
Mediating Effects of Perceived Impacts on Students' Knowledge and Attitudes toward Climate Change

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ABSTRACT

Climate change is caused by the burning of fossil fuels, raising animals, and other human activities, resulting in the greenhouse effect and global warming. This research aims to determine the knowledge, attitudes, and perceived impacts of climate change to communicate and send message about possible environmental policies to address climate change.

The study was conducted among 415 higher education students in selected colleges and universities in Misamis Occidental during the first quarter of the calendar year 2023. The quantitative-correlational research design was used. Standardized questionnaires were adopted and slightly modified to provide the needed information relative to the problems. Data analysis was done with frequency and percentage distribution, weighted average mean, and multiple mediation analysis through SPSS.

The study revealed that most participants have a satisfactory level of knowledge on climate change, understanding that extreme events like hurricanes, drought, and forest fires impact energy infrastructure, and that forest serve as a sink in the carbon cycle. They also have high positive attitudes towards climate change, believing that individuals can make a positive difference in global climate change. The multiple mediation analysis revealed the strength of mediation of the perceived impacts of climate change on the relationship between the participants' knowledge and their attitudes on climate change.

It is recommended that participants further their understanding of climate change by taking part in academic project work activities, such as researching environmental issues that have an impact on people's lives and society, such as reforestation, cutting back on firewood use, considerate use of non-renewable energy sources, and solid waste management.

KEYWORDS: *Students' Knowledge, Attitudes, Perceived Impacts of Climate Change, Philippines*

INTRODUCTION

The climate of the Earth has changed and developed over time. While some of these changes were brought on by natural events like volcanic eruptions, floods, forest fires, etc., many of them were brought on by human activity. The burning of fossil fuels, raising animals, and other human activities produce a significant quantity of greenhouse gases. The primary causes of climate change are the greenhouse effect and global warming, which are brought on by this. Climate change has brought complex and significant set of implications. The effects of climate change on the environment, vegetation, infrastructure, lives of the people most

especially on human health are not only matters of individual concern but the entire society as well. This particular research is one way of expressing concerns on the recent manifestation of climate change which happened on several municipalities and cities of the province of Misamis Occidental last December 2022. It is the view of the researcher to determine the knowledge, attitudes and perceived impacts of climate change so to communicate and send message about possible environmental policies to address climate change to local legislators and educational institutions.

Statement of the Problem

It was the intention of the study to establish the mediating role of perceived impact on the relationship between the knowledge and attitudes on climate change among higher education students in selected colleges and universities in Misamis Occidental.

The quantitative-correlational research design was used in this study and involved 415 higher education students in selected colleges and universities in Misamis Occidental during the first quarter of the calendar year 2023. Standardized questionnaires were adopted and slightly modified to provide the needed information relative to the problems. Data analysis was done with frequency and percentage distribution, weighted average mean, and multiple mediation analysis using SPSS.

RESULTS AND DISCUSSIONS

Majority of the participants have satisfactory level of knowledge on climate change. Out of 415 participants, 237 or 57.11 percent revealed satisfactory level of knowledge; followed by 103 or 24.82 percent got average. The participants have good knowledge on why the forests are important for mitigating climate change, on how extreme events impact energy infrastructure, on how are warming ocean temperatures impacting fish and other marine mammals, and what is greenhouse effect. Caranto and Pitpitunge [1] affirmed that high school students have moderate level of knowledge and hold misconceptions on climate change basic concepts, impacts on different systems and adaptations strategies.

Table 1. *Knowledge Level of the Participants on Climate Change*

| Knowledge Level | Frequency | Percentage |
|-------------------|-----------|------------|
| Very Satisfactory | 72 | 17.35 |
| Satisfactory | 237 | 57.11 |
| Average | 103 | 24.82 |
| Low | 3 | 0.72 |
| Very Low | - | - |
| Total | 415 | 100.00 |

The attitudes of the participants on climate change are reflected in Table 2. It can be observed that the participants have good attitudes on climate change. This is revealed in the overall mean of 3.81 which is interpreted as “Good.” The participants were very concerned on global climate change including its impacts.

The very good attitudes of the participants were also noted on how they placed high regard on the environmental problems and issues as well considering themselves to play an active role in preserving this environment for the future generation.

The table shows that all statements pertaining to the attitudes of the participants to climate change registered factor loadings of equal to or greater than 0.55. Some statements were discarded as its factor loadings were below 0.55. In SEM analysis, factor loading 0.55 or above are acceptable (Hair, et al.) [2].

The Average Variance Extracted (AVE) of the attitudes of the participants on climate change was 0.373. This value is below 0.50 which is the standard measurement of the AVE result. This implies that there is a need to have another approach to assess convergent validity. This could be done by going through an assessment of composite reliability. Composite Reliability (CR) and Cronbach's alpha values must be more than or equal to 0.70 to show good dependability (Nunnally, and Bernstein) [3]. As shown in the table, the attitudes of the participants on climate change yielded CR of 0.885 and all values of Cronbach's alphas were all greater than 0.70. These measures satisfied the internal consistency and shown that all structures had high level reliability.

Table 2. *Attitudes of the Participants on Climate Change, Factor Loadings, Average Variance Extracted, Composite and Cronbach Alpha Coefficients for Reliability*

| Statements | WAM | Interpretation | Factor Loadings | Cronbach Alpha Coefficient |
|--|------|----------------|-----------------|----------------------------|
| 1. I am concerned about global climate change. | 4.84 | Very Good | 0.569 | 0.758 |
| 2. I believe there is evidence of global climate change. | 4.38 | Very Good | 0.565 | 0.754 |
| 3. Global climate change will impact future generations. | 4.53 | Very Good | 0.627 | 0.763 |
| 4. We cannot do anything to stop global climate change. | 2.97 | Average | 0.615 | 0.739 |
| 5. I can do my part to make the world a better place for future generations. | 4.44 | Very Good | 0.609 | 0.753 |
| 6. Knowing about environmental problems and issues is important to me. | 4.46 | Very Good | 0.599 | 0.756 |
| 7. Things I do have no effect on the quality of the environment. | 3.25 | Average | 0.562 | 0.721 |
| 8. It is a waste of time to work to solve environmental problems. | 2.48 | Poor | 0.745 | 0.726 |
| 9. There is not much I can do that will help solve environmental problems. | 2.84 | Average | 0.635 | 0.723 |
| 10. Climate change is inevitable because of the way modern society works. | 4.06 | Good | 0.649 | 0.748 |
| 11. People should be made to reduce their | 4.05 | Good | 0.577 | 0.739 |

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| energy consumption if it reduces climate change. | | | | |
| 12. I would only do my share to reduce climate change if everyone else did as well. | 3.33 | Average | 0.623 | 0.733 |
| 13. The government should provide incentives for people to look after the environment. | 3.93 | Good | 0.550 | 0.735 |
| Overall Mean | 3.81 | Good | | |
| Average Variance Extracted (AVE) | | | 0.373 | |
| Composite Reliability (CR) | | | 0.885 | |

Legend: 4.21 – 5.00 Very Good (VG) 3.41 – 4.20 Good (G)
 2.61 – 3.40 Average (A) 1.81 – 2.60 Poor (P)
 1.00 – 1.80 Very Poor (VP)

The participants perceived that climate change have very high impact on health. This is shown in the overall mean of 4.30, interpreted as “very high.” The participants affirmed that prolonged high temperature could result to dehydration of humans and other animal species. Dehydration occurs when an individual use or lose more fluids than taken in and the body don’t have enough water and other fluids to carry the normal body functioning. There is a high risk of dehydration when it is hot and humid as sweat cannot evaporate and cool the body as it normally does, leading to increased body temperature and the need for more fluids. Likewise, exposure to high temperature for a long time could lead to problems related to respiratory and circulation.

Mental health and well-being are also impacted with climate change. This is evident in the responses of the participants when asked on their perceptions of the mental health and well-being impacts on climate change. In fact, the impacts were considered as very high from the participants’ perspectives. The manifestations of climate change experienced by a lot of students last December 2022 have caused trauma and emotional stress to individuals who happen to live in those areas devastated by continuous raining and flooding, strong winds, and high coastal water levels. The participants revealed that continuous flow of floodwater and rains have caused the population on the area of the stud to feel anxious, depress, experienced sleep disorder and poor concentration. The World Health Organization (WHO) [4] concluded that climate change poses serious risks to mental health and well-being urging countries to include mental health support in their response to the climate crisis. Along this line, the new WHO policy brief recommends that government should include in its initiatives integrating climate considerations with mental health programs, integrating mental health support with climate action, build upon global commitments, develop community-based approaches to reduce vulnerability, and close the large funding gap that exists for mental health and psychosocial support (WHO) [4].

The environmental impacts on climate change were also considered by the participants as high. The impacts on climate change were manifested on the water contamination which resulted to health problems among the affected population through effects of supply and quality of water.

The table also shows that all indicators of the health, mental health and well-being and environmental impacts of climate change registered factor loadings of greater than 0.55. In SEM analysis, factor loading 0.55 or above are acceptable (Hair, et al.) [2].

The Average Variance Extracted (AVE) of the perceptions on health impacts, mental health and well-being and environmental impacts of climate change of the participants were 0.348, 0.491 and 0.479. These values are below 0.50 which is the standard measurement of the AVE result. This implies that there is a need to have another approach to assess convergent validity. This could be done by going through an assessment of composite reliability. Composite Reliability (CR) and Cronbach's alpha values must be more than or equal to 0.70 to show good dependability (Nunnally, and Bernstein) [3]. As shown in the table, the perceptions of the participants yielded CR values of 0.871 for health impacts, 0.871 for mental health and well-being and 0.846 for environmental impacts on climate change and all values of Cronbach's alphas were all greater than 0.70. These measures satisfied the internal consistency and shown that all structures had high level reliability.

Table 3. *Perceived Impacts on Climate Change, Factor Loadings, Average Variance Extracted, Composite and Cronbach Alpha Coefficients for Reliability*

| Statements | WAM | Interpretation | Factor Loadings | Cronbach Alpha Coefficient |
|--|------|----------------|-----------------|----------------------------|
| Perceived Health Impact on Climate Change | | | | |
| 1. Prolonged exposure to extreme heat can result to dehydration. | 4.45 | Very High | 0.558 | 0.879 |
| 2. Prolonged exposure to extreme heat can result to exacerbation of respiratory, cardiac, and other illnesses associated with extreme heat. | 4.33 | Very High | 0.595 | 0.876 |
| 3. Longer growing seasons and longer pollen season can cause allergies/asthma in terms of timing, frequency and severity. | 4.13 | High | 0.583 | 0.878 |
| 4. Air temperature and UV radiation can result to acute respiratory symptoms, lung inflammation and scar tissue, chest pain, coughing, throat irritation, congestion and bronchitis. | 4.22 | Very High | 0.632 | 0.873 |
| 5. Drought, dust, smoke can result in respiratory symptoms, lung damage, adverse chronic and acute cardiovascular and respiratory health | 4.36 | Very High | 0.600 | 0.876 |

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| outcomes. | | | | |
| 6. Molds and airborne allergens from moisture and humidity can cause allergies, asthma, and respiratory symptoms. | 4.28 | Very High | 0.568 | 0.878 |
| Overall Mean | 4.30 | Very High | | |
| Average Variance Extracted (AVE) | | | 0.348 | |
| Composite Reliability (CR) | | | 0.871 | |
| Mental Health and Well-Being Impact | | | | |
| 1. Extreme weather events such as flooding and continuous heavy rain can cause anxiety, and emotional stress. | 4.28 | Very High | 0.635 | 0.921 |
| 2. Extreme weather events such as flooding and heavy rain can cause acute traumatic stress and post-traumatic stress disorder. | 4.24 | Very High | 0.719 | 0.915 |
| 3. Extreme weather events such as flooding can cause chronic psychological dysfunction. | 4.14 | High | 0.727 | 0.915 |
| 4. Extreme weather events such as flooding and hurricanes can cause depression, poor concentration and sleep disorders. | 4.20 | High | 0.737 | 0.914 |
| 5. Extreme temperatures such as prolonged cold or heat can cause chronic stress. | 4.20 | High | 0.711 | 0.916 |
| 6. Extreme temperatures such as prolonged cold or heat can cause poor physical and mental health. | 4.18 | High | 0.733 | 0.915 |
| 7. Extreme temperatures such as prolonged cold or heat can increase the risk of diseases and even death. | 4.24 | Very High | 0.635 | 0.922 |
| Overall Mean | 4.21 | Very High | | |
| Average Variance Extracted (AVE) | | | 0.491 | |
| Composite Reliability (CR) | | | 0.871 | |
| Environmental Impact of Climate Change | | | | |
| 1. Increased concentration of effluent pathogens in wastewater treatment plants can result to waterborne pathogens. | 4.15 | High | 0.636 | 0.898 |

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|--|------|-----------|-------|-------|
| 2. Contaminated water supply from flooding and storm surge can cause vomiting, diarrhea, and wound/skin infections. | 4.31 | Very High | 0.695 | 0.892 |
| 3. Contaminated water supply from flooding and storm surge can cause famine and dehydration. | 4.17 | High | 0.611 | 0.901 |
| 4. Pathogenic organisms from water temperature can cause diarrhea, and neurotoxic or respiratory effects from toxic algae. | 4.24 | Very High | 0.791 | 0.880 |
| 5. Rising sea levels threatens coastal communities and ecosystems. | 4.09 | High | 0.700 | 0.892 |
| 6. Warmer temperature increases the frequency, intensity and duration of heat waves which bring health risks to people | 4.12 | High | 0.707 | 0.899 |
| 7. Changes in the patterns and amount of rainfall can affect supply and quality of water. | 4.23 | Very High | 0.635 | 0.922 |
| Overall Mean | 4.19 | High | | |
| Average Variance Extracted (AVE) | | | 0.479 | |
| Composite Reliability (CR) | | | 0.846 | |

Legend: 4.21 – 5.00 Very High (VH) 3.41 – 4.20 High (H)
 2.61 – 3.40 Average (A) 1.81 – 2.60 Low (L)
 1.00 – 1.80 Very Low (VL)

Table 3. Results of Multiple Mediation Analyses of Attitudes of Participants Towards Climate Change

| Independent Variable | Mediating Variables | Dependent Variable | Effect of IV on M | Effect of M on DV | Direct Effect | p-value | Decision |
|----------------------|--|--------------------|-------------------|-------------------|---------------|---------|-------------|
| Knowledge | Perceived Impact on Health | Attitudes toward | 0.303 | 0.281 | 0.24 | 0.009 | Significant |
| | Perceived Impact on Mental Health and Well Being | Climate Change | 0.298 | 0.246 | | | |
| | Perceive Impact on Environment | | 0.275 | 0.232 | | | |

Several attributes could relate to the participants' attitudes toward climate change. This means that the attitudes of the participants, in this case, the students of selected higher

educational institutions have attitudes resulting from several factors. The results of the multiple mediation analysis revealed that mediating variables like the perceived impacts of climate change on health, mental health and well-being and environment significantly mediate the relationship between the participants' knowledge and their attitudes toward climate change. The Yale Program on Climate Change [5] emphasized that public awareness and understanding are important components of an effective response to climate change. The individual's understanding that global warming is occurring, and that it poses serious risks for human societies and natural ecosystems could help them

Students realized the significance of their knowledge on climate change and its impact so they could be more empower to fight and adapt the impacts of climate change. With the beliefs on the health, mental and well-being as well as environmental impacts of climate change, students have more open perspectives on what they could contribute to safeguard the environment through participation in diverse range of sustainability and environment-protection related activities. Their perceived impacts paved a way for the students to be more conscious and resilient to climate change. With open minds on the relative impacts, the students will be actively participating in initiatives relative to climate change.

CONCLUSIONS AND RECOMMENDATIONS

The study revealed that most of the participants have satisfactory level of knowledge on climate change for knowing that extreme events like hurricanes, drought, and forest fires impact energy infrastructure through water shortages, power outage, and higher electricity and gas prices; and that forest serve as a sink in the carbon cycle. The participants have high positive attitudes towards climate change as they were concerned about global climate change, and its impacts on the future generation. They were very positive about the idea that individuals can make a positive difference in global climate change. The participants believed that climate change has impacts on the health of people like prolonged exposure to extreme heat which can result to heat-related illnesses and death, including heat cramps, heat exhaustion, heatstroke, and hyperthermia; and prolonged exposure to extreme heat can result to dehydration. Mental health and well-being of people can also be affected by extreme weather events such as flooding and hurricanes causing anxiety, and emotional stress. Contaminated water supply from flooding and storm surge can also result in some cases to people's vomiting, diarrhea, and wound/skin infection. The multiple mediation analysis revealed the strength of mediation of the perceived impacts of climate change on the relationship between the participants' knowledge and their attitudes on climate change.

It is recommended that participants further their understanding of climate change by taking part in academic project work activities, such as researching environmental issues that have an impact on people's lives and society, such as reforestation, cutting back on firewood use, considerate use of non-renewable energy sources, and solid waste management.

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