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UNDERSTANDING OF CLIMATE CHANGE DISASTER RISK, AND VULNERABILITY AMONG STUDENTS, TEACHERS, AND ROLE-TAKERS

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Abstract

This research examines the understanding of climate change, disaster risk, and vulnerability in educational contexts, encompassing students, teachers, school administrators, and leaders in the selected schools in the Philippines. Utilizing a descriptive research design and surveys, the study reveals that both Basic Education (BE) and Senior High School (SH) students demonstrated notable comprehension of climate change, disaster risk exposure, and vulnerability, with SH students displaying slightly elevated understanding in specific areas. The findings emphasized the need to enhance disaster preparedness education for teachers and augment the grasp of climate change among school administrators. Furthermore, a strong positive correlation emerges between comprehending climate change and reducing vulnerability to disasters. In conclusion, this research underscores the urgency of bolstering understanding and preparedness related to climate change and disaster risks among students, educators, and educational leaders, necessitating dynamic educational strategies, collaboration with experts, and proactive measures to cultivate safety and resilience in the face of these multifaceted challenges.

Keywords: Climate change, Disaster risk, Education, Resilience, Vulnerability

INTRODUCTION

Climate change pertains to the long-term changes of temperatures and weather patterns (United Nations, 2020.). However, the climate change conundrum still continues to cross different lines of security that affects the entirety of both living and nonliving organisms (Muttarak & Lutz, 2014). Due to climate change many levels we should consider to make sure that people really understand the effect and danger it may cause. Just say for instance,

people's risk exposure and vulnerability to Climate change impact. This paper believed that the more exposure a person or a group of people to a risk the more vulnerable it is.

Exposure. The situation of people, infrastructure, housing, production capacities, and other tangible human assets located in hazard-prone areas (UNDRR Terminology, 2017).

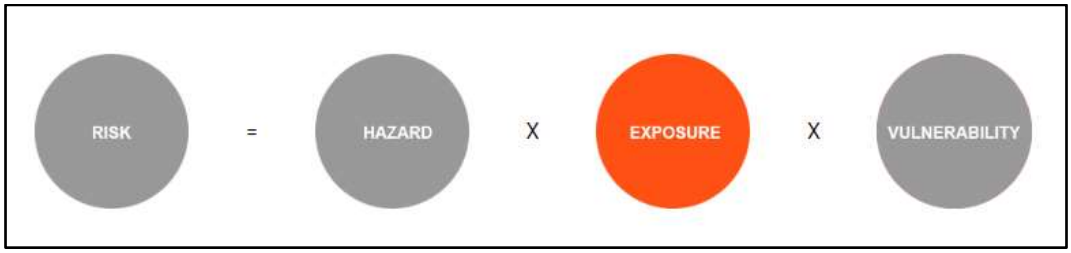


Figure 1. Risk equation (Source: www.preventionweb.net)

A *hazard* is a potential threat or danger posed by natural or man-made events (earthquakes, floods, hurricanes, wildfires) or any other event with the potential to cause harm or damage. While *exposure* is simply the presence of people, infrastructure, or valuable assets near a hazard. It means that everyone in the danger zone is at risk. The susceptibility and sensitivity of people, infrastructure, or assets to the potential impacts of a hazard is referred to as *vulnerability*. Many factors, such as level of preparedness, resilience, socioeconomic conditions, and infrastructure quality, can have a direct impact on the severity level of risk.

By multiplying these three components, the equation attempts to demonstrate that risk is a product of hazard, exposure, and vulnerability. Technically, the likelihood and magnitude of risk can increase or decrease depending on how the factors in the equation interact. In other words, reducing, if not eliminating, the components (hazard, exposure, vulnerability) can help reduce the overall risk.

In terms of conducting education and public awareness campaigns, encouraging public participation, and ensuring access to climate change information, the United Nations Framework Convention on Climate Change (UNFCCC) is a leader. On top of that, the UNFCCC emphasized the significance of incorporating climate change education into formal education systems in order to empower individuals, particularly youth, to take action as climate change poses a threat to our planet which requires an urgent collective effort to address the climate change conundrum.

Education has always had the potential to influence climate change attitudes and behaviors (Ahmed et al., 2021; Fathoni et al., 2019). Youth can be taught about the effects of global warming and adaptation strategies by incorporating climate change literacy into the curriculum (Ledley et al., 2017; Quddus, 2020). Individuals with climate change literacy are better able to make informed decisions and take action to mitigate risk. It also dispels fears by providing empirical evidence and countering the issue's pessimistic narrative (Climate Change Education, 2023).

Various educational initiatives have also been launched. The World Economic Forum named the Climate Action Project (CAP) an Education 4.0 Lighthouse. This category was created to recognize public-private partnerships that aim to improve students' learning experiences. Take Action Global (TAG), a non-profit organization, spearheaded the initiative, which involved 3.4 million teachers and students worldwide. The project's goal is to educate and empower young people to take action against climate change, with a focus on curriculum and lesson planning. Participants come together on Climate Action Day to share what they have learned over the course of the year (INQUIRER.net BrandRoom, 2023).

Furthermore, collaboration and partnership are two ways to advocate for climate change. For example, organizations such as the World Meteorological Organization (WMO) and weather presenters have been shown to be effective in climate change education and outreach. WMO established the

Climate Without Borders network to engage weather presenters in educating, motivating, and activating their audiences with valuable climate change information. Additionally, video series produced by WMO and Climate Central, such as "Summer in the Cities" and "Weather in 2050," offer glimpses into the future effects of global warming on weather patterns and serve as an educational tool.

Finally, education is pivotal in addressing climate change by fostering awareness, empowering individuals, and promoting informed decision-making (Birkmann & von Teichman, 2010; Mal et al., 2018). Putting Climate Change Action Literacy (CCAL) at the heart of the curriculum can positively equip the youth with the necessary knowledge and motivation to take action. Also, the literature suggests that partnerships, collaboration, and outreach are needed to strengthen educational strategies for addressing the complex challenges posed by climate change. This paper seeks to assess and evaluate the students' understanding of Climate Change, Disaster Risk Exposure, and Vulnerability.

METHOD

This study used descriptive research design to investigate the students' understanding on Climate Change, Disaster Risk Exposure, and Vulnerability. According to Saunders et al and Miller, descriptive research provides an accurate profile of people, events, or situations. This design provides researchers with a profile that describes relevant aspects of the phenomenon of interest from an individual, organizational, and industry-oriented standpoint.

The respondents of this study were randomly selected from different schools namely Unida Christian Colleges, De La Salle Santiago Zobel-Vermosa, and College of Mary Immaculate, as long as they meet the following criteria:

Table 1. Selected participants

SHS students from De La Salle Santiago Zobel - Vermosa	• Grade level: 11 • Strand: Science, Technology, Engineering, and Mathematics
Elementary and JHS from Unida Christian Colleges	• Bona Fide Grade 6, 7, 8, 9, 10 Students of Unida Christian Colleges • Taking Science Subject
Leadership team and Staff from College of Mary Immaculate	• President, Chief Finance Officer, IT Governance Head, • Department Heads • SHS Focal Person

Non-random sampling is a technique where the sample selected will be based on factors such as convenience, judgment and experience of the researcher and not on probability (Admin, 2020).

The primary instrument in this study was survey questionnaire (delivered both google forms and printed copy for those cannot access online), and were purposively developed to acquire information on students', teachers', role-takers, and leaders' understanding on Climate Change, Disaster Risk Exposure, and Vulnerability.

The instrument in this study underwent a pilot test to a purposely selected thirty first section students and answer the questionnaire provided by the researcher. Results revealed that there is cronbach's alpha of 0.96 means to say that the instrument to be used is Excellent or Valid.

Figure 1. Key Concepts in Understanding Climate Change

The conceptual framework aims to provide a structured approach to examine knowledge, preparedness, resilience, and other factors related to climate change and disaster risk. The framework comprises fundamental ideas and involves numerous processes, *Assessment Methods,* which entail the use of survey and questionnaire to gather data from the targeted population via google form and print out (only for people who cannot use online devices). It goes into detail about the methods used to collect information on participants' understanding of climate change, disaster risk exposure, and vulnerability. *Evaluation Dimensions;* this stage specifies the precise components to be evaluated, such as knowledge and comprehension, as well as preparedness and resilience. It underlines the significance of examining these characteristics in order to acquire insights about the skills and awareness of the participants. *Data Analysis;* this step employs a combination of quantitative and qualitative analysis techniques. It demonstrates how to analyze survey and questionnaire responses, as well as conduct thematic analysis, to acquire a thorough knowledge of the data collected. *Correlational Analysis;* this section shows how to utilize correlational analysis to investigate correlations and associations between variables in data.

Development of focused Interventions; depending on the outcomes of the evaluation, this stage entails developing focused interventions to improve participants' comprehension, readiness, and resilience. It underlines the need of tailoring techniques to particular knowledge gaps and obstacles discovered throughout the investigation. *Identifying Strategies;* this part examines methods for better understanding and dealing with climate change, disaster risk exposure, and vulnerability. It explores various initiatives for fostering long-term change, such as educational programs, community participation, and capacity-building efforts. *Policy Recommendations;* the framework concludes the research-based policy suggestions. It emphasizes the importance of policy actions that promote informed decision-making, increase resilience, and reduce the risks associated with climate change and disaster events.

The framework serves as a guide to inform evidence-based interventions, strategies, and policy recommendations that can lead to more effective environmental mitigation and adaptation activities.

The researchers ensure that respondents have a thorough grasp of the study, including gathering information, where it will be used, and why. In this study, respondents are regarded as more than just a source of data; the researchers regard them as collaborators with the ability to contribute to the completion of the analysis. Respect for the participants, who serve as the foundation for many ethical rules, is another critical component of this study. Confidentiality of all personal information collected from the participants will be maintained strictly. Anonymity of data will be kept to protect the identity of the participants, and will only be accessible to authorized personnel.

The replies were collated and manually processed with the assistance of a computer to ascertain the precise interpretation of the data. Matrix tables were created to organize, summarize, and analyze data in order to easily determine its differences from one another. A correlational matrix is a statistical technique used to evaluate the relationship between two variables

in a data set that contains a correlation coefficient; where one (1) represents a strong relationship between variables, zero (0) represents a neutral relationship, and negative one (-1) represents a weak relationship (Wagavkar, 2023).

RESULTS AND DISCUSSION

Data was gathered and analyzed to compare how Basic Education (BE) and Senior High School (SH) students understood climate change, disaster risk exposure, and vulnerability. The following table lists the total number of respondents (N) and the mean results for each group across the survey's three sections.

Table. 2. Demographics

Group Descriptives

	Group	N	Mean
Basic Ed vs SHS Part I	Basic ED	105	11.27
	SHS	124	11.5
Basic Ed vs SHS Part II	Basic ED	105	13.31
	SHS	124	14.3
Basic Ed vs SHS Part III	Basic ED	105	9.77
	SHS	124	10.7

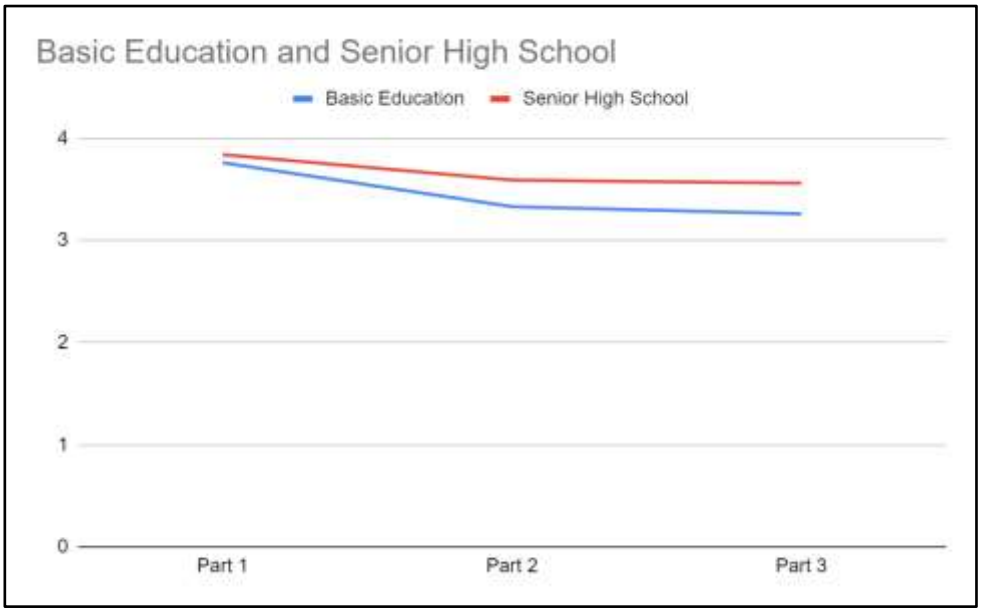
The average score for Basic Education students in Part 1 was 11.27, while the average score for Senior High School students was 11.05. This implies that both groups understand well the topic of climate change. Students in Senior High School outperformed students in Basic Education in Part 2 with an average score of 14.03 as opposed to 13.31. This suggests that compared to the students in Basic Education, Senior High School students believe they understand the subject matter slightly better.

Finally, both groups' average scores in Part 3 were fairly low. Students in basic education scored an average of 9.77, while those in senior high school

scored an average of 10.07. The implication is that their comprehension of vulnerability could be improved.

Overall, the data shows that students in Basic Education and Senior High School have a fair amount of knowledge about climate change, exposure to disaster risk, and vulnerability. Students in senior high school, however, display a marginally higher level of comprehension in some areas. For educators and policymakers looking to further improve students' knowledge and awareness in this crucial area, these findings offer insightful information.

Table 3. Respondents' Results



part I-level of understanding on climate change, Part II disaster Risk, part III Vulnerability

To gain insights into students' understanding of climate change, disaster risk exposure, and vulnerability, surveys were conducted among two groups: Basic Education and Senior High School students. The data obtained from their responses will now be analyzed and interpreted.

In the surveys, participants were asked to rate their level of understanding on a scale ranging from 1 to 5, with 1 indicating "not at all"

and 5 indicating "to a great extent." The following results were obtained for each part of the survey:

Table 4. Level of understanding

Description	Range	Legend
1. not at all	1.00-1.80	NL
2. little	1.90-2.60	LT
3. somewhat	2.70-3.40	SW
4. to a large extent	3.50-4.20	TLE
5-to a great extent	4.30-5.00	TGE

Part 1: The average rating given by Basic Education students for their understanding of climate change, disaster risk exposure, and vulnerability was 3.76. This suggests that, on average, Basic Education students perceive their level of understanding to be between "somewhat" and "to a large extent." It indicates that they have some level of awareness and comprehension of these topics.

In comparison, Senior High School students rated their understanding slightly higher, with an average score of 3.84. This implies that Senior High School students perceive their understanding to be slightly higher than Basic Education students, falling within the range of "to a large extent." It indicates that they have a relatively stronger grasp of the climate change topic.

Part 2: The average rating provided by Basic Education students for their understanding in this section was 3.33, indicating a perception of understanding between "somewhat" and "to a large extent." It suggests that Basic Education students have a moderate level of understanding regarding the specific aspects covered in this part of the survey.

On the other hand, Senior High School students rated their understanding higher, with an average score of 3.59. This signifies a slightly stronger perception of understanding, falling within the range of "to a large

extent." It suggests that Senior High School students have a relatively better grasp of the concepts explored in this section.

Part 3: Both Basic Education and Senior High School students rated their understanding of this part lower compared to the previous sections. Basic Education students provided an average rating of 3.26, indicating a perception of understanding between "somewhat" and "to a large extent." Similarly, Senior High School students rated their understanding slightly higher, with an average score of 3.56, falling within the same range.

Overall, the data suggests that both Basic Education and Senior High School students have a moderate to relatively strong level of understanding regarding climate change, disaster risk exposure, and vulnerability. However, Senior High School students generally exhibit a slightly higher perception of understanding compared to Basic Education students across all parts of the survey.

These findings provide valuable insights into the students' perspectives on these important issues, highlighting the need for continued education and awareness programs to further enhance their understanding and preparedness in the face of climate change and disaster risks.

School Administrators' Educational background has no significant relationship to the level of understanding of climate change.

It implies that climate change is an unequivocal global phenomenon that is evidently experienced by all crowds of people, the learned, the uneducated, rich, or marginalized. However, the extent of understanding is crucial to one's vulnerability and risks in disasters. The higher awareness and understanding of climate change, the more likely to be less susceptible to experiencing disaster risks. The key to understanding disaster risk is by recognizing that disasters are an indicator of development failures, meaning that disaster risk is a measure of the sustainability of development (UNDRR, 2019)

School Administrators' Disaster Preparedness Education

As to disaster preparedness education, school leaders' and administrators' level of preparedness is described as "somewhat". It may indicate that schools have insufficient understanding on how they handle natural disasters and other emergencies at school level. Disasters and emergencies can happen anytime at school, and everyone must be well acquainted with how to respond to these risks safely and effectively. Educational leaders must take the initiative to improve their understanding on disaster preparedness skills by acquiring training for administrators, teachers, and non-teaching staff so they can educate the learners on how to prepare and respond for disasters. Education therefore has a vital role to play in preparing communities and building disaster resilient societies and safe lives (UNESCO, 2023).

Educational managers are not only committed to develop globally resilient, digital literate graduates but most importantly must ensure that the school climate provides a safe, lifesaving and life-sustaining disaster preparedness plan by inculcating to the learners how to protect themselves, especially the young learners when these emergencies happen. Writers (2022) emphasized that administrators, teachers, staff, parents, and students can work together to promote and maintain school-wide safety and minimize the effects of emergencies and other dangerous situations.

School Administrators' Leadership and Disaster Preparedness Education

As to leadership and disaster preparedness, school managers' and administrators' level of leadership and disaster preparedness is described as "to a great extent". It may imply that school leaders and administrators take disaster preparedness as a paramount concern in the achievement of their educational goals and learning outcomes. It may also mean that they have acknowledged that the Philippines is prone to various hazards and natural

calamities, and embraced the fact that it is the education sector that is most vulnerable during these calamities. As it is mandated by the Philippine Disaster Risk Reduction and Management Council (DRRM) Act of 2010, otherwise known as RA 10121., pushing towards developing the resilience of education by prioritizing school safety. These focus areas are Prevention and Mitigation, Preparedness, Response, Recovery and Rehabilitation. It clearly illustrates the significant role of leadership in mapping out a very effective disaster preparedness advocacy to make their educational institutions "disaster proof". Our data suggest that the level of understanding of climate change has a STRONG POSITIVE RELATIONSHIP towards Vulnerability and Disaster Risks.

It implies the crucial role of the respondents' awareness on climate change. Therefore, it means that to enhance the knowledge level of Disaster Risk and Vulnerability among the respondents, their level of understanding climate change must be AGGRESSIVELY ENHANCED first. It is therefore empirical, that school stakeholders, especially school leaders, teachers, and learners must have a full grasp on the nature, causes, and impact of climate change to their environment, school climate, daily living, and how it can affect their future. Only when they have reached a genuine level of understanding on climate change, can they decrease their vulnerabilities to these hazards. With the help of advocacy campaign plans on climate change awareness, it may increase capacities of communities exposed to protect themselves from these disasters. Education is crucial to promote climate action. It helps people understand and address the impacts of the climate crisis, empowering them with the knowledge, skills, values, and attitudes needed to act as agents of change (UNESCO, 2023).

The Philippines is vulnerable to various natural and human-induced hazards. Philippine Atmospheric Geophysical and Astronomical and Services Administration (PAGASA, 2019) report underscored that there are an average 19-20 tropical cyclones in a year which cause hazards like flooding

and landslides. Moreover, the country experiences earthquakes, volcanic eruptions, fires, and the like. Human-induced hazards can be the form of violent extremism or civilian violent rallies. School managers, teachers, and learners must be trained in identifying hazards and in assessing risks to facilitate an effective school preparedness plan and allow them to employ faster and relevant responses to these crises. It should be second nature to school administrators, teachers, and students to take care of their school and to take control of their safety (DepEd, School Disaster Risk Reduction Manual, 2014).

CONCLUSION

The assessment and evaluation of the knowledge and perceptions of Basic Education (BE) and Senior High School (SH) students regarding climate change, disaster risk exposure, and vulnerability have yielded useful insights. Several conclusions can be drawn from the analysis of the survey data.

Firstly, both BE and SH students exhibit a fair amount of knowledge about climate change, exposure to disaster risk, and vulnerability. The average scores in Part 1 show that both groups have a comparable level of comprehension, indicating that the educational curriculum effectively imparts fundamental knowledge on these topics to students in all academic levels.

However, it was discovered that when comparing particular aspects, SH students thought they understood themselves a little bit better. In Part 2, SH students outperformed BE students in terms of average score, demonstrating a deeper understanding of the material. This implies that the focused curriculum of Senior High School programs might provide more in-depth knowledge and exposure to the problems of climate change and disaster risk.

Both groups' average scores in Part 3 were relatively low, indicating that they still needed to learn more about disaster risk exposure, vulnerability, and climate change. This emphasizes the requirement for improved

educational approaches and interventions to increase students' knowledge in these fields.

Overall, the results show that students studying BE and SH have a solid foundation of knowledge regarding climate change, disaster risk, and vulnerability. They still need to improve their knowledge and awareness in some areas, though. This emphasizes the value of ongoing initiatives to improve the curriculum, offer focused instruction on disaster risk and climate change, and encourage environmental literacy among students at all educational levels.

The study reveals that the educational background of school administrators does not significantly influence their understanding of climate change. However, the level of preparedness for disaster and emergency situations among school leaders and administrators is described as somewhat lacking, indicating insufficient understanding of handling natural disasters at the school level.

Conversely, the level of leadership and disaster preparedness is perceived to be of great extent, suggesting that school leaders prioritize disaster preparedness in achieving educational goals and learning outcomes. Our data further highlights a strong positive relationship between understanding climate change and vulnerability to and risks of disasters. Therefore, improving the understanding of climate change is crucial in addressing and mitigating potential risks.

Overall, prioritizing disaster preparedness education and fostering a deeper understanding of climate change will contribute significantly to the safety and well-being of the school community and the achievement of educational goals and learning outcomes.

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