Cutter-Mackenzie-Knowles, 2019). These approaches may not be effective in making the students understand and develop pro-environmental behaviors towards the environment.

Moreover, Shealy et al. (2017) mentioned that time spent on science homework or science-themed extracurricular activities is more predictive of belief than time spent in class discussing climate change. McNeal et al. (2014) and Akrofi et al. (2019) pointed out that students are more engaged in pro-environmental attitudes and behaviors through activities rather than the typical student-centered lecture types of discussion. Students are more involved during movie viewing and debate than lectures, with measurable increases when discussing climate solutions and local implications. Participation in various climate-related clubs and activities and regional manifestations of the effects of climate change influenced their knowledge and awareness of climate change. The students' positive engagement towards the environment was manifested through their purchasing and household practices (Bulbul et al., 2020). Similarly, in the study of Li et al. (2015), the average annual carbon footprint per student is 3.84 tons of CO₂, equivalent to 65%, attributable to daily life, 20% to transportation, and 15% to academic activities such as studying. Furthermore, besides knowledge, more individualized features like a solid connection to nature, personal relevance to the issue, and individual initiative to act are crucial components that support the success of behavior change programs. Factors such as perceptions and beliefs play an essential role in an individual's behavioral change. In the study of Ratinen (2021), students' knowledge of climate change and their understanding of mitigation and adaptation were utilized to predict their outlook on climate change. Results showed that these students had a high level of constructive hope and emphasized their belief that people would act to mitigate and stop climate change disasters. The study presented that young people are more likely to feel hopeful when concerned about environmental issues and think everyone, including them, can find solutions to these climate change

issues. The children’s perceptions of their ability to influence change on a personal, local, and governmental level were found to be linked to their climate change engagement (Ross et al., 2021). The connection between these factors was also evident in the study of Lombardi et al. (2016), where students showed an interesting correlation between the evaluation of students, their opinions of the credibility of the causes of the present climate change, and their understanding of human-induced climate change. The ecological imbalances caused by human perspectives on the natural environment and consumption patterns are expanding daily. This means that even in their most fundamental decisions, humans leave their ecological mark on the planet (housing, nutrition, travel). However, these footprints can be decreased

by taking specific steps such as significantly reducing consumption and preventing wasting resources (Akten & Akyol, 2018).

The uncertainties in determining the factors contributing to the development of pro-environmental behavior cited in the previous studies make it challenging to implement and encourage behavioral change in the students. A few studies also focused on the Philippine setting and its curriculum. Thus, this study was conducted to know the junior high school students' awareness of climate change, their carbon footprint measurement, and identify its relationship.

Based on the aforecited literature and studies relevant to the present study, the theoretical-conceptual framework of this study is presented in Figure 1.

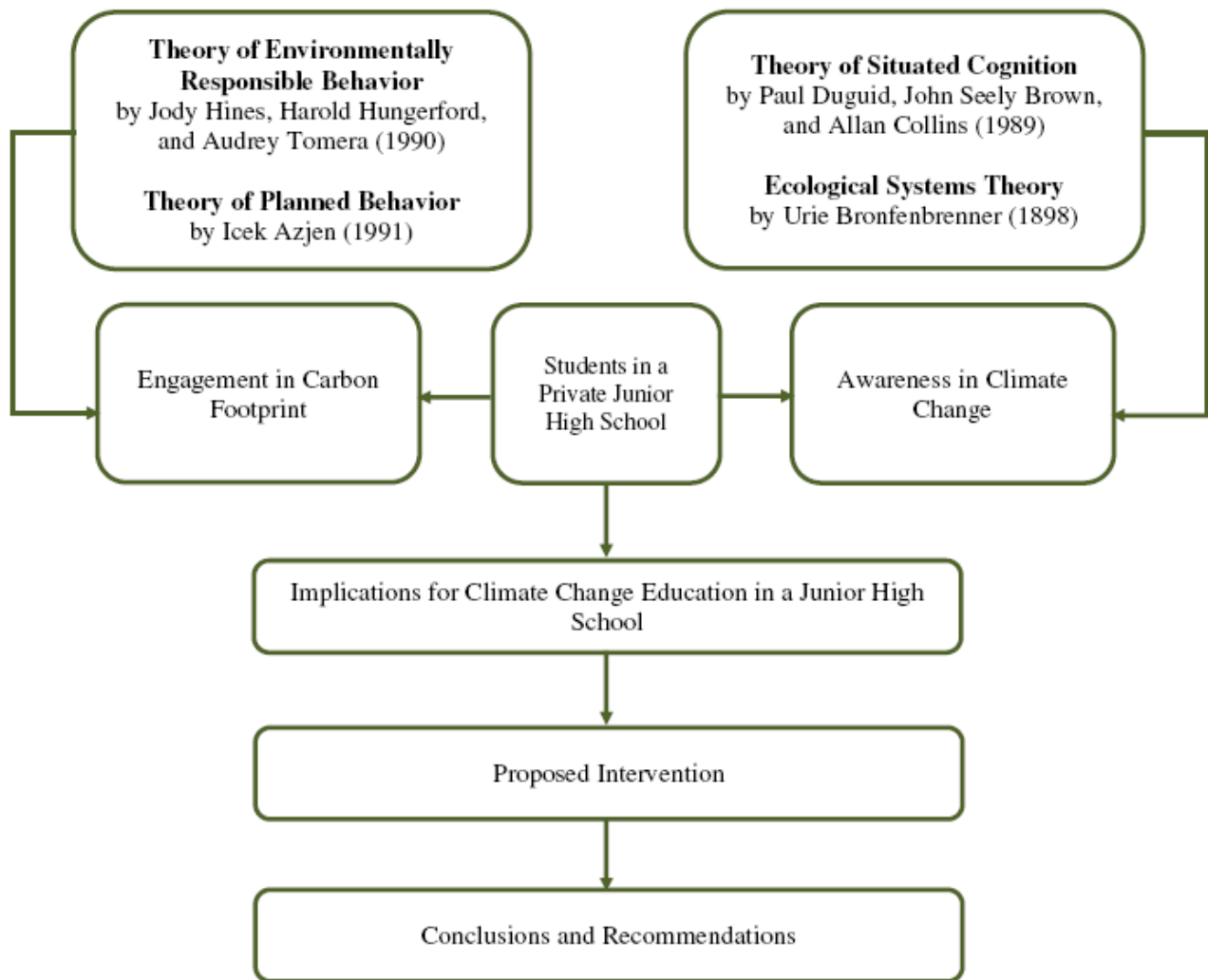


Figure 1 Theoretical-Conceptual Framework of this Study in Schematic Diagram

Figure 1 contains the theoretical framework of the study. Students’ awareness of climate change is anchored on two theories – the Theory of Situated Cognition by Paul Duguid, John Seely Brown, and Allan Collins (1989) and the Ecological Systems Theory by Urie Bronfenbrenner (1989). These theories regarded child development as a complex system of relationships influenced by multiple levels of the surrounding environment, ranging from immediate family and school settings to broad cultural values, laws, and customs. On the other hand, the Theory of Planned Behavior by Icek Ajzen (1985) and the Theory of Environmentally Responsible Behavior by Jody Hines, Harold Hungerford, and Audrey Tomera (1990) mainly supported the students’ engagement in climate change and considers that different important variables influence an individual’s intention to act. These theories

greatly emphasize that factors such as belief, behavior, knowledge, etc. greatly influence the engagement towards environmental issues, specifically climate change. The results of this study were analyzed and correlated with one another to determine the implications of the two variables. The researcher then proposed an effective teaching intervention in teaching climate change issues in the classroom and provided conclusion and recommendations for the study.

Significance of the Study

The result of the study would benefit the following:

the **school administrators and curriculum experts** could be provided guidance on how to create innovative and appropriate environmental education interventions, as well as assess how the school's vision and mission align with environmental consciousness;

the **science teachers** could be guided in giving students a heightened understanding of the effects of climate change and carbon footprint reduction, and a genuine evaluation that emphasizes the application of knowledge on the topic in real-world situations;

the **parents** could be made aware of how positive environmental actions at home contribute to mitigating climate change and help reduce carbon footprint;

the **students** could reflect on what they can do to help the environment and put their knowledge of environmental issues into a lifetime action; and

the **future researchers** could have a reference in generating better and more comprehensive studies on students' awareness on climate change and its relationship towards carbon footprint reduction.

Scope and Delimitation of the Study

The study aimed to determine and correlate the students' awareness on climate change and their carbon footprint measurement. The respondents are Junior High School students from Grade 7 to Grade 10 in one of the private schools in Cebu City in School Year 2021 – 2022. Survey forms adapted from previous studies were used to analyze the following: (1) Knowledge (students' level of knowledge in terms of common causes of climate change, impacts of climate change in humans and the environment and possible solutions to the issue and (2) Engagement (students' carbon footprint in the following areas such as house, school, daily routines – food and transportation). Since classes are held online, survey forms were given via Google form.

Definition of Terms

The following terms were defined according to their use in the study:

Carbon footprint. In this study, it refers to the total greenhouse gas (GHG) emissions created directly and indirectly by the students in their house, school, and daily routines.

Carbon footprint engagement. It refers to the students' involvement in daily activities, specifically in house and school, that may contribute to their carbon footprint. In this study, this was measured using a modified and validated version of the 20-item worksheet from the Chicago Botanical Garden website.

Climate change awareness. It refers to students' knowledge on common causes, impacts, and possible solutions of climate change and consciousness in carbon footprint. In this study, this was measured using an evaluated and validated 20-item two-tier multiple-choice questionnaire prepared by the researcher.

2. RESEARCH METHODOLOGY

This chapter presents the study's research methodology, including the research design, research environment, research subjects, data gathering procedure, pedagogical approach, research instrument, research ethics consideration, data management plan, and statistical data treatment.

Research Design

This study utilized descriptive research using a correlational analysis to determine the extent of the relationship between Junior High school students' knowledge about climate change and their carbon footprint engagement.

The descriptive research method helped determine the students' level of awareness on climate change and know the students' level of engagement in carbon footprint. This method provided systematic information about the two variables focused on in the study – level of awareness and engagement. These variables were observed and measured.

Furthermore, in correlational analysis, the relationship between the students' awareness of climate change and their engagement in carbon footprint was sought and interpreted. This method recognized patterns and trends in the data but did not go beyond its analysis to prove the causes of the observed patterns. Causes and effects were not included in this research. The data, relationships, and distributions of variables were only studied and not manipulated.

Research Environment

This study was conducted in one of the private universities in Cebu City, Cebu during the School Year 2021 – 2022. The university comprises a college, senior high school, junior high school, and elementary departments. The university's vision, mission, and objectives (VMO) target to develop competent and socially responsive individuals focusing more on core values such as excellence and social responsibility. Specifically, the Junior High School department, where this study was conducted, emphasizes providing and developing desirable values like respecting and preserving the environment. Furthermore, the Junior High School department currently comprises more than 600 students and offers either online or digitized modular learning modes, making the students learn in their homes.

Research Subjects

The respondents of the study were Grades 7, 8, 9, and 10 students in a private university in Cebu City, Cebu. Currently, the Junior High School department of the university holds a total population of 608 students for the School Year 2021 – 2022. Proportional stratified sampling was used in this study, aided with Slovin's formula in determining the respondents for each year level. In the calculation using Slovin's formula, 48 (forty-eight) respondents were from Grade 7, 46 (forty-six) were from Grade 8, 67 (sixty-seven) from Grade 9, and 80 (eighty) students from Grade 10.

Data Gathering Procedure

The study observed the following methods: research permission, conduct of the study, and collection of results. A letter was given to the principal asking the permission to conduct an exam to the students about their awareness of the climate change topic and a survey about the students' level of engagement based on their carbon footprint. Once the permission letter was approved, the researcher gave the respondents the assent form and thoroughly explained the study. A letter was given to the parents of the respondents as well as an assurance that the study strictly followed the Data Privacy Act and Child Protection Policy. The respondents then answered the reviewed, validated and had undergone pilot testing survey questions through Google Forms and submitted the forms once done. The researcher then gathered the results to answer the problems of the study.

The data gathered was stored for two years in public access as it may be of use during research revisions, publication, or as a reference in case questions and inquiries related to the study. To secure its longevity, the researcher made an electronic copy of the data and stored it in a flash drive. Processed data were coded to ensure that the researcher protected the information given by the respondents. The information gathered was kept in strict confidence and deleted after the study. The researcher erased all the responders' digital files and other information. The study's findings did not reveal any personal details, and respondents were given the option of participating in the research or not. Abiding by the Data Privacy Act of 2012, after processing and interpreting the data, the researcher deleted the residual questionnaires and answers in the Google Forms and the electronic documents to assure data confidentiality.

Research Instruments

This study utilized an evaluated and validated 20-item two-tier multiple-choice questionnaire prepared by the researcher to identify the students' level of awareness on climate change. This questionnaire is divided into 5 (five) aspects of climate change - the basic concepts, causes, effects, mitigations, and adaptations of the community, with every 4 (four) questions in each aspect. These questions are based on global warming and climate change concepts found in books guided by the Philippine curriculum. The data were analyzed by tabulating students' answers to each question.

The combination of the responses to the first tier on content and the second tier on reasons was examined and analyzed using a scoring protocol. The results were reported as Weighted Mean. This statistical treatment helped determine the students' level of awareness towards climate change.

In addition, the study used a modified and validated version of the 20-item worksheet from the Chicago Botanic Garden website, specifically Assessing My Carbon Footprint Worksheet (Unit 4; Activity 4.2), to identify the students' level of engagement in climate change. The survey questionnaire was modified to fit into the Philippine

setting with 4 (four) different categories – 5 questions for energy consumption, 5 for food and drinks, 5 for waste, and another 5 questions for transportation. Each choice in the question has a corresponding point: A – 1 point, B – 2 points, C – 3 points, and D – 4 points. Likert scale was used as the scoring protocol and used Weighted Mean to analyze the results.

Furthermore, this study also used a validated four (4) open-ended questions to observe the students' understanding about carbon footprint. Colaizzi's (1978) method of analysis of data was used to present themes based on the students' answers. The following seven steps of Colaizzi's method were used to analyze the data: (1) Transcribing of all subject descriptions; (2) Extracting significant statements; (3) Making up formulated meanings; (4) Building themes; (5) Creating a detailed description; (6) Identifying the fundamental structure of the phenomenon; and (7) Returning to participants for approval.

Moreover, the Pearson Product Moment Coefficient of Correlation, r was also used to determine the relationship between the level of awareness and engagement on climate change.

Research Ethics Consideration

A letter was sent to the vice president for academics at the chosen university to request permission to conduct the study with students. The vice president approved the selection of potential student participants for the study. The selected students were informed about the study and asked to sign an informed consent form if they agreed to participate. The students' scores were kept strictly confidential, and their identities were anonymized during data processing and interpretation.

Data Management Plan

The collected data may be publicly accessible for five years for purposes such as research revisions, publishing, or as a reference for any questions or inquiries about the study. The researcher created an electronic copy of the data and stored it on a hard drive to ensure its preservation. All collected data were anonymized to protect the respondents' confidentiality. To further ensure confidentiality, the remaining questionnaires and responses, along with the electronic documents, were deleted after the data were processed and interpreted, in compliance with the Data Privacy Act of 2012.

Statistical Treatment of Data

The study employed the following statistical techniques:

1. The students' level of awareness towards climate change and level of carbon footprint engagement was categorized based on their responses. The results were then analyzed using the weighted mean to determine their category.

Formula:

$$WM = \frac{\sum \chi W}{\sum W}$$

where: WM = weighted mean,

χ = each of the item value,

W = weight of each item, and

Σ = the sum of

2. To determine the relationship between the students' level of awareness and their level of engagement on carbon footprint, the Pearson Product Moment Coefficient of Correlation, r was used.

Formula:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

where: r = Pearson coefficient,

n = number of the pairs of the stock,

$\sum xy$ = sum of the products of the paired stocks

$\sum x$ = sum of the x scores

$\sum y$ = sum of the y scores

$\sum x^2$ = sum of the squared x scores

$\sum y^2$ = sum of the squared y scores

All tests were set at **5% level of significance**.

3. PRESENTATION, ANALYSIS, AND INTERPRETATION OF DATA

This chapter presents, analyzes, and interprets data acquired from the study. The discussion is organized according to the specific research problems from the previous chapter.

Respondents' Level of Awareness on Climate Change

Table 1 shows the respondents' level of awareness on climate change.

Table 1 Respondents' Level of Awareness on Climate Change

Concepts	Mean	SD	Qualitative Description
Basic Concepts	1.75	1.03	Partial Understanding
Causes	1.75	0.95	Partial Understanding
Effects	0.94	0.95	Misconception
Mitigation	1.67	1.04	Partial Understanding
Adaptation	1.59	1.07	Partial Understanding
Overall	1/54	1.24	Partial Understanding

As shown in Table 1, the students in the following concepts have means categorized as Partial Understanding: Basic Concepts, Causes, Mitigation, and Adaptation on climate change. Moreover, among these concepts, the Basic Concepts and Causes of climate change had the highest mean of 1.75 (SD = 1.03 and 0.95). The findings from the study may imply that the students of this survey have some level of information on the causes, mitigation, adaptation of climate change, and the economic sector that might be affected. However, although students understand these concepts, their level of understanding (partial understanding) may indicate that they were aware of the basic knowledge of climate change but may have difficulty explaining further the reason and idea behind the topic or vice versa. Their partial understanding suggests that only a portion of their understanding of climate change may be correct rather than the entire one. In addition, the respondents demonstrate Misconception (M = 0.94, SD = 0.95) in the aspect of the effects of climate change. The result suggests that most respondents have different insights into climate change's effects. It may imply that their understanding of climate change's effects is unclear, with few misinterpretations regarding the topic, resulting in inaccurate meanings according to the concept.

With an M = 1.54 and SD = 1.24, students manifested a Partial Understanding of the overall level of awareness of climate change. While the overall result exhibited Partial Understanding, results on the Effects of climate change manifested Misconception. Based on the results, students exhibited an understanding of climate change but not entirely. Their incomplete understanding of the topic may be due to misinterpretations, unclear ideas, and a lack of retention about climate change that need to be addressed. Furthermore, the results may also be attributed to implementing activities in the curriculum and the amount of time allocated to tackle these concepts.

The results affirmed the study of Sezen-Barrie et al. (2019) regarding achieving a low understanding of climate change, specifically its impacts/effects and solutions, due to the lesser time discussed on the topics. Lesser time allocated in the discussion and the students' inability to comprehend the content is two reasons for poor student retention of some aspects of each concept. In addition, the results also substantiated the study of Walsh & Tsurusaki (2018), where it mentioned that professional development activities are required to assist teachers in approaching contentious issues, instilling diverse worldviews, and preparing students to actively participate in addressing these societal challenges.

The findings of this study also agreed with the following studies: Fahey et al. (2014) revealed that teaching climate change in schools as a 'just science' approach with a content focus may be insufficient. The discussion of climate change in schools should focus on all aspects of climate change and should be tackled with ample time for the students to understand and comprehend the concepts properly. In addition, the study of Siegner & Stapert (2019) mentioned the success and importance of implementing a climate change curriculum in a middle school classroom where students demonstrate high levels of climate literacy, progress in reading comprehension, and overall interest in the topic. Furthermore, Busch et al. (2019) agreed with the notion that participation in science activities and several science classes had the most significant impact on the students' knowledge and social norms on climate change.

The results of this study confirmed the Ecological Systems Theory by Urie Bronfenbrenner (1898) which states that the environment in which an individual grows up influences every aspect of their life. The theory also explained how the individual's knowledge is obtained from the different factors that surround them.

Respondents' Understanding of Carbon Footprint

The data from the open-ended questions revealed several themes relating to the respondents' understanding of carbon footprint. These themes were produced based on the guidelines of Colaizzi's method of data analysis. Pertinent quotes from the participants are also presented to help clarify the data description. From the data gathered, different themes regarding the definition, production, contributing factors, and effect of carbon footprint to the environment have emerged.

Theme 1: Differences in the Definition of Carbon Footprint

Table 2 shows the differences in the respondents' responses to the definition of carbon footprint.

One theme that emerged from the respondents' answers to the open-ended questions was the difference in the definition of carbon footprint. Several respondents provided a clear and concise definition of carbon footprint, particularly mentioning the reasons of how it is generated. Majority of the respondents' answer to the question coincided with one another. Most of the respondents noted "individual actions" as the generator of these greenhouse gases released in the atmosphere. In addition, the respondents have also mentioned "events, organization, service, place, or product" as producers of a greenhouse gas, carbon dioxide.

Table 2 Differences in the Definition of Carbon Footprint

NUMBER	RESPONSES	ASPECTS
27	A carbon footprint is the total greenhouse gas emissions caused by an individual, event, organization, service, place or product, expressed as carbon dioxide equivalent.	Correct definition of Carbon Footprint
31	Your carbon footprint is the total carbon dioxide released due to your individual activities. Your household's carbon footprint would be the total carbon dioxide released by your home and all the people who live there.	
5	Carbon footprint is the trails that are left from pollution.	Incorrect definition of Carbon Footprint
13	It is part of the greenhouse gas.	
15	A carbon footprint is a footprint made of carbon.	
41	Based-on my understanding it is a greenhouse organization where we plant trees and help the earth together.	

The respondents' responses imply that most likely already have a piece of knowledge about carbon footprint and have already tackled this topic in class. It can be that upon discussing climate change; the discussion also addressed the carbon footprint. This implication affirmed the study of Bulbul et al. (2020), which mentioned that the connection between carbon increase, global warming, and climate change are widely discussed and emphasized topics worldwide.

However, few respondents have shared an unclear definition of carbon footprint. This is evident based on the answers of respondents 5, 13, and 15. Moreover, respondent 41 mistakenly identified carbon footprint as an organization. These responses imply that these few difficulties in defining carbon footprint might have aroused due to their incomplete understanding of the topic as well as received an incomplete information about the topic. The findings supported the study of Oz-Aydin (2016), which determined high school students' awareness of the carbon footprint included in the High School Biology Curriculum. Results showed that students do not fully understand carbon footprint and global climate change due to failure to teach carbon footprint and to achieve the objective in carbon footprint education.

Theme 2: Understanding on Carbon Emission

In theme 2, it has been observed that all of the respondents identified human activities as the cause of the emission of carbon gases in the atmosphere. Specifically, the respondents identified the following as the causes of carbon emission: burning and consumption of fossil fuels, waste from factories, smoke from vehicles, and burning of plastics. As respondent 64 stated,

"Carbon emissions are created by burning fossil fuels for electricity or heat, chemical reactions, and leaks from industrial operations and equipment."

Moreover, respondent 93 mentioned,

"It is produced by burning fuel to produce power around the country."

According to the Intergovernmental Panel on Climate Change, human activity is 95% of the cause of global warming. Carbon emissions are one of the most significant contributors to the phenomenon of global warming. Cities are home to 70% of the world's population, and this figure is expected to rise to 70% by 2050. Because urbanization alters personal land use, transportation, industrial and agricultural production, consumption, and social activities, it has a negative impact on natural resources. As a result of this situation, the importance of natural resources has grown, as has the size of human-caused ecological footprints that threaten natural resources (Akten & Akyol, 2018). All of the respondents positively identified the factors that caused the carbon emission in the atmosphere. This may imply that the respondents are aware and conscious of the activities that emit carbon in the atmosphere. Furthermore, this may also imply that this aspect in carbon footprint was tackled and was integrated during the discussion of climate change specifically, the causes.

Theme 3: Influences in One's Carbon Footprint

Table 3 shows the respondents' answer on the factors that influence one's carbon footprint.

Several factors had emerged based on the respondents' responses as to what influences someone's carbon footprint.

Table 3 Factors that Influence One's Carbon Footprint

NUMBER	RESPONSES	ASPECTS
8	Not turning off electricity when no one is using.	Energy Consumption
130	Excessive use of electricity.	
36	It depends on how much the person uses appliances that can harm the environment.	
51	Our daily need and usage, major needs in daily life such as food, water, electricity.	
61	Public transportations and private vehicles contribute the carbon footprint.	Choice of Transportation
126	If they take a jeepney or if they walk.	
128	The energy we use in our homes and how often we travel.	
202	By where you live, what you eat, and how you commute.	Choice of Food
39	Some factors that can influence one's carbon footprint are using bikes or walking instead of using vehicles that produce greenhouse gases, being vegan, recycling, and only buying what you need.	

First, the consumption of energy in their household was noted. Specifically, the respondents distinguished the use of electricity as the major household energy influencer. Aside from energy consumption in the household, the respondents also noted the influence of transportation in one's carbon footprint. Furthermore, the ways of transportation chosen by a person influences the level of carbon emission in their everyday lives. It was also cited that choosing the mode of transportation is important as one mode may contribute bigger carbon than the other. In addition, the respondents noted that the frequency in travelling may influence one's carbon emission. Lastly, according to the respondents' answer, food consumption influences one's carbon emission. The respondents regarded that dietary choices or food preferences can influence someone's carbon emission.

These responses show that the respondents are aware that their choices or preferences in the consumption of food, household energy consumption, and choice of transportation greatly influences their carbon emission. This implies that the respondents already have knowledge about how each activity may or may not contribute carbon emission to the environment. It may also imply that information regarding these concepts were properly tackled during class discussion. These results aided the study of Akten & Akyol (2018), where it mentioned that, humans leave ecological footprints on the Earth even in their most basic decisions (for instance, housing, nutrition, travel, etc.). Understanding the relationship between our daily activities and the use of natural resources requires understanding which consumption category our personal footprint originated from. These footprints can be reduced by implementing some measures (particularly consumption reduction, resource conservation, and so on). The results of the study also agreed with the analysis of Li et al. (2015), which presented different categories that contribute to the students' carbon footprint – the daily life category: dining, showering, and dorm plug loads (65%), transportation, including commuting and longer trips (20%), and with academics accounting for 15%.

Theme 4: Impact of One's Carbon Footprint: Global Warming, Climate Change and Pollution

The respondents' answer on the impact of one's carbon footprint is shown in Table 4.

In theme 4, the respondents' answers fall into three categories: global warming, climate change, and pollution.

Our carbon footprint has a detrimental effect on the environment in several ways. The respondents' mentioned that the carbon footprint contributes to global warming and helps increase the greenhouse gases of the atmosphere. Carbon footprint also has an impact on the amount of greenhouse gases emitted into the environment. Respondent 11 mentioned that further increase in the concentrations of these gases will result to changes in the temperature of the planet. As the temperature of the planet increase further, changes in the climate can be observed. These changes in the climate may manifest into different phenomena as mentioned by respondent 79 and 99. Furthermore, carbon emissions cause changes in the physical aspects of the environment. Respondent 14 indicated that carbon emissions contribute to urban air pollution, toxic rain, coastal and ocean acidification, and worsens the melting of glaciers and polar ice. In addition, the respondents mentioned that too much release of carbon gases in the atmosphere may also lead to pollution in the environment.

Table 4 The Impact of One's Carbon Footprint

NUMBER	RESPONSES	ASPECTS
11	High concentrations of greenhouse gases, specifically carbon dioxide, threaten to raise the average surface temperature of the planet to intolerable levels.	Global Warming
4	It increases heat in the atmosphere, reflecting itself to our earth.	
79	It can make the Earth create irregular and drastic weather patterns.	
99	The carbon emissions effect the earth in the form of climate change. As the temperature rises our climate changes inherently, such changes in the weather patterns results into floods, wildfires, severe droughts, and heat waves.	Climate Change
14	It contributes to urban air pollution, it leads to toxic acid rain, it adds to coastal and ocean acidification, and it worsens the melting of glaciers and polar ice.	
54	It affects in the way that we produce pollution like the gases and substances causing life threatening impacts to the environment.	Pollution
66	My carbon footprint had an impact on the environment by increasing air pollution and waste pollution.	

According to respondent 66, the production of pollution like the gases and substances in the atmosphere can cause life threatening impacts to the environment. The respondents' responses regarding the impact of carbon footprint and the emission of carbon gases in the atmosphere implies that the respondents have enough understanding of the effects of carbon footprint in the environment. This finding coincided with the study of Oz-Aydin (2016), which determined the awareness of 9th grade students about the carbon footprint issue, results found that students exhibited high awareness in the aspects of impact – household and transportation components of carbon footprint. These results were higher than their awareness about the causes of increased everyday carbon emissions. Overall, the respondents were aware of their daily carbon emissions and understood their environmental impact. However, although the respondents comprehended some aspects of the carbon footprint, there is still evidence of confusion and misinterpretation concerning other aspects, such as the definition of carbon footprint in theme 1. This relates with the respondents' level of awareness of climate change, where students manifested an overall Partial Understanding of the different aspects of climate change. This is expected as both topics are related to one another.

Respondents' Level of Engagement in Carbon Footprint

The level of engagement of the respondents in carbon footprint is shown in Table 5.

Table 5 indicates that the respondents exhibit Low carbon footprint engagement in all concepts: Energy Consumption, Food and Drinks, Waste, and Transportation. In this table, the respondents obtained the highest mean of 2.20 (SD = 0.86) in the aspect of Transportation.

Table 5 Respondents' Level of Engagement in Carbon Footprint

Concepts	Mean	SD	Qualitative Description
Energy Consumption	2.08	0.84	Low
Food and Drinks	2.01	0.85	Low
Waste	1.95	0.71	Low
Transportation	2.20	0.86	Low
Overall	2.06	0.91	Low

The highest mean in the aspect of Transportation may imply that transportation plays a significant role in the students' carbon footprint. This result may be due to the students' frequency of traveling, the way they commute from one place to another, and the amount of time they spend traveling. The results substantiated the study of Li et al. (2014), with transportation accounting as one of the most significant contributors to the carbon footprint emission of Chinese students, with activities such as visiting one's hometown and daily commuting as the main reasons for the carbon emission.

Overall, the respondents manifested a Low level of engagement in carbon footprint with an $M = 2.06$ ($SD = 0.91$). The results may suggest that the respondents are doing their part in reducing their carbon dioxide emissions in their daily activities. It may imply that students may have been conscious of how their daily activities emit carbon dioxide and can affect the environment. It may also imply that students are aware of the activities/actions that emit a high rate of carbon dioxide, which is why they avoid or limit those activities.

The results were similar to the study of Cordero et al. (2020), where graduates developed a strong personal connection to climate change solutions after the topic on climate change was incorporated in their course, thus reflecting it in their daily behaviors and careers. In addition, the results substantiated the study of Hoffman & Mutarak (2020), which focuses on the importance of formal education in the Philippines' proenvironmental behavior. They found out that education has a positive impact on environmental behavior, thus in line to Azjen's theory of planned behavior. Knowing about the anthropogenic causes of climate change implies that people are aware that they can do something about it.

The findings of this study also agreed with the study of Akrofi et al. (2019), which states that the participation of the students in activities related to climate change (causes, effects, mitigation, and adaptation) influenced their knowledge as well as their actions towards climate change. Moreover, it also corroborated with Ayanlade & Jegede (2016) who emphasized that graduates who have more class experience on climate change exhibit pro-environmental behaviors than those students who were not exposed to the class. However, Hoffman & Mutarak (2020) emphasized that while some evidence suggests that education is associated with positive environmental behavior, little is known about the decision-making mechanisms of the students, which was contradicted by these findings. Hines et al.'s Theory of Environmentally Responsible Behavior which states that different factors such as knowledge and substantially impacts an individual's intention to act, significantly affecting one's behavior was affirmed by the results of this study.

Relationship Between the Respondents' Level of Awareness on Climate Change and their Level of Engagement in Carbon Footprint

Table 6 shows the relationship between the students' level of awareness on climate change and their level of engagement in carbon footprint.

The table indicates that there was no significant correlation between the respondents' level of awareness on climate change and their level of engagement in carbon footprint, $r(239) = .0004$, $p = .951$. This failed to reject H_0 , which means that the two variables were not correlated. The results of the study mean that a respondent may have a high or low level of awareness on climate change depending on his/her understanding on the concepts, may also exhibits either high or low level of engagement on carbon footprint. Moreover, students' awareness of climate change is not entirely the only factor influencing pro-environmental behaviors toward the environment. The result may imply that there may be other factors that can contribute to students' pro-environmental behaviors towards the environment. Awareness on the causes, impacts, mitigation, and adaptation on climate change may not be enough in order for the students to act positive actions towards the environment.

Table 6 Correlation Between the Respondents' Level of Awareness on Climate Change and their Level of Engagement in Carbon Footprint

Variables	Mean	SD	Test Statistics	
			Computed r	p - value
Level of Students' Awareness on Climate Change	1.54	0.40	0.004ns	.951ns
Level of Students' Engagement in Carbon Footprint				

^{ns} not significant at $\alpha = .05$

Individual perspectives, knowledge, social, personal, and a combination of other factors may stimulate pro-environmental behavior to appear. The result supported the study of Busch et al (2019), where it mentioned that knowledge about the causes and effects of climate change was a poor predictor of behavior. In addition, the result affirmed the study of Rousell & Cutter-Mackenzie-Knowles (2019) which state that didactic approaches to

climate change education have had a little impact on students' attitudes and behaviors. The study's findings agreed with the study of Ratinen (2021), which highlighted that both student's knowledge and perception on climate change are important in climate change action. Aside from knowledge, outside factors such as students' perception and beliefs influence the students to act necessary actions against climate change. Another study by Ross et al (2021) also agreed that children's perceptions of their capacity to influence change on a personal, local, and governmental level were linked to their engagement.

Moreover, the student's actions regarding carbon footprint participation may also be influenced by their standing beliefs, norms, and policies at home, in the community, and their physical environment. In addition, their exposure to media and the media that deliver salient concepts of climate change may also play a role in developing their proenvironmental behaviors. Furthermore, their experiences that they find to have alleviated their living condition, such as having a better living quarter by cleaning or by lessening soot formation by alternating with electrically powered cookers, can influence their positive behavioral change towards the environment.

4. SUMMARY, CONCLUSION, AND RECOMMENDATIONS

This chapter presents the study's summary, findings, conclusions, and recommendations.

Summary

This study utilized descriptive research to determine the students' level of awareness on climate change and level of engagement in carbon footprint and used a correlational analysis to know the relationship between junior high school students' knowledge about climate change and their carbon footprint engagement. The study was conducted to 48 (forty-eight) respondents from Grade 7, 46 (forty-six) from Grade 8, 67 (sixty-seven) from Grade 9, and 80 (eighty) respondents from Grade 10, at a private university in Cebu City, Cebu. Specifically, the study aimed to answer the following questions:

1. What is the respondents' level of awareness on climate change?
2. What are the respondents' understanding of carbon footprint?
3. What is the respondents' level of engagement in carbon footprint?
4. Is there a significant correlation between the respondents' level of awareness on climate change and their level of engagement in carbon footprint?
5. What intervention may be proposed to enhance the respondents' awareness on climate change and their engagement in carbon footprint?

Findings of the Study

These findings emerged from a thorough analysis of the data.

1. The respondents exhibited a Partial Understanding in the basic concepts, causes, mitigation, and adaptation on climate change. However, there was a students' Misconception in the aspect of the effects of climate change.

Overall, the students manifested a Partial Understanding on the level of awareness on climate change.

2. Four (4) themes emerged in terms of the respondents' understanding of carbon footprint. These are: (1) differences in the definition of carbon footprint; (2) understanding on carbon emission; (3) influences in one's carbon footprint; and (4) impact of one's carbon footprint: global warming, climate change, and pollution.
3. Results revealed that the respondents exhibited a Low carbon footprint engagement in the aspects of energy consumption, food & drinks, waste, and transportation. In general, the respondents manifested a Low level of engagement in carbon footprint.
4. There was no significant correlation between the respondents' level of awareness on climate change and their level of engagement in carbon footprint.
5. The proposed intervention to enhance the students' awareness of climate change and carbon footprint and the students' engagement in carbon footprint was a guideline on integrating the activities in the discussion on climate change and carbon footprint.

Conclusion

Climate change is one of the most critical issues that need immediate action. It is a must that everyone, particularly the students, must be informed of the underlying concepts that govern this problem. Hence, the students' climate change and carbon footprint awareness and their carbon footprint engagement were tested and measured to see their relationship with each other.

Based on the findings of the study, the students' lack of complete understanding of climate change and carbon footprint necessitates immediate action by curriculum makers, administration, and teachers to

enhance students' learning and involvement toward pro-environmental behavior. In addition, the students' manifestation of low engagement in carbon footprint emphasized that students are doing their part in reducing their carbon dioxide emissions. Furthermore, the irrelevance of the student's level of awareness on climate change and their level of engagement in carbon footprint suggests that acting responsibly towards the environment requires more than just knowledge. Positive actions toward the environment may be attributed to external and internal factors.

Thus, to influence the students' awareness of climate change and develop pro environmental behavior, teachers should make holistic class discussions about climate change and carbon footprint by integrating activities relatable to their lives.

Recommendation

The following recommendations are suggested on the account of the study's findings:

1. that the school administrators and curriculum experts provide innovative and appropriate environmental education interventions and activities, as well as evaluate how the school's vision and mission align with environmental consciousness.
2. that more trainings and seminars be conducted to guide the teachers in choosing and making appropriate activities and discussions on climate change and carbon footprint.
3. that the science teachers be guided in ensuring that their students have a deeper understanding of how to reduce their carbon footprint and the implications of climate change, as well as a true evaluation that places an emphasis on using what they have learned to solve problems in the real world.
4. that the parents be informed to make aware of how positive environmental actions at home contribute to mitigating climate change and help reduce carbon footprint.
5. that the future researchers consider expanding the variables involved in the study of climate change awareness and carbon footprint engagement, include the examination of the K to 12 curriculum and its parts that emphasizes on ecological and carbon footprint as well as environmental and climatological issues, and determine the students' source of information about climate change in order to compile more thorough data and further assess how both knowledge and proenvironmental behavior be achieved in Philippine classroom.

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