Model of Environmental Education Affecting through Psychological State for Global Warming Alleviation

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Abstract. The research objective was to develop a model of environmental education through psychological state affecting to global warming alleviation. The populations were 35,010 undergraduate students of the first semester of academic year 2011 of Mahasarakham University. The simple random sampling was used to collect the sample for 450 undergraduate students with proportion according to fields of study. The methodology was survey research and questionnaire was employed as instrument for data collecting. LISREL was used for model verification. Results illustrated as Equation 1 as following. Considering on structural model confirmatory factors of EE was able to explain the variation of endogenous factors of Psychological State (STATE) to caused Environmental Behaviors for Global Warming Alleviation (BEH) with 87.5 percents Therefore, the equation 1 can be written as following. BEH = 0.34 STATE + 0.71 EE (1), (R2 = 0.875)

Keywords: Model, Environmental Education, Psychological State, Affecting, Global Warming Alleviation

1. Introduction

Currently, environmental information on climate change with global warming has become hot issue for general people who are directly impacted by the earth quake, flood, and drought, furthermore it also affected to natural system, ecological system, biodiversity loss, new vector of disease born, species migration, and so on. However, the environmental problem can't absolutely separate from individual level. The main of cause is revealed that the people have not enough knowledge and understanding, lack of consciousness, awareness, and attitude to practice proper behavior including realizing that they take very important parts to take responsibility for conservation of natural resources and environment (United States National Academy of Sciences., 2008, National Research Council of USA., 2010, & Thiengkamol, 2011e).

The psychologists also realized that psychological state affects to human behavioral blueprint, and then they had developed a large number of theories and models but they had the main focus on explanation how individual perceived and evaluated the stimulant before making decision to express their behaviors. Nevertheless, study on human behavior, it can't be neglected the psychological state. There is much debate over how much of whom is influenced by nature (genetic) or nurture (environment), and both contribute significantly to our complete expression (Kassin, 2003, Pearson, 2006, Thiengkamol, 2011f, Thiengkamol, 2011f).

Environmental education (EE) is an effective learning process for gaining more knowledge and understanding, raising awareness, changing attitude and behavior of human being about the environment and associated challenges. Additionally, it also develops the necessary skills, participation, motivations, and commitments to make informed decisions and take responsible action. Therefore, psychological state should be integrated with EE process to create properly environmental behavior for global warming alleviation regarding to consumption behaviour, energy conservation, recycling, waste managing, traveling and knowledge transferring behaviors (Thiengkamol, 2004, Thiengkamol, 2005a, Thiengkamol, 2011a, Thiengkamol, 2011e, Thiengkamol, 2011i, & Thiengkamol, 2011j).

1.1. Objective

The objective was to develop a model of environmental education through psychological state affecting to global warming alleviation.

2. Methodology

The research design was implemented in steps by step as follows:

- The populations were 35,010 undergraduate students of the first semester in academic year 2011 of Mahasarakham University. The 450 simple random sampling was employed to collect data from different faculties of Mahasarakham University with the equivalent proportion.
- The research instrument was the questionnaire and it was used for data collecting. The content and structural validity were determined by Item Objective Congruent (IOC) by 5 experts in the aspects of environmental education, psychology, social science and social research methodology. The reliability was done by collecting the sample group from 50 undergraduate students of Rajabhat Mahasarakham University which is nearby Mahasarakham University. The reliability was determined by Cronbach's Alpha. The reliability of environmental education principle, psychological state, environmental behaviors, and the whole questionnaire were 937, .897, 929 and 971 respectively.
- The descriptive statistics used were frequency, percentage, mean and standard deviation. The inferential statistics used was LISREL by considering on Chi-Square value differs from zero with no statistical significant at .05 level or Chi-Square/df value with lesser or equal to 2, P-value with no statistical significant at .05 level and RMSEA (Root Mean Square Error Approximation) value with lesser than 0.05 including index level of model congruent value, GFI (Goodness of Fit Index) and index level of model congruent value, AGFI (Adjust Goodness of Fit Index) between 0.9-1.00.

3. Results

3.1. Confirmatory Factors of Exogenous Variables

Results of Confirmatory Factor Analysis of Exogenous Variables of Environmental Education (EE) and Psychological State (STATE) affecting to environmental behaviors for global warming alleviation, were revealed as followings.

3.1.1 Confirmatory factors of EE had Bartlett's test of Sphericity of 995.457 statistically significant level ($p < .01$) and Kaiser–Mayer–Olkin Measure of Sampling Adequacy/MSA) of 0.809. This indicated that components of EE aspect had proper relationship at good level and it can be used for analysis of confirmatory factors as presented in Table 1.

Table 1 Results of Analysis of Confirmatory factors of Environmental Education

	Components of Environmental Education	Weight	SE	t	R^2
X1	Knowledge and Understanding on Environment	0.52	0.052	9.93**	0.22
X2	Attitude toward Environment	0.65	0.029	22.84**	0.82
X3	Value for Environment	0.48	0.028	17.03**	0.53
X4	Skill for Environmental Practice	0.58	0.033	17.43**	0.56
X5	Participation to Environmental Activities	0.58	0.036	16.24**	0.51
Chi-square = 3.30 df = 3 P = 0.34705					
GFI = 1.00 AGFI = 0.99 RMSEA = 0.015 RMR =0.010					

** Statistically significant level of .01

From Table 1, results of analysis of confirmatory factors of EE from 6 observed variables were revealed that the model was congruent to empirical data by considering from 1) Goodness of Fit Index (GFI) equaled to 1.00 and Adjust Goodness of Fit Index (AGFI) equaled to 0.99 2) Root Mean Square Error of Approximation (RMSEA) equaled to 0.015 (RMSEA < 0.05) and 3) Chi- Square value had no statistically significant at level of .01 and degree of freedom was lesser than or equaled to .05.

Considering on loading weight of observed variables in model, it was revealed that observed variables had loading weight with 0.52 to 0.65 and had covariate to model of Environmental Education with 22.0 to 82.0 percents.

3.2. Confirmatory Factor Analysis of Endogenous Variables

3.2.1. Confirmatory Factor Analysis of Psychological State (STATE)

Confirmatory factors of Psychological State had Bartlett's test of Sphericity of 751.823 statistically significant level ($p < .01$) and Kaiser–Mayer–Olkin Measure of Sampling Adequacy/MSA) of 0.769. This indicated that components of STATE aspect had proper relationship at good level and it can be used for analysis of confirmatory factors as presented in as shown in Table 2.

Table 2 Results of Analysis of Confirmatory factors of Psychological State

Confirmatory factors of Psychological State		Weight	SE	t	R^2
Y7	Value of Self-Living	0.46	0.028	12.02**	0.39
Y8	Value of Family Living	0.45	0.035	11.56**	0.47
Y9	Attitude of Sufficiency	0.47	0.037	15.58**	0.49
Y10	Religion Belief	0.71	0.038	17.96**	0.88
Y11	Environmental Physical	0.45	0.039	11.01**	0.46
Chi-Square=0.236, df=2, P-value=0.75428					
GFI = 1.00 AGFI = 1.00 RMSEA = 0.001 RMR = .012					

** Statistically significant level of .01

FromTable 2. results of analysis of confirmatory factors of STATE from 5 observed variables were revealed that the model was congruent to empirical data by considering from 1) Goodness of Fit Index (GFI) equalled to 1.00 and Adjust Goodness of Fit Index (AGFI) equalled to 1.00 2) Root Mean Square Error of Approximation (RMSEA) equalled to 0.001 (RMSEA < 0.05) and 3) Chi- Square value had no statistically significant at level of .01 and degree of freedom was lesser than or equalled to .05.

Considering on loading weight of observed variables in model, it was revealed that observed variables had loading weight with 0.45 to 0.71 and had covariate to model of Psychological State with 39.0 to 88.0 percents.

3.2.2. Confirmatory Factor Analysis of Endogenous Variables of Environmental Behaviors for Global Warming Alleviation (BEH)

Confirmatory Factor Analysis of Endogenous Variables of Environmental Behaviors for Global Warming Alleviation (BEH) had Bartlett's test of Sphericity of 834.218 statistically significant level (p< .01) and Kaiser–Mayer–Olkin Measure of Sampling Adequacy/MSA) of 0.832. This indicated that components of BEH aspect had proper relationship at good level and it can be used for analysis of confirmatory factors as shown in Table 3.

Table 3 Results of Analysis of Confirmatory factors of Environmental Behaviors for Global Warming Alleviation

Confirmatory factors of Environmental Behaviors for Global Warming Alleviation		Weight	SE	t	R^2
Y1	Consumption Behavior	0.59	0.029	19.95**	0.69
Y2	Energy Conservation	0.40	0.032	12.67**	0.34
Y3	Waste Management	0.21	0.028	7.41**	0.13
Y4	Travelling Behavior	0.34	0.039	8.81**	0.18
Y5	Recycling Behavior	0.76	0.044	17.01**	0.54
Y6	Knowledge Transferring and Supporting for Environmental Conservation	0.60	0.031	18.96**	0.64
Chi-square = 11.08 df = 7 P = 0.13517					
GFI = 0.99 AGFI = 0.98 RMSEA = 0.000 RMR = 0.036					

** Statistically significant level of .01

From Table 3, results of analysis of confirmatory factors of BEH from 6 observed variables were revealed that the model was congruent to empirical data by considering from 1) Goodness of Fit Index (GFI) equalled to 0.99 and Adjust Goodness of Fit Index (AGFI) equalled to 0.98 2) Root Mean Square Error of Approximation (RMSEA) equalled to 0.000 (RMSEA < 0.05) and 3) Chi- Square value had no statistically significant at level of .01 and degree of freedom was lesser than or equalled to .05.

Considering on loading weight of observed variables in model, it was revealed that observed variables had loading weight with 0.21 to 0.76 and had covariate to model of Environmental Behaviors for Global Warming Alleviation with 13.0 to 69.0 percents.

3.3. Results of Effect Among Variables in Model in Terms of Direct Effect

Confirmatory factors of Environmental Education (EE) had direct effect to Environmental Behaviors for Global Warming Alleviation (BEH) with statistically significant at level of .01 with effect of 0.71. Moreover, confirmatory factors in aspect of Environmental Education (EE) had indirect effect to Environmental

Behaviors for Global Warming Alleviation (BEH) with statistically significant at level of .01 with effect of 0.25.

Confirmatory factors of Environmental Education (EE) had direct effect to Psychological State (STATE) with statistically significant at level of .01 with effect of 0.35.

Confirmatory factors of Psychological State (STATE) had direct effect to Environmental Behaviors for Global Warming Alleviation (BEH) with statistically significant at level of .01 with effect of 0.34.

Considering on structural model confirmatory factors of EE was able to explain the variation of endogenous factors of Psychological State to caused Environmental Behaviors for Global Warming Alleviation (BEH) with 87.5 percents. Therefore, the equation can be written as following.

$$BEH = 0.34\ STATE + 0.71\ EE \quad (1)$$

$$(R^2 = 0.875)$$

Equation (1) factors that had the most effect to Environmental Behaviors for Global Warming Alleviation (BEH) was Environmental Education (EE), subsequence was Psychological State (STATE) and these were able to explained the variation of environmental Behaviors for Global Warming Alleviation (BEH) with 87.5 percents.

4. Discussion

As a result, it might be concluded that environmental education and psychological state play very important roles to create the environmental behavior of consumption, energy conservation, waste management, travelling behavior, recycling behavior, and knowledge transferring and supporting for environmental conservation, therefore environmental education should introduced by integration in every subjects in the school. Besides, in aspect of environment, especially at educational institute such as the schools, collages, and universities should provide environment and situation to escort the students to study good environmental physical of institute and encourage them with sufficiency attitude and religion belief to deeply understand on the importance of such as biodiversity, ecological system and interrelationship among living things to gain more knowledge and understanding about environment and to raise their awareness, and to change their attitude and behavior for environmental conservation. The results of this study were congruent to various studies of Thiengkamol, (2005a, 2010b, 2011i, & 2011j) and the concept proposed by Thiengkamol, (2009a, 2009b, 2011e, 2011f & 2011j).

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