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Adaptation and Mitigation of Climate Change: Awareness of Basilan State College Freshman Students

Orlando DL Zerrudo*, Nasser A. Salain, Ed.D. and Haipa A. Salain, Ed.D.
Basilan State College Basilan, Philippines.
*Corresponding author email id: ozerrudo@yahoo.com

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Abstract **– Climate change is one of the greatest public policy issues in our time. It has a lot of implications to humanity and the environment with its effects often linked to the collapse of various civilizations. Student's awareness on adaptation and mitigation of climate change contributes in the reduction of damages to property and to human race. The study determined the level of awareness on adaptation and mitigation of climate change of Basilan State College freshmen students. The researcher used descriptive-survey research design using questionnaire to gather the needed data. The data gathered were statistically treated, analyzed and interpreted. The overall awareness on adaptation and mitigation of climate change was "occasionally" aware. The male and female freshman students do not differ in their level of awareness on adaption and mitigation of climate change. The freshmen students were irregular to adapt and mitigate practices to minimize the effects of climate change. The school should revise the school curriculum to incorporate concepts of climate change in science subjects.**

Keywords **– Science Education, Awareness, Adaptation and Mitigation of Climate Change, Descriptive-Survey, Philippines.**

I. INTRODUCTION

CLIMATE change is one of the greatest public policy issues in our time. It has a lot of implications to humanity and the environment with its effects often linked to the collapse of various civilizations. According to Houghton (2001)[1] climate change is a change in the statistical properties of the climate system when considered over periods of decades or longer, regardless of cause. For the United Nations Framework Convention on Climate Change (2004)[2] climate change is a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

Climate change constitutes one of the 21st century key challenges to development the world over (UNDP, 2007). As such, climate change and global warming have become issues of global concern in the recent decades. This is evidenced by the flurry of conferences, campaigns, reports and researches on this subject since the Rio Earth Summit in 1992. While there are natural causes of climate change, the current warring trend has been largely blamed on human activities mainly the burning of fossil fuels, industrial pollution, deforestation, and land use changes (IPCC, 2007[3]; Canadel *et al*., 2010[4]; Weart, 2010)[5]. All these anthropogenic activities either increase the concentration of greenhouse gases in the atmosphere (Canadel *et al*., 2010), as is the case of combustion of fossil fuel and industrial pollution, or interfere with the absorption of carbon by terrestrial sinks (IPCC, 2007), as is the case of deforestation and land use changes, leading to global warming.

The climate change literature defines adaptation to the adjustment in ecological, social, or economic systems in response to the actual or expected climatic stimuli and their effects or impacts. It also refers to the changes in process, practices and structure to moderate potential changes or to benefit from opportunities associated with climate change. While mitigation refers to limiting global climate change through reducing the emissions of greenhouse gases (GHGs); since GHG emissions account for more than 80% of rising GHG concentrations in the atmosphere (Smit & Pilifosova, 2001)[6].

Climate change has brought about typhoons in the Philippines that have mangled homes, establishments and flooded the streets, making land transportation impossible. Many Filipinos suffered, lost their shelters, experienced scarcity in food and water, and even students were affected by these catastrophes. Thus, natural calamity occurrences became the main reason for the consecutive cancellation of classes during the month of July to August in the Philippines. In response to this climate problem, many law makers have proposed that the opening of the school classes be moved to September instead of June (Presidential Task Force on Climate Change, 2007)[7]. The amount of greenhouse gasses in the atmosphere is increasing its volume. The policies to mitigate climate change are implemented but the public shows limited support for mitigation and similar limited awareness of the mechanism and risk associated with the issue (Weber & Stern, 2011)[8].

Furthermore, the ecosystem will be affected badly by climate change. Among the ecosystems that will be greatly affected by climate change are the forests. Projected adverse impacts of climate change on forests include increased occurrence of forest fires, which will put the forests at risk and increased occurrence of pests and diseases and loss of thousands of species (IPCC, 2007). With the reduction of the forest area, ecosystem services such as biodiversity, water, carbon, climate regulation, soil and water protection or purification, recreational, cultural and spiritual benefits provided by the forests will also decrease.

Based from these events and observations, the researcher would like to find out the awareness of freshmen students of Basilan State College on climate change. Particularly, the researcher would like to determine their awareness on adaptation and mitigation to climate change.

Theoretical Framework

The Norm-Activation Model (NAM) of Shalom H. Schwartz, 1977 and the Value-Belief-Norm Theory (VBN) of Paul C. Stern, 2000 assume that people act pro-environmentally when they feel a moral obligation to do so, which depends on the extent to which people are aware of the problems caused by their behavior, and feel responsible for these problems and their solution. VBN theory further proposes that problem awareness is rooted in environmental concern and values. The NAM and VBN theories are reasonably successful in explaining low-cost environmental behavior and "good intentions" such as willingness to change behavior, political behavior, environmental citizenship, or policy acceptability. Therefore, the Norm-Activation Model (NAM) and the Value-Belief–Norm Theory (VBN) support this study.

The other theory that will support this study is the Social Representations Theory of Markova, (2008). It is a theory of social knowledge specifically concerned with how individuals, groups, and communities collectively make sense of socially relevant or problematic issues, ideas, and practices. From this perspective, behavior is not causally related to beliefs rather beliefs and behavior coexist as part of the system of meaning used to understand an issue. Different segments of society are likely to interact in diverse ways and at varying levels of intensity with concepts such as climate change. Debatably, individually and as communities of practice, scientists working on climate change engage with the concept more frequently than do distinct branches of government and many in the general public.

Conceptual Framework

The independent variables of the study are awareness of freshman students on adaptation and mitigation and gender differences on climate change. The domains on adaptation and mitigation are (a) tree planting and recycling of waste materials, (b) reduce use of gasoline, diesel, and kerosene, (c) avoid burning garbage at home, (d) switching of unused electrical devices, and (e) practice waste segregation (reduce, reuse, and recycle).

The dependent variable of this study is the level of awareness of freshman students on the adaptation and mitigation of climate change.

The implications of this study will help increase awareness of freshman students on the adaptation and mitigation of climate change which will then help reduce more damage to property and humanity.

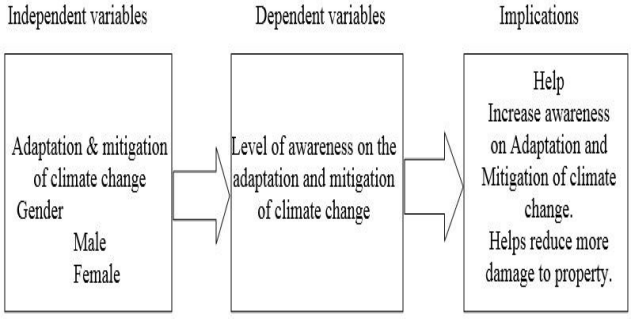

Fig.1. Schematic diagram of the conceptual framework of the study

Statement of the Problem

This study determined the level of awareness on adaptation and mitigation of climate change of Basilan State College freshman students.

Specific Objectives

1. What is the awareness level of freshman students on the adaptation and mitigation of climate change in terms of:

a) Tree planting and recycling of waste materials.
b) Reduce the use of gasoline, diesel, and kerosene.
c) Avoid burning of garbage.
d) Switching off unused electrical bulbs and electrical devices and,
e) Practice waste segregation at home?

2. Is there a significant difference between male and female freshmen students on the awareness of adaptation and mitigation of climate change?

Statement of the Hypothesis

There is no significant difference of male and female freshman students on adaptation and mitigation of climate change.

II. Research Design and Procedures

This chapter frameworks the manner in which the study will be conducted. The key components are the research method, the sample, research instrument, data gathering procedure and statistical treatment of the data.

Research Method

The approach used in this study is descriptive-survey research method. The descriptive-survey method of research, according to Travers (1978) aims to answer questions regarding the status or nature of the situation as it exists at the time of the study, which also involves testing certain hypotheses and exploring the causes of the particular phenomena. Since this study needs to determine the awareness of the respondents on adaptation and mitigation of climate change, this method is used.

The Respondent and Sample

The respondents of the study were the freshman students of Basilan State College, Basilan Province. The courses with board examination like Bachelor of Elementary Education and Bachelor of Secondary Education, Bachelor of Science in Nursing, Bachelor of Science in Criminology, and Bachelor of Science in Nutrition and Dietetics were the respondents of the study. The other respondents were the Bachelor of Arts and Bachelor in Computer Science which does not require a board examination. The respondents were mixtures of male and female students. The stratified-random samples were used in this study to take the exact ratio of samples needed for each courses. The total population of the respondents' is 981. Using the Slovin's formula with a margin error of 5%, it generated 284 samples. Shown below is the number of samples for each course.

Table 1. The distribution of the respondents (N = 284)

Course	Sex		No. of Respondents
	Male	Female	
AB	48	110	158
Bs Computer Science	8	7	15
Bs Criminology	25	9	34
Education(BEED/BSED)	10	32	42
Bs Nursing	4	8	12
Bs Nutrition & Dietetics	11	12	23
Total	106	178	284

Table 1 shows the distribution of the samples using stratified-random sample. The total male respondents are 106 and the female respondents are 178. The total samples in this study are 284.

The Research Instrument

A survey was conducted to measure the respondents' awareness on adaptation and mitigation of climate change. The general purpose of the survey is to collect data from the respondents about their knowledge and opinion on climate change (Gall et al., 1996). A questionnaire was formulated as a survey instrument to obtain the present awareness of freshman students of Basilan State College on climate change.

The questionnaire is of two parts; Part A is the Personal Profile of the respondents and Part B is the awareness of the freshmen students on adaptation and mitigation of climate change.

Each item has alternate responses, consisting of:

Awareness on Adaptation and Mitigation of climate change

1 = Never.
2 = Seldom.
3 = Occasionally.
4 = Usually.
5 = Always.

The Instrument Reliability

The Alpha (Cronbach), a model of internal consistency reliability, which is based on the average inter-item correlation, is the model adopted in this study.

Internal consistency reliability vary from a low of 0 to a high of 1.0 and represent the proportion of the variance in the respondents' scores that are attributable to the true differences on the psychological construct (DeVellis, 1991). The following guidelines have been proposed by DeVellis (1991) regarding acceptable reliabilities for research instrument scales:

Below .60	Unacceptable
Between .60 and .65	Undesirable
Between .65 and .70	Minimally acceptable
Between .70 and .80	Respectable
Between .80 and .90	Very Good
Much Above .90	Very Good, considering shortening the scale

An instrument with a Cronbach Alpha value of below 0.60 would mean that its reliability is unacceptable. An Alpha value of between 0.60 and 0.65 would signify that its reliability is undesirable. An Alpha value between 0.65 to 0.70 would be interpreted as minimally acceptable. A value of between 0.70 and 0.80 implies that the instrument's reliability is respectable. An Alpha value of 0.80 and 0.90 indicates that the reliability is very good. An instrument is considered having a good reliability, and with the possibility of shortening its scale, is that with a Cronbach Alpha of much above 0.90.

A pre-testing of the questionnaire will be conducted on 30 freshman students of the college who are not included as respondents of the study. An instrument reliability analysis will then be conducted based on the data that will be obtained. The result of such test was that the Cronbach Alpha value was 0.84, which means that the reliability of the instrument was very good.

The Instrument Validity

The Alpha (Cronbach), a model of internal consistency reliability, which is based on the average inter-item correlation, will be used to determine the validity of the instrument. Using the path finder analysis of Cronbach Alpha model, the Cronbach Alpha of each item in a questionnaire must not have a Cronbach Alpha value of less than 0.7.

A pre-testing of the questionnaire will be conducted to 30 freshman students of the college who are not part of the study using this analysis. Since each item in the questionnaire does not have a Cronbach Alpha value of less than 0.7, the instrument of this study was very valid.

Data Gathering Procedure

Permission will be asked from the college president to conduct the survey of this study on the freshmen students. Upon approval by the President, the researcher will start mining data to answer the researcher questions. Then collate the data and start the statistical treatment of the data.

Statistical Treatment of the Data

In this section, the descriptive and inferential statistics will be used to describe the data.

To determine the respondents' profile, the frequency will be used.

To determine the level of awareness on adaptation and mitigation of climate change, the mean and average mean will be used.

To determine the significant difference on gender, the t-test will be used.

III. Presentation, Analysis and Interpretation of Data

This chapter presents the analysis and interpretation of data gathered based on the research problems. The presentation of data is in order arranged according to the statements of problems in an attempt to answer them congruently.

The first research question that this study sought to answer was, "What is the awareness level of freshman students on the adaptation and mitigation of climate change in terms of:

a) Tree planting and recycling of waste materials.
b) Reduce the use of gasoline, diesel, and kerosene.
c) Avoid burning of garbage.

d) Switching off unused electrical bulbs and electrical devices and,
e) Practice waste segregation at home?"

Table 2. Level of awareness on adaptation and mitigation of climate change of freshman students

Awareness on adaptation and mitigation of climate change	Mean	Descriptive Equivalent
a) Tree planting & recycling of waste materials.	3.32	Occasionally
b) Reduce use of gasoline, diesel, & kerosene.	3.00	Occasionally
c) Avoid burning of garbage.	3.38	Occasionally
d) Switching of unused electrical bulbs and devices.	3.47	Occasionally
e) Practice waste segregation at home.	3.27	Occasionally
Grand Mean (GM)	3.28	Occasionally

Legend:
1-1.9 = Never.
2-2.9 = Seldom.
3-3.9 = Occasionally.
4-4.9 = Usually.
5-Above = Always.

The findings revealed that the freshmen students are aware "occasionally" on adaptation and mitigation of climate change. They are "occasionally" more aware on "switching of unused electrical bulbs and devices and less aware of "reduce use of gasoline, diesel, and kerosene. The overall awareness on adaptation and mitigation of climate change is occasionally aware with mean of 3.28.

In his studies, Pitpitunge, 2013[9], it showed that the students hold more correct perceptions on the basic concepts and causes of climate change but have low awareness on the effects and adaptation of climate change. The students also had alternative perceptions and they had poor knowledge and comprehension on the aspects of climate change.

The second research question that this study sought to answer was "Is there a significant difference on male and female freshmen students on adaptation and mitigation of climate change?

Table 3 Significance of the difference on adaptation and mitigation of climate change between male and female freshmen students

Awareness on adaptation and mitigation of climate change	Male		Female	
	Mean	Description	Mean	Description
a) Tree planting & recycling of waste materials.	3.44	Moderate extent	3.37	Moderate extent
b) Reduce use of gasoline, diesel, & kerosene.	3.15	Moderate extent	3.05	Moderate extent
c) Avoid burning of garbage.	3.24	Moderate extent	3.39	Moderate extent
d) Switching of unused electrical bulbs & devices.	3.35	Moderate extent	3.67	Moderate extent
e) practice waste segregation at home	3.36	Moderate extent	3.37	Moderate extent
Grand Mean (GM)	3.30	Moderate extent	3.37	Moderate extent

Table 4. The t-value and p-value on the adaptation and mitigation of climate change

Awareness on the adaptation and mitigation of climate change	T-value	P-value	Interpretation
a) Tree planting & recycling of waste materials.	-.541	.589	Not significant
b) Reduce use of gasoline, diesel, & kerosene.	-.699	.485	Not significant
c) Avoid burning of garbage.	1.035	.302	Not significant
d) Switching of unused electrical bulbs & devices.	2.044	.042	Significant
e) Practice waste segregation at home	.080	.936	Not significant
Total	0.383	0.47	Not significant

There is no significant difference on the awareness of adaptation and mitigation of climate change between male and female on tree planting & recycling of waste materials, t (284)) = -.541, p =.589.

There is no significant difference on the awareness of adaptation and mitigation of climate change between male and female on reduce use of gasoline, diesel, & kerosene, t (284)) = -.699, p = .485.

There is no significant difference on the awareness of adaptation and mitigation of climate change between male and female on avoid burning of garbage, t (284)) = 1.035, p = .302.

There is a significant difference on the awareness of adaptation and mitigation of climate change between male and female on switching of unused electrical bulbs & devices, t (284)) = 2.044, p = .042.

There is no significant difference on the awareness of adaptation and mitigation of climate change between male and female on practice waste segregation at home, t (284)) = .080, p = .936.

The results indicate that the switching of unused electrical bulbs & devices show significant difference on the awareness of the adaptation and mitigation of climate change and the others show no significant difference on the adaptation and mitigation of climate change between male and female. The results shows that since the p values (p = 0.47) is greater than assumed alpha level of significance of .05, therefore there is no significant difference between male and female on the awareness on adaptation and mitigation of climate change.

It was reported that women and men perceive and experience climate change in diverse ways because of their distinct socially constructed gender roles, responsibilities, status and identities, which result in varied coping strategies and responses (Lambrou & Nelson, 2010)[10].

IV. Conclusion

Our global student's must implement the measures to adapt and mitigate climate change due to unpredictable change of climate. Each one in this world must take part to discover other measures how to adopt and mitigate climate change. The level of awareness of Basilan State College freshman students on Adaptation and Mitigation of climate change is "Occasional". It indicates that the freshman students are irregular in practice to adapt and mitigate to reduce the effects of climate change. Awareness on climate change adaptation is not only for persons in school but also for out of school individuals. The hypothesis that there is no significant difference on male and female freshman students on adaptation and mitigation of climate change awareness is accepted. Since *climate change* is a huge global problem face by man today, subjects on climate change must be a part of a school curriculum from elementary grade to high school level.

V. Recommendation

Based on the findings of this study, the following recommendations are proposed for education curriculum planners and researchers:

For the Educational Curriculum Planners:

1. Our school curriculum must be revised so that it can transfer the climate change knowledge to our students. Our teachers must be involved in designing the climate change knowledge for our students to ensure that the content developed is simple and easy to understand.
2. Our school must embark on capacity building on climate change to ensure that teachers' understanding of climate change is improved before incorporating climate change knowledge in their subjects.

For the Future Researchers

1. Researchers should also explore the link between level of awareness on climate change and behavior change to inform any policy that seeks to make the public adopt positive environmental behaviors through awareness creation.
2. Researchers should also craft a study on the best resource materials available that students need to supplement their contents on climate change.

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Authors' Profiles

Orlando D.L. Zerrudo was born in Isabela City, Basilan Province, Philippines on February 20, 1955. Zerrudo finished Liberal Arts major in general science at Universidad de Zamboanga, Zamboanga City, Philippines on 1998. Zerrudo earned his Master of Arts in Science Education at Universidad de Zamboanga, Zamboanga City, Philippines on 2010. He is currently the ASSOCIATE DIRECTOR FOR RESEARCH and a GRADUATE SCHOOL/COLLEGE INSTRUCTOR at Basilan State College, Isabela City, Basilan Province. He was a SECONDARY and TERTIARY TEACHER and an ADVISER of a project proponent in science fair competitions in the country for 20 years. He presented research papers at research conferences held in the country. He published "Causes of Teenage Pregnancy of College Students in Basilan State College" (Palawan, Philippines: Integrated South East Asian Research Journal on Higher Education ISSN 2467-5997, Volume 2, Issue 1, 2016); "Effects of Climate Change: Awareness of Freshman Students of Basilan State College" (Palawan, Philippines: Integrated South East Asian Research Journal on Higher Education ISSN 2467-5997, Volume 1, Issue 1, 2015); and "Knowledge, Attitude, and Practices of Basilan State College Education Students on Solid Waste Segregation" (Iloilo City, Philippines: ADLE Research Journal ISSN 23508175, Volume 1, No.1, 2013). He is presently working on a paper entitled "Interfaith Marriages of Basilan State College Students".

Dr. Nasser A. Salain was born in Tuburan, Basilan Province, Philippines, on June 3, 1973. His educational background includes: a degree in Doctor of Education major in Educational Management, Zamboanga City, 2011; a Masters degree in Public Administration, Basilan, 1998; Bachelor of Secondary Education, Basilan, 1993; and Bachelor of Arts, Basilan, 1996. He is the President of Basilan State College from 2010 up to the present. He served as Basilan Sanguniang Panlalawigan member from 2001 to 2010. He also served as Sanguniang Panlalawigan Youth Representative. He had published research papers in refereed journals such as the International Association of Multidisciplinary Research (IAMURE), ADLE, and International Research Enthusiast Society Inc. (IRESInc.) Research Journals. Dr. Salain is a member of the Basilan Jaycees, and was VP for Community Development; He is the Founding Chairman of the Basilan Youth Network Alliance; member of the National Amnesty Philippines; member, Philippine Muslim Youth Congress; and Vice Chairman of the Basilan Young Professional Alliance, among others. His

Major Research Awards were: Research Awards Received were: Best Research Paper–ADLE International Conference on Research in Higher Education, Cebu City, Philippines, April, 2015; Top Five Best Research Paper-IRES-ISEARCHED and IRCET International Research Conference, Puerto Princesa City, Palawan, Philippines,

Dr. Haipa Abdurahim-Salain was born on February 27, 1976. She finished her college degree at Basilan State College where she took Bachelor of Arts in Political Science and graduated in 2003. She finished her Master's Degree and Doctor's Degree in the same school in 2011 and 2015 respectively. She is an Assistant Professor I at Basilan State College She is currently the Dean of the College of Arts and Sciences, at the same time the adviser or the Supreme Student Council. She is a certified accreditor of the Accrediting Agency of Chartered Colleges and Universities in the Philippines (AACCUP), Inc. She had presented a research paper entitled "Teaching Performance of the Basilan State College Faculty: A Differentiation by Personal and Professional Attributes", during the First International Multidisciplinary Research Conference on August 19-21, 2016 at Kay Hotel and Residences, Angeles City. . Salain had attended various seminars such as the Research Capability Building on December 17-18, 2016 at Marcia Business Hotel, Zamboanga City; National Youth Congress 2016, A Simulation of Parliament to Formulate a Youth Legislative Agenda for Sustainable Development on December 14-16, 2016 at Romulo Hall, Teachers' Camp, Baguio City; Training-Workshop of Accreditors on Outcomes-Based Quality Assurance organized by the on November 14-16, 2016 at Musuan, Maramag, Bukidnon; National Seminar on Student Discipline Administration in Higher Education on October 28-30, 2016 at Rajah Park Hotel, Fuente Osmeño Circle and Grand Convention Center, Cebu City; Zamboanga Peninsula Higher Education Research Association Fourth Assembly on September 1-3, 2016 at Grand Astoria Hotel, Zamboanga City; Workshop Conference on Women Leadership, Power, Decision Making in State Universities and Colleges; International Conference; 20th IFSSO General Conference; National Conference of Mindanao History and Culture; 2011 PASUC General Assembly; International Seminar-Workshop on Action Research Writing and Thesis Advising; National Seminar on Student Discipline, Campus Crime Prejudice and Crime Scene Management in Higher Education; Seminar on Effective Writing Skills; National Seminar on Forum on Early Childhood Education and Core History and Philosophy and Experience; 2011 and 2013 UP CSSP-SSPRF Summer Training-Seminar for Social Science Teacher; Capability Building for Office for Peace Frontliners; 2012 UP CSSP-SSPRF HAIN National Training-Workshop on Gender and Sexuality; and, other relevant trainings and seminars.