
Climate Change Awareness among Students in the Secondary Level

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Abstract:

This paper is an attempt to examine the level of awareness of students in UP High School Cebu towards Climate Change – a phenomenon that should be a concern for everyone. Climate change has been affecting many lives throughout the globe. This phenomenon is largely brought by anthropogenic sources, thus only we, humans, can offer best solutions to combat the problem. So it is in this premise that the first solution undertaken is measuring the level of awareness. The paper concludes that there is a high level of awareness on Climate Change among the respondents; however there were misconceptions that were sighted. It is then recommended that Science teachers in the institution should incorporate climate change awareness in their Science curriculum in order for some concepts to be clarified, thereby eliminating misconceptions.

Key words: Climate Change, Awareness, Global Warming, Environment, Misconceptions

I. Introduction

The Philippines, according to the World Wildlife Fund (WWF), is one of the countries very vulnerable to climate change. Climate change refers to any significant change in the measurement of the parameters of climate lasting for an

extended period of time. It therefore includes major changes in temperature, precipitation, or wind patterns, among other effects, that occur over several decades or even longer (EPA, 2014). Data show that the years 1998 and 2001 through 2010 were the hottest since records began in the 1880s and 2010, tied with 2005 as the hottest years on record. According to the National Oceanic and Atmospheric Administration (NOAA), global temperatures in those years may have been the highest in the last millennium. The last two decades of the 20th century is the warmest (See Fig 1) (Berg, Hager, & Hassenzahl, 2014). These major changes in global temperature are largely anthropogenic (caused by humans). Since the start of the industrial revolution up to the present where human activities mostly rely on machines, the amount of carbon dioxide and other greenhouse gases which are products of combustion, have been increasing enormously. The concentration of atmospheric carbon dioxide has increased from about 288 parts per million (ppm) approximately 200 years ago (before the Industrial Revolution began) to 394 ppm in 2011 (See Fig 2) (Berg, Hager, & Hassenzahl, 2014). The burning of fossil fuels for energy largely contributes for the tremendous rise of carbon dioxide level in atmosphere (EPA, 2014)^a.

A normal phenomenon suggests that as the sun heats up the Earth, some of the radiation (heat) is reflected back to the outer space, while some is trapped by the atmosphere and stays on Earth, maintaining the normal temperature. This phenomenon is called greenhouse effect. However, as the amount of greenhouse gases, like carbon dioxide increases, this also increases the ability of the atmosphere to trap more heat thus raising the Earth's temperature. The extent of greenhouse effect is what commonly called global warming (An Inconvenient Truth, 2006; EPA, 2014)^a.

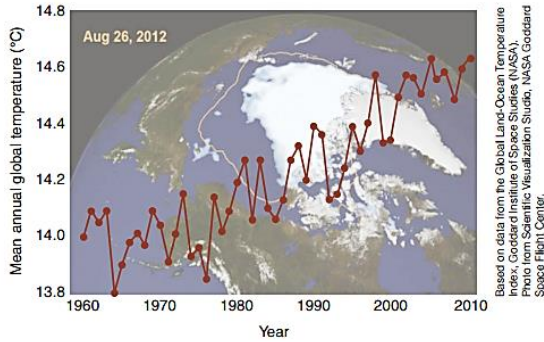


Fig 1. Mean global temperature, 1960 to present.

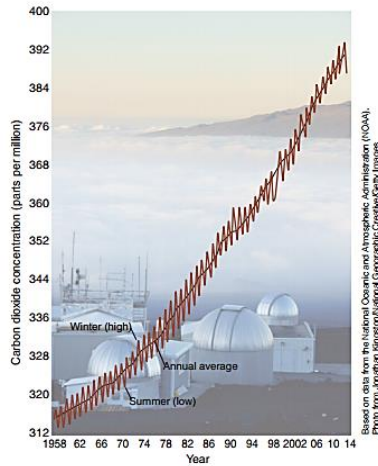


Fig 2. Carbon dioxide (CO₂) in the atmosphere, 1958 to present.

Climate change has horrible repercussions that are life-threatening. Among these are the melting of the polar ice caps, ocean acidification, coral bleaching, climate wars, and stronger storms.

Melting of Polar Ice Caps

The ice caps play a very important role in stabilizing the temperature especially that of the North and the South Poles. They serve as mirrors because they reflect fair amount of heat that enters the Earth (An Inconvenient Truth, 2006). As the

global temperature increases, these ice caps melt, and as a consequence, sea level will rise. In fact in the last 100 years, global temperature has increased by about half a degree. Consequently, this increase in temperature caused a rise in the sea level by about 6 to 8 inches (EPA, as cited in HowStuffWorks^a, 2014). The rise in sea level will cause low-lying islands to be underwater after some time, as in the case of Kiribati, a group of 32 islands in the central tropical Pacific Ocean, which planned to move its 100,000 people to Fiji (Vijayaraghavan, 2012).

Ocean Acidification

Oceans serve as sink for about 30 – 40% of the carbon dioxide emissions caused by humans (EPA, 2014). When carbon dioxide dissolves in this ocean, carbonic acid is formed leading to higher acidity mainly near the surface. This has been proven to inhibit shell growth in marine animals such as corals, oysters, shrimp, lobster, many planktonic organisms, and may be a cause for reproductive disorders in some fishes.

Equally worrisome is the fact that as oceans continue to absorb more CO₂, their capacity as a carbon storehouse could diminish. This implies that more of the carbon dioxide emitted will remain in the atmosphere, further aggravating global climate change (National Geographic, 2014).

Coral Bleaching

Coral reefs allow many marine organisms to live, that is why it is often called the “rainforest of the ocean.” Corals are in symbiosis with the algae zoothanthelae, where corals provide the house, the algae in return provide the food for corals. The rise in temperature brought by global warming could stress the corals. As consequence, zoothanthelae will be ejected and corals suffer from bleaching, and die. (Buchheim, n.d.)

Climate Wars

Walker and King (2006) cited in their book a phenomenon brought by climate change called Climate War. An example they gave was an incident that happened in Darfur which is a region of western Sudan, south of Sahara. People in the region lived so peacefully, not until an unimaginable horror happened in which more than two million people were displaced, homes destroyed, and lives ruined. According to the authors, the origin of the conflict was somehow complex; however, it was triggered by an ongoing drought. The people and cattle died in huge numbers, and resources became so scarce. Inhabitants of the area became so desperate that they began to set themselves against their farming neighbors.

Stronger Storms

Storms are formed over the bodies of ocean. The energy that propels storms comes from warm sea water, and usually in the tropics during hot months. Global warming increases the temperature of the water, therefore increasing the energy that drives the storms making them more destructive. Walters and King (2006) asserted that over the past thirty years, hurricanes have become 70% more energetic.

It is the aim of this paper to assess the basic awareness of the students in the University of the Philippines High School Cebu, Cebu City, Philippines, for academic year 2013-14, towards Climate Change. This paper further aimed to know if the students have misconceptions on climate change, because if there are, the misconceptions will be addressed in their respective science classes. Finally, this paper could also serve as benchmark on where to take off in integrating climate change awareness in their science curriculum.

II. Methodology

This study was conducted during the first week of April, 2014. A descriptive type of research was employed. Respondents were selected using stratified simple random sampling (See Table 1).

Table 1. Frequency Distribution of the Respondents

	Grade 7	Grade 8	Grade 9	Grade 10	Total
n (boys)	7	7	10	6	30
n (girls)	8	8	6	7	29
Total	15	15	16	13	59

Specifically, the following questions were asked from each respondent:

- (a) Have you heard about climate change?
- (b) What do you know about climate change?
- (c) Do you think the problem of climate change can be solved at all?
- (d) How do you think an individual can help overcome the problem of climate change?
- (e) Do you think the problem of climate change can affect you as a person?
- (f) If your answer to letter (e) is Yes, how does the problem of climate change affect you as a person?

With permission from the author (See Appendix A), the same set of questions were used from the study of Oruonye (2011).

III. Results and Discussions

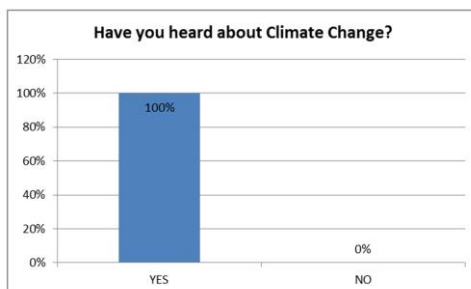


Fig 3. Overall frequency of responses for Question (a)

Fig 3 vividly depicted that all (100%) of the respondents had heard about climate change. This is in contrast with the result of Oruonye (2011) in which there were about 18.2% of the respondents did not hear about climate change.

Though all of the respondents heard about climate change, such result does not address the question whether or not they understood about the phenomenon. Question (b) asked on what they know about climate change.

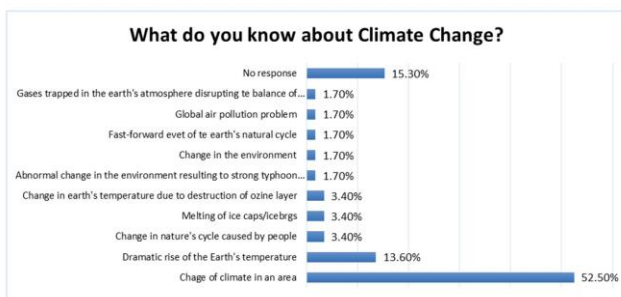


Fig 4. Overall frequency of responses for Question (b)

Fig 4 shows the overall response from the question ‘What do you know about Climate Change?’ 52.50% of the respondents wrote that climate change is the change of climate in an area, while 13.60% wrote that climate change is the dramatic rise of the Earth’s temperature. Other, of lesser frequency (3.40% and 1.70%) said that it is the melting of the polar ice caps and icebergs, the destruction of the ozone layer resulting to increase of Earth’s temperature, and gases trapped in the Earth’s atmosphere disrupting balance in the environment. The responses were related to the phenomenon of climate change, however the respondents do not have sufficient knowledge on it because their explanation is insufficient.

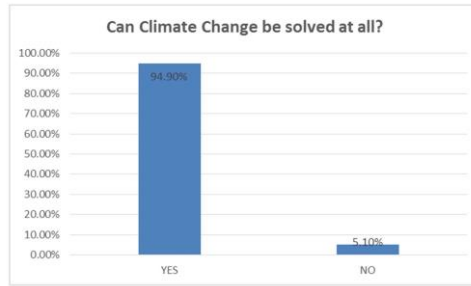


Fig 5. Overall frequency of responses for Question (c)

Fig 5 shows the overall response from the question, “Can Climate Change be solved at all?” An overwhelming 96.90% believed that the climate change phenomenon can be given a solution. Though their knowledge on climate change may still be insufficient, In contrast with Oruonye’s (2011) finding, only 32.9% believed that it can be solved, a majority of 60.0% believed that it cannot be solved, while 7.1% did not give any response to the question.

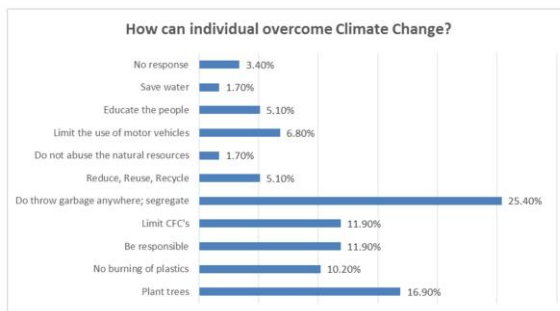


Fig 6. Overall frequency of responses for Question (d)

Fig 6 shows the overall response from the question, “How can an individual overcome Climate Change?” 25.40% of the respondents wrote that not throwing garbage anywhere and segregating garbage could help overcome climate change, 5.10% wrote 3Rs – reduce, reuse, recycle. Proper garbage segregation, reducing, reusing, and recycling materials could minimize the effects of climate change. For example in the United Kingdom, recycling is already saving around 10-15 million tons of CO₂

equivalent per year, equivalent to taking 3.5 million cars off the road (Waste & Resources Action Programme, 2006). Throwing leftover foods in the dumpsite could generate a considerable amount of methane, a greenhouse gas, which could contribute to an increasing in global temperature. If there will be proper waste segregation, such kind of methane-producing waste could be tapped for possible source of biogas, which is a fuel.

16.90% of the respondents wrote that planting trees could overcome climate change. This is partly true if trees are to be planted in a proper place. Forests in the tropical belt around the equator benefit the planet. They absorb CO₂, in a process called carbon sequestering, which can lower temperatures. It's the forests outside of the tropics that may have little or no impact on climate change (HowStuffWorks^b, 2014).

The farther away from the equator forests are, the more likely they are to trap heat in their dense canopies, raising temperatures. This is known as the albedo effect. In a study conducted by the Lawrence Livermore National Laboratory, Carnegie Institution and Université Montpellier II, scientists found that forests in mid-to-high latitudes could increase temperatures by up to 10 degrees F (5.5 degrees C) in the next 100 years than if those forests were not there (Lawrence Livermore National Laboratory, as cited in HowStuffWorks^b, 2014).

Limit the use of CFCs, no burning of plastics, and limit the use of motor vehicles got 11.90%, 10.20%, and 6.80%, respectively. These activities produce greenhouse gases and other gaseous substances that are health hazards.

From the responses, there was no mention of limiting the use plastics. The plastic production worldwide is growing at a rate of 5% per year (Simoneit et al, 2005). Because increasing production of plastics coupled with its improper disposal, it has become a menace that contributes to climate change. In the Philippines, however, the Total Plastic Bag Ban Act of 2011 is

now being practiced in at least 15 cities in Metro Manila that impose different punishments for violators. The Act was passed to prevent more non-biodegradable wastes from polluting the environment. It seeks to protect and advance the rights of the people to a balanced and healthful ecology. It prohibits groceries, supermarkets, public markets, restaurants, fast food chains, department stores, retail stores and other similar businesses from using non-biodegradable plastic bags. Instead, they could only provide recyclable paper bags or biodegradable plastic bags. The author of the Act, Philippine Senator Loren Legarda cited that a study showed around 500 billion to one trillion plastic bags are consumed each year that causes pollution and even the death of some species (Hogaza, 2014).

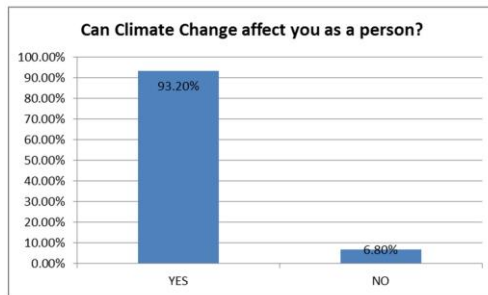


Fig 7. Overall frequency of responses for Question (e)

Fig 7 shows the overall response from the question, “Can Climate Change affect you as a person?” A huge 93.20% of the respondents claimed that climate change can affect them, while 6.80% said it does not affect them. Similarly in Oruonye’s (2011) finding, the majority 71.6% said climate change can affect them, while 28.4% said otherwise.

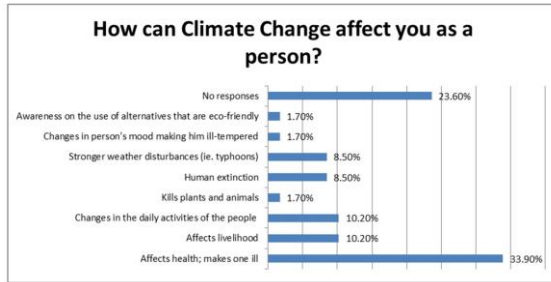


Fig 8. Overall frequency of responses for Question (f)

Fig 8 shows the overall response from the question, “How can Climate Change affect you as a person?” 33.90% of the respondents believed that climate change can affect one’s health by making them ill. Weather and climate is significant to one’s health. Changes in climate affect the average weather conditions that people are used to. Warmer average temperatures will lead to hotter days. Warmer temperatures could increase the concentrations of unhealthy air and water pollutants. Changes in temperature, precipitation patterns, and extreme events could enhance the spread of some diseases (EPA, 2014)^b.

In 2003, The Nature Conservancy (2014) cited that extreme heat waves caused more than 20,000 deaths in Europe and more than 1,500 deaths in India. Scientists have linked the deadly heat waves to climate change and warn of more to come.

The Nature Conservancy (2014) further asserted that In addition to heat-related illness, climate change may increase the spreading of infectious diseases, since warmer temperatures allow disease-carrying insects and microbes to survive in areas where they were once opposed by cold weather. Pests and diseases that were once limited to the tropics, such as malaria-carrying mosquitos, may find favorable conditions in new areas that were once too cold to make them live.

The World Health Organization (WHO) (as cited in The Nature Conservancy, 2014) estimated that climate change may

have caused more than 150,000 deaths in the year 2000 alone, with an increase in deaths likely in the future.

Climate change also affects the livelihood of the people, as well as it affects the daily activities their daily activities – these were mentioned by 10.20% of the respondents. In India, for example, there is this Dalit which is a group of people from all over the country which are considered as untouchables, whose livelihood were affected by climate change. In a study collaborated by National Dalit Watch of National Campaign on Dalit Human Rights & Society for Promotion of Wastelands Development (2013), stated that with global warming, the melting of Himalayan glaciers will become faster leading to larger inflows of water into the Brahmaputra. The Brahmaputra basin will be faced with floods and high sediment loads which will block the drainage system with silt, sedimentary rocks, sand, and mining debris. People whose livelihoods are on the area are expected to be affected.

In the Philippines, as climate change affects farm yield, income and food, food consumption, which averages 113 to 171 kilos per capita, are likewise compromised and may even exacerbate present inadequacies. The substantial number of farmer households across ecozones that presently allocate their produce for home consumption, either wholly or partially, are put at risk of food and income insecurity. Farm income is also expected to decline with reduced production as a result of lower yield. Consequently, the importance of non-farm income livelihood sources is heightened (Peñalba et al, 2012).

8.50 % of the respondents mentioned they were nervous every time they hear the news of a coming storm because from experience, there were typhoons in the Philippines that were really very strong, equivalent to Western's category 4 or 5. Last November 2013, the Philippines experienced the worst typhoon of all time, which is internationally known as Haiyan, locally, Yolanda, with wind speed of approximately 310 kilometers per hour. Haiyan was branded as the most powerful tropical

cyclone to make landfall in recorded history. According to Cogan (2013), more than 6,000 lives were lost, more than 27,000 were injured, and 1.2 millions of houses were damaged, half of which were completely destroyed. While majority would say, and they are in part correct, that the increase in the ocean water temperature brought by global warming can give more energy to the typhoon and could propel them to become stronger, there are contentions regarding the claim. Schiermeier (2013) claimed that the effect of warming seas could be counteracted by the apparent increase in the strength of shearing winds — winds blowing in different directions and varying in strength at different altitudes. Shearing winds tend to hinder the formation of storms, or tear them apart before they can reach extreme strength.

On balance, many climate researchers think that it is possible that tropical-storm activity will increase as the planet temperature increases. There is some evidence (Elsner, 2008, as cited by Schiermeier, 2013) that storm intensity has increased over the last three decades, but reliable data are limited to the north Atlantic, where observations are very abundant. In other places, the evidence is not yet conclusive (Coumou & Rahmstorf, 2012, as cited by Schiermeier, 2013).

IV. Conclusion and Recommendation

The findings show that there is a high level of awareness on Climate Change among the students of UP High School Cebu. Although there were misconceptions sighted, it is role of the Science teachers to incorporate climate change awareness in their Science curriculum so that during class discussions, concepts will be clarified to eliminate the misconceptions.

Climate change is not just in books. It is real, it is happening, it is affecting everyone. The first-level response should be awareness. It may take time to combat climate

change, but as everyone becomes aware of it and its ill effects, little by little we may bring back Earth to its normalcy.

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Figure 1. Mean Annual Global Temperature, 1960 to Present. From *Visualizing Environmental Science* (p. 222) by Berg, L., Hager, M C., and Hassenzahl, D., 2014, New Jersey: John Wiley and Sons Publishing.

Figure 2. Carbon dioxide (CO₂) in the Atmosphere, 1958 to Present. From *Visualizing Environmental Science* (p. 222) by Berg, L., Hager, M C., and Hassenzahl, D., 2014, New Jersey: John Wiley and Sons Publishing.

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