

Climate Change Knowledge Relates to Behavioral Practice Among Stakeholders in a Chinese Christian School

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Abstract

Climate change has become a global concern in the recent decades and is in dreadful need of attention and measures to mitigate its effect on society. This study examined the level of climate change knowledge and the extent of behavioral practice among school personnel and stakeholders of a Chinese Christian school in Bacolod City, Philippines. Three research hypotheses were postulated to guide the study. A benchmarked questionnaire was administered to a sample of 299 school personnel and stakeholders. Mean, Standard Deviation, ANOVA with Scheffe as Post-Hoc Test and Pearson Product Moment Coefficient of Correlation were employed to analyze the data collected. Findings indicated that the level of climate change knowledge and behavioral practice were significantly high generally among school personnel and stakeholders. The school personnel and stakeholders' level of climate change knowledge and behavioral practice revealed a significant relationship.

Keywords: science education, climate change knowledge, behavioral practice, descriptive research, Philippines

INTRODUCTION

Climate change today is the world's major concern because of its enormous effect on people and environment. Climate change constitutes one of the 21st Century key challenges to global development (United Nations Development Program, 2007). A vital action towards making effective climate mitigation efforts is to educate everyone on the interaction between climate and society. Although information on climate change is now readily available, the nation still seems unprepared to respond effectively to climate change, due partly to a general lack of public understanding of climate change issues and opportunities for effective responses (Leiserowitz, 2005; Leiserowitz and Smith, 2010; Leiserowitz, 2007; Moser and Dilling, 2007; Patchen, 2006; Pew Research Center for the People and the Press, 2009a, 2009b). The reality of global climate change lends increasing urgency to the need for effective education on earth system science, as well as on the human and behavioral dimensions of climate change, from broad societal action to smart energy choices at the household level (Gardner and Stern, 2002).

A “Report on Climate Change Knowledge, Attitude and Behavioural Practice Study” (White and Protz, 2012) mentioned that “people did indeed identify actions for which they could take personal responsibility without relying on government. Future campaign strategies must address this issue by convincing members of the society that they have a role to play in addressing climate change issues. Individuals, as well as various organizations, will need assistance in establishing the roles that they can play in responding to climate change”.

The Task Force on the Interface between Psychology and Global Climate Change outlines ways how psychology can help people adopt more environmentally friendly behaviors as well as ways policymakers can publicize such practices and, whenever appropriate,

weave behavioral research into environmental laws and regulations to make them more effective (Neuman and Price 2009).

Although the government plays an essential role in mitigating global warming through legislation and regulatory action, voluntary consumer reduction in energy usage is also important, especially in the absence of large-scale government interventions. More attention is needed to understand the potential and limitations of individuals' contributions to mitigation (Semenza, Hall, Wilson, Bontempo, Sailor, George, 2008).

In the quest for active response to this issue in the local community, the researcher conducted this study to find out the level climate change knowledge and the extent of behavioral practices of school personnel and stakeholders to be able to design a proposal of a suitable and effective program.

METHODOLOGY

Data collection was done within the period of the school year 2014-2015 and was administered by the giving out of survey questionnaires to the respondents. The respondents (23 school personnel, 132 parents, 132 students and 11 utility providers) were determined through Slovin's formula and the stratified random sampling technique.

The questionnaire containing both open and close-type questions was created using quadripartite assessment scale. The quadripartite scale consisted of a series of statements expressing either a positive or negative attitude towards a certain notion. The respondents will express the level of satisfaction or dissatisfaction with a specific statement. The respondents were guaranteed informed consent and privacy of information (Mitroff & Kilmann, 2002; Naito & Nakayama,

2003), which is hoped to contribute to obtaining honest and accurate answers as possible. Data entry was done in licensed Statistical Package for Social Sciences (SPSS) used for data processing and analysis software.

The following procedures were observed in the treatment of the data and the subsequent interpretation of results. Mean and Standard Deviation were used for the determination of the level of climate change knowledge and the extent of behavioral practice of the school personnel and stakeholders. The standard deviation was used in determining the homogeneity of the data gathered.

The results in numeric form will be interpreted using this scale:

	Level of Climate Change Knowledge	Extent of Behavioral Practice
1.00 – 1.5	Very Low	Very Low Extent
1.51 – 2.5	Low	Low Extent
2.51 – 3.5	High	Great Extent
3.51 – 4.0	Very High	Very Great Extent

ANOVA with Scheffe as the Post-hoc test was used for the determination of the significant difference of the level of climate change knowledge and the determination of the significant difference of the extent of behavioral practice among the school personnel and stakeholders. Scheffe was used in the multiple comparisons between and within the groups of school personnel and stakeholders in their climate change knowledge and behavioral practice.

Pearson product-moment coefficient of correlation was used for the determination of the relationship between the level of climate change knowledge and extent of behavioral practice among the school personnel and stakeholders.

RESULTS AND DISCUSSION

Level of Climate Change Knowledge among Stakeholders. The level of climate change knowledge among school personnel and stakeholders in Trinity Christian School is high. The total mean calculated is 3.30. There were three groups/categories/roles played in the community considered; the level of climate change knowledge among school personnel and stakeholders. A summary of the result is presented in Table 1.

Table 1. Level of Climate Change Knowledge Among School Personnel and Stakeholders.

Categories	n	Mean	Standard Deviation	Verbal Interpretation
Students	140	3.11	0.367	High
Parents	124	3.47	0.340	High
School Personnel	35	3.45	0.337	High
TOTAL	299	3.30	0.395	High

The result presented in Table 1 reveals that the level of climate change knowledge among stakeholders is high. The respondents demonstrated a high level of climate change knowledge like in the study conducted in Portland and Houston where almost all respondents were aware of global climate change (Semenza, DE Hall, Wilson, Bontempo, Sailor, George, 2008). These results are largely consistent with lay environmental beliefs and values about climate change collected in the U.S. (Reiner; Curry; De Figueiredo et al., 2006; Bord; Fisher; O'Connor, 1998; Brechin, 2003; Zahran; Brody; Grover; Vedlitz, 2006; Leiserowitz, 2005. Kempton, 1997).

Previous research shows widespread awareness of the issue of climate change. In England, 99% of the public have heard of either 'climate change', 'global warming' or 'the greenhouse effect', although the term 'climate change' alone is less widely recognized than 'global warming' (Department of Environment, Food and Rural Affairs in the United Kingdom, 2002; Norton & Leaman, 2004).

Likewise, two-thirds of the British public say they know 'a great deal' or 'a fair amount' about 'global warming' (Norton & Leaman, 2004).

These findings are consistent with reported higher levels of interest and knowledge about science issues in general, amongst men and those with a higher level of education (MORI, 2005; Eurobarometer, 2001; Evans & Durant, 1995; Office of Science and Technology and The Wellcome Trust, 2000; Durant et al., 1989; Hargreaves Leurs, Speers, 2003). Invariably, the level of climate change knowledge of students, parents and school personnel are collectively high.

The respondents under the category of parents and school personnel who are assumed to be highly educated showed high level of climate change knowledge (Parents' mean=3.47 and School Personnel's mean=3.45) as other research shows that graduates are more likely to feel environment/pollution affects their quality of life and is a priority area for government, compared to those with no qualifications, concern about climate change in particular is slightly lower amongst graduates than those without qualifications (Department of Environment, Food and Rural Affairs-DEFRA, 2002). This contradicts the results of the study of Ekpoh and Ekpoh (2011) when they found out that "findings indicated that the level of climate change awareness was low generally among teachers".

Students have also displayed a high level of climate change knowledge (Bruinders; Canavan; Johnstone; Mabuza; Mattushek; Spencer(2009). Previous researches have shown that young people are more concerned about environmental issues in general, and global environmental issues in particular (Young; Sydney; Australia; Environment Protection Agency, 1994; Tranter, 1996; Witherspoon and Martin; Jowell, 1992; Brook; Prior; and Taylor (eds.); Aldershot; Dartmouth, 1992; Worsley; and Skrzypiec, 1998; Young; Jowell; Brook;

Prior; and Taylor (eds.); Aldershot; Dartmouth, 1990; Young; Jowell; Brook; Prior; and Taylor (eds.); Aldershot; Dartmouth, 1991). In their study of young people's understanding of global environmental issues in Europe and North America, Boyes and Stanisstreet (1998) found “that some orthodox ideas about these issues were already established by the youngest group. For example, the ideas that the greenhouse effect will cause changes in weather patterns, and global warming were already well known to pupils aged 11/12 years” (Stanisstreet; and Boyes; in Harris; and Blackwell (eds.); Arena; Aldershot, 1996).

Though students displayed a high level of climate change knowledge (mean=3.11), they are the category that got the lowest mean as compared with the other two categories (Parents' mean=3.47 and School Personnel's mean=3.45). This would mean that students have not yet reached their maturity as to their judgment and knowledge on climate change issues. Recent studies indicate that younger people are less concerned than older age groups about climate change (Bibbings, 2004a) and the environment in general (DEFRA, 2002; Christie & Jarvis, 2001; Witherspoon & Martin, 1991). It was also noted that the awareness of the causes and impacts of climate change is lowest amongst the under-25 and over-65 age groups (DEFRA, 2002; Bibbings, 2004a; Hargreaves et al., 2003).

Table 2. Extent of Behavioral Practice among School Personnel and Stakeholders.

Categories	n	Mean	Standard	
			Deviation	Verbal Interpretation
Students	140	2.88	0.402	High
Parents	124	3.31	0.428	High
School Personnel	35	3.11	0.485	High
TOTAL	299	3.08	0.467	High

Table 2 staged that the extent of behavioral practice among stakeholders is high within the study area. The respondents demonstrated a high extent of behavioral practice in climate change. Semenza, Hall, Wilson, Bontempo, Sailor, George (2008) mentioned that awareness about climate change is virtually universal (in Portland and in Houston) with the vast majority reporting some level of concern (in Portland and in Houston). Similarly the study conducted by Caribbean Institute of Media and Communication and The University of the West Indies (2012) shows that the attitude of many Jamaicans toward climate change seems to be positive, in that many expressed that they were very concerned about it and were interested in finding out more about the impact of climate change on the country. And since 2003, time-series data have shown an increase in the level of climate change concern (GlobeScan, 2006). Consistently, the extent of behavioral practice of students, parents and school personnel are high respectively.

The respondents under the category of parents and school personnel who are assumed to be highly educated showed high level of climate change knowledge (Parents' mean=3.11 and School Personnel's mean=3.31) as other research shows that graduates are more likely to feel environment/pollution affects their quality of life and is a priority area for government, compared to those with no qualifications, concern about climate change in particular is slightly lower amongst graduates than those without qualifications (DEFRA, 2002).

Though students have also displayed high extent of behavioral practice and are ready and willing to participate in climate change mitigating measures like in the study of Bruinders; Canavan; Johnstone; Mabuza; Mattushek; Spencer (2009) and as was supported by the studies of Young (1994); Tranter (1996); Witherspoon and Martin; Jowell; Brook; Prior; and Taylor (eds.); Aldershot;

Dartmouth (1992); Worsley; and Skrzypiec (1998); Young; Jowell; Brook; Prior; and Taylor (eds.); Aldershot; Dartmouth (1990); Young; Jowell; Brook; Prior; and Taylor (eds.); Aldershot; Dartmouth (1991), it still proved to be the lowest (mean=3.11) among the groups covered in the study in terms of their extent of behavioral practice. This would also mean that students have not yet reached their maturity as to their behavioral practice on climate change as recent studies indicate that younger people are less concerned than older age groups about climate change (Bibbings, 2004) and the environment in general (DEFRA, 2002; Christie & Jarvis, 2001; Witherspoon & Martin, 1991; DEFRA, 2002; Bibbings, 2004; Hargreaves et al., 2003).

Difference in the Level of Climate Change Knowledge among Stakeholders. There is a significant difference between the groups in their level of climate change knowledge. The independent variables are the groups/categories/roles played in the community, while the dependent variables are the level of climate change knowledge. One-way ANOVA is used to compare the data obtained. A summary of the result is presented in Table 3A.

Table 3A. Significance of the Difference in the Level of Climate Change Knowledge among School Personnel and Stakeholders.

LEVEL OF CC KNOWLEDGE	Sum of Squares	Degree of Freedom	Means Square	F	Sig
Between Groups	9.764	2	4.882	39.307	0.000
Within Groups	36.764	296	0.124		
Total	46.528	298			

F(2,296) = 39.307, p<.01

The result presented in Table 3A shows that the calculated significance level (p-value) of 0.000 at 0.01 level of significance (alpha) and 298 degrees of freedom. Thus the null hypothesis is rejected while the alternative hypothesis is retained. This means that there is a statistically significant difference among the groups/categories/roles played in the community in their level of climate change knowledge within the study area.

Table 3B. Scheffe Multiple Comparisons on the Level of Climate Change Knowledge.

Dependent Variable	RC	RC	Mean Difference	Std. Error	Sig	95% Lower Bound
KNOWLEDGE	Students	Parents	-0.366*	0.043	0.000	-0.47
		School Personnel	-0.349*	0.067	0.000	-0.51
	Parents	Students	-0.366*	0.043	0.000	0.26
		School Personnel	-0.017	0.067	0.968	-0.15
		School	Students	-0.349*	0.067	0.000
	School Personnel	Parents	-0.017	0.067	0.968	-0.18

Table 3B presents that there are significant differences both between students and parents (p=0.000) and between students and school personnel (p=0.000) in their level of climate change knowledge. The calculated p-value 0.000 shows that there is a significant difference between parents and students in their level of climate change knowledge. But no significant difference in the level of climate change knowledge between parents and school personnel with a calculated significance level of 0.968.

There is also a significant difference between the school personnel and students in their level of climate change knowledge at 0.000significance level, but 0.968 calculated significance level tells no significant difference between school personnel and parents in their level of climate change knowledge.

The significant difference between students and parents in their level of climate change knowledge like the significant difference between students and school personnel in their level of knowledge on climate change can be attributed to the age difference between the groups (Bibbings, 2004; DEFRA, 2002; Christie & Jarvis, 2001; Witherspoon & Martin, 1991; DEFRA, 2002; Bibbings, 2004a; Hargreaves et al., 2003). This means that students and parents vary in their level of knowledge on climate change. Lorraine Elisabeth Whitmarsh (2005) proposed that awareness and knowledge of climate change are higher among graduates and middle-aged people. Similarly, those with a higher level of education are also more likely to know the result of climate change (Eurobarometer, 2001).

The level of climate change knowledge of school personnel differs from the students like in the study of Albert Van Overmeer (1983), “Students and teachers do have different perceptions”. Academic staff is significantly more knowledgeable about climate change in comparison to students (Bruinders; Canavan; Johnstone; Mabuza; Mattushek; Spencer).

Difference in the Extent of Behavioral Practice among Stakeholders There is a significant difference between the groups in their extent of behavioral practice. The independent variables are the groups/categories/roles played in the community, while the dependent variables are the level of climate change knowledge.

Table 4A. Significance of the Difference in the Extent of Behavioral Practice among School Personnel and Stakeholders.

EXTENT OF BEHAVIORAL PRACTICE	Sum of Squares	Degree of Freedom	Means Square	F	Sig
Between Groups	11.948	2	5.974	33.387	0.000
Within Groups	52.962	296	0.179		
Total	64.909	298			

F(2,296) = 33.387, $p < .01$

The result presented in Table 4A shows that the calculated p-value of 0.000 at 0.01 level of significance and 298 degrees of freedom. Thus the null hypothesis is rejected while the alternative hypothesis is retained. This means that there is a significant difference among the groups/categories/roles played in the community in their extent of behavioral practice within the study area.

Scheffe's procedure is used as Post Hoc Tests to compare between and within the groups in this study. Table 4 B presents the differences among the groups/categories or/roles played in the community in their extent of behavioral practice.

Table 4B.Scheffe Multiple Comparisons on the Extent of Behavioral Practice.

Dependent Variable	RC	RC	Mean Difference	Sig
BEHAVIORAL PRACTICE	Students	Parents	-0.426*	0.000
		School Personnel	-0.234*	0.015
	Parents	Students	-0.426*	0.000
		School Personnel	-0.192	0.061
	School Personnel	Students	-0.234*	0.015
		Parents	-0.192	0.061

Table 4B presents that there is a significant difference between students and parents with the calculated level of significance of 0.000. No significant difference between students and teachers with the p-value of 0.015 in their extent of behavioral practice. A calculated level of significance of 0.000 shows that there is a significant difference between parents and students in their extent of behavioral practice, but no significant difference between parents and teachers with 0.061 calculated p-value in their extent of behavioral practice. There is also a significant difference between the teachers and students at 0.000 p-value, but 0.061 level of significance tells no significant difference between school personnel and parents in their extent of behavioral practice.

The significant difference between students and parents in their extent of behavioral practice can also be attributed to the age difference between the groups (Bibbings, 2004; DEFRA, 2002; Christie & Jarvis, 2001; Witherspoon & Martin, 1991; DEFRA, 2002; Bibbings, 2004a; Hargreaves et al., 2003). “There is an association of age and much environmental behaviour. Older persons are more likely to not leave TVs on standby, switch off lights, take shopping bags to the shops, and take account of amount of packaging and recycling in purchases. Younger persons are more likely to cycle or walk for trips of 2-3 miles, take public transport and share a car” (Lynn and Longhi). Older people are more likely than younger people to report environmentally friendly behaviours (Lynn and Longhi).

Relationship between Climate Change Knowledge and Behavioral Practice of School Personnel and Stakeholders.

Table 5. Significance of the relationship between the Climate Change Knowledge and Behavioral Practice among School Personnel and Stakeholders

CORRELATES	n	df	p value	Sig @ 0.01
Climate Change Knowledge	299	596	0.000	Significant
Behavioral Practice	299			

There is a statistically significant correlation between the level of climate change knowledge and extent of behavioral practice of stakeholders. This means that changes in either level of climate change knowledge or extent of behavioral practice of stakeholders are correlated with changes in either of them. Blennow & Persson's (2009) study concluded that a person's attitude or belief in climate change had been found to directly correlate with

their motivation to take mitigating action. However, people's attitude towards climate change will only change if they are exposed to the issue on a regular basis (Wilson, 2003). There is a significant relationship between climatic change knowledge and environmental attitude among higher secondary students (Essouradjane and Raju, 2014). The findings of Lynn and Longhi (2011) offer an interesting suggestion that more highly-educated people may be more willing to take environmentally-motivated principled actions.

The correlation between the level of climate change knowledge and extent of behavioral practice is manifested in this study. Harker-Schuch and Bugge-Henriksen (2013) mentioned that knowledge about climate change science significantly affects opinions about climate change. The lecture in climate change science significantly improved knowledge development but did not affect opinions.

According to Sunstein (2006), knowledge of a certain topic will enhance an individual's concern with this topic, and according to Tjernström and Tietenberg (2008), unfamiliarity with climate change science is the single largest factor accounting for an individual's motivation to feel concerned about climate change (Harker-Schuch and Bugge-Henriksen, 2013). Bord et al., (1998) added that "the more knowledge exhibited on climate change, the more willing individuals are to get involved in mitigating activities." Bord and O'Connor (1997) support the assumption that knowledge is a significant motivator of behavioral change which is a precursor to the development of policy aimed at climate change mitigation and adaptation.

At the individual level, behaviors of significance for climate change may be influenced by a person's attitudes toward climate change, but they are also subject to these wider sociocultural and political factors (Lorenzoni;

Nicholson-Cole; Whitmarsh, 2007; Swim; Clayton; Howard, 2011; Renn; WIREs Clim Change, 2011) which, from a sociological perspective are internal to the understanding of climate change dilemmas (Renn, 2011 and Klöckner, 2013).

Though individuals' knowledge does not transform easily into organizational knowledge even with the implementation of knowledge repositories, individuals tend to hoard knowledge for various reasons (Bock, Singapore; Zmud, USA; Kim, Korea; Lee, Korea-Hongkong). In the study of Semenza; Hal; Wilson; Bontempo; Sailor; George (2008), the majority of respondents claimed to have changed their behavior in response to climate change.

The conclusion of the MIT study, and similar research, on the need to foster public knowledge about the physical processes surrounding climate change in order to effect action, accords with what Macnaghten and Jacobs describe as the “ dominant view of sustainable development”, where people “are presented as individual agents acting 'rationally' in response to information made available to them.”(Berk. and Schulman, 1995; Henderson-Sellers; McDaniels, Axelrod., and Slovic, 1996; Macnaghten and Jacobs, 1997; Burgess et al 1999; Macnaghten and Urry, 1998) with few behavioral changes taking place (Bostrom, Granger Morgan, Fischhoff, and Read, 1994; Kempton, Boster, and Hartley, 1995; Read, Bostrom, Granger Morgan, Fischhoff, and Smuts, 1994)

CONCLUSIONS

The high level of climate change knowledge implies that Bacolod Trinity Christian School personnel and stakeholders are knowledgeable in the issues of climate change. Their high extent of behavioral practice connotes

their responsible and educated practices in relation to the issues of climate change.

The Bacolod Trinity Christian School personnel and stakeholders' climate change knowledge and behavioral practice significantly relate to each other. It further implies that one's level of knowledge on climate change indicates its extent of behavioral practice on climate change or one's extent of behavioral practice shows its level of climate change knowledge.

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