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Effects of Environmental Ethics Infusion Instruction on Knowledge and Ethics of Undergraduate Students

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ABSTRACT

The purposes of this research were to study environmental knowledge and environmental ethics of undergraduate students who learned by taking instructional process based on infusion of environmental ethics, to compare environmental knowledge and environmental ethics between experimental and the control groups and to compare environmental knowledge and environmental ethics between experimental and control groups with different sexes. Sixty of fourth-year undergraduate students in environmental technology major were sampled. They were assigned into two groups. Experimental and control groups consisted of 30 students each. The findings revealed that the experimental group students and the control group students showed their environmental knowledge at 69.00 and 60.75% of total score. In addition, the first group indicated that their environmental ethics at the level 4 (goodness of environmental ethics) and the latter group at level 3 (societal ethics). The experimental group had higher score of environmental knowledge and environmental ethics than those control group ($p < 0.05$). Female students in the experimental group had higher score of environmental knowledge and environmental ethics than those male students ($p < 0.05$). In conclusion, environmental education teaching process using ethics infusion could develop students' environmental knowledge and environmental ethics at a high level which were greater than the control group. Therefore, the teachers should support and incorporate the instructional strategies into environmental education curriculum.

Key words: Environmental ethics, environmental knowledge, environmental literacy, environmental education, infusion, instructional strategies

INTRODUCTION

Environmental Literacy is a conceptual learning to develop people knowing in terms of environmental education. Some scholars point out that their inseparable relations with environmental ethics (Lundmark, 2007), a personal sense of competence and collective competence to surroundings (Chawla and Cushing, 2007). Roth (1992) is beyond term environmental literacy as a certain cognitive skills and basic definition, claimed that environmental literacy builds on an ecological paradigm. Environmental literacy is the capacity to perceive and interpret the relative health of environmental systems and to take appropriate action to maintain, restore, or improve the health of those systems. In the present, environmental problems had effected to environmental and human being quality. We were understood that many problems have been caused by meant of

environmental ethics decreased. We need to incorporate moral-based decision in all community (Sadler, 2004; Sadler and Zeidler, 2005; Matkins and Bell, 2007; Nuangchalem, 2009). Also, we need to solve environmental problems with many methods, especially environmental education which it is process of environmental teaching for

people have environmental knowledge and understanding, awareness, attitude, environmental ethics, behavior and evaluation (Palmer, 1998; Kennedy *et al.*, 2009).

The environmental problems are now facing the world that global problems stemming from the process of industrialization and capitalist development. It has been taking place in every area of the world. We therefore need contemporary concepts to help frame both the nature of the problems that is widely applicable strategies for approaching environmental education. At this point, our children should be known and understandable how to sustain environment (Nuangchalem and Prachagool, 2010). They should be developed cooperatively by learning process, environmental thinkers, local communities and other workings hand in hand.

Teaching environmental ethics is an important method to raise concept in terms of think globally, act locally, which students need learn to be understandable nature of environment and environmental literacy. The way of infusion environmental ethics is an appropriate way to promote environmental literacy students because they are growing to work and live in the society (Kollmuss and Agyeman, 2002). The purposes of this research were to study environmental knowledge and environmental ethics of undergraduate students who learned by taking instructional process based on infusion of environmental ethics, to compare environmental knowledge and environmental ethics between experimental and the control groups and to compare environmental knowledge and environmental ethics between experimental and control groups with different sexes. The results of this study can be discussed and implied for environmental education.

MATERIALS AND METHODS

The participants of this research were 60 fourth-year undergraduate students in environmental technology, Faculty of Environment and Resource Studies at Mahasarakham university who enrolled in the first semester, academic year 2008. They were selected by a simple random sampling technique and they were assigned into two groups; an experimental group of 30 students who learned using environmental ethics infusion method and the control group of 30 students who learned using traditional method.

Four units of learning were designed: forest, water resource, rubbish and global warmth. The environmental ethics infusion method is employed many instructional strategies. The course will engage students to perceive environmental ethics by let them talking about Buddhist novels, comparing such thing surround them by using contents analogy, saying good and evil concerning environmental belief and making socio-environmental examples.

The research instruments included 4 lessons plans on environmental education for 4 weeks (16 h). It was considered by 5 experts in a various kind of field study, they indicate that the total score of lesson plans at good level ($\bar{x} = 4.27$). Achievement was constructed 50-item multiple choices emphasized on knowledge and understanding, analysis, synthesis and application. The researcher had studied how to design the evaluation forms and analyzed the technique and taking a pilot study. It indicates that p-value and B value higher than 0.20, B value was between 0.26 and 0.83, p-value was between 0.20 and 0.45, CL value using the formula KR-20 and CL value equal to 0.85. Environmental ethics test was designed in 4 contents; forest, water resource, rubbish and global warmth are 40-item multiple choices. In each item, it was given the score; 1, 2, 3 and 4 level

(no wrong and right). They were examined by the 5 experts to evaluate index of consistency, they were between 0.50 and 1.00.

Data collected and analyzed by coefficient analysis of Pearson's model. Choose the B value which were positive and higher 0.20, B value was between 0.20 and 0.67. The reliability value using CL-coefficient alpha model by Cronbach's method which indicated that CL value of the whole environmental ethics form of 40 items was 0.88. This research is experimental research as 2×2 factorial design; teaching method and sex, treatment by randomized posttest-only control group design.

RESULTS

The results of this study can be explained that environmental knowledge and environmental ethics of undergraduate students who learned by taking instructional process based on infusion of environmental ethics that the experimental group students and the control group students showed their environmental knowledge at 69.00 and 60.75% of total score. The experimental and control groups showed their environmental knowledge of the experimental group at $\bar{X} = 27.60$ and control group at $\bar{X} = 24.30$ of the total score (Table 1).

The results can be pointed that an environmental ethic of experimental group showed at $\bar{X} = 3.38$; the level 4 (goodness of environmental ethics) and control group at $\bar{X} = 2.81$; level 3 (societal ethics) (Table 2). The experimental group had higher score of environmental knowledge and environmental ethics than those control group ($p < 0.05$). The experimental group showed their environmental knowledge and environmental ethics higher score than those control group at 0.05 level of significantly statistical differences (Table 3). Female students in the experimental group had higher score of environmental knowledge and environmental ethics than those male students

Table 1: Environmental knowledge between experimental and control groups

Environmental knowledge	Experimental	Control
Forest	6.77±1.33	5.97±1.69
Water resource	5.43±1.36	4.50±1.89
Rubbish	7.30±1.56	6.93±2.07
Global warmth	8.10±1.30	6.90±2.76

Values are expressed as Mean±SD

Table 2: Environmental ethics between experimental and control groups

Environmental ethics	Experimental	Control
Forest	⁽²⁾ 3.58±0.28	⁽¹⁾ 3.15±0.48
Water resource	⁽²⁾ 3.36±0.33	⁽¹⁾ 2.64±0.41
Rubbish	⁽²⁾ 3.36±0.27	⁽¹⁾ 2.80±0.39
Global warmth	⁽¹⁾ 3.22±0.34	⁽¹⁾ 2.66±0.38

Values are expressed as Mean±SD. ⁽¹⁾Societal ethics; ⁽²⁾Goodness of environmental ethics

Table 3: Comparison of environmental knowledge and ethics between experimental and control groups

Statistic	Value	Hypothesis df	Error df	F-value	p-value
Pillai's trace	0.600	2	57	42.718	0
Wilks' lamda	0.400	2	57	42.718	0
Hotelling's trace	1.499	2	57	42.718	0
Roy's largest root	1.499	2	57	42.718	0

Table 4: Comparison of environmental knowledge and ethics between experimental and control groups with sex differences

Statistic	Value	Hypothesis df	Error df	F-value	p-value
Pillai's trace	0.329	2	27	6.614	0.005
Wilks' lamda	0.671	2	27	6.614	0.005
Hotelling's trace	0.490	2	27	6.614	0.005
Roy's largest root	0.490	2	27	6.614	0.005

at .05 level of significantly statistical differences (Table 4). In conclusion, environmental education teaching process using ethics infusion could develop students' environmental knowledge and environmental ethics at a high level which were greater than the control group. Therefore, the teachers should support and incorporate the instructional strategies into environmental education curriculum.

DISCUSSION

Experimental group learned by using environmental ethics infusion method had environmental knowledge and environmental ethics higher score than those control group, it can be discussed that the instructional strategies in terms of infusion method raise students' knowledge and understanding, engage students' perception about environmental education. Teaching techniques in a various kind of method can help students learn concept and open their windows opportunisms to take environmental literacy (Roth, 1992; Lundmark, 2007). Talking Buddhist novels about environmental surroundings and deep taking about supernatural phenomena can engage students. The experimental group intended and participated in process of Instruction. Yaikaew (2007) described that Buddhist novels are the interesting stories about natural conservation of people at the past. It is a drive people to give sacred environment based on supernatural powers. When they heard to learn environmental ethics, they were happy, funny and interesting so much. They loved to protect and sustain natural resources and environment. Jueprasit (2005) compared environmental perfection and being environmental problems which students understand the truth of environment especially impact of environmental problems and quality of life. Jatupornpong (2005) supported that saying the goodness in environmental conservation and evil of destroying environment which take students understand how to use resources in terms of this is good and is not good.

The female were environmental knowledge and environmental ethics more than male. This can be summarized that nature of male and female are different in physical, mind, emotion, wisdom, acceptance in many things and training (Kaewnum, 2005). The male were trained to be brave, lead man and freedom more than female. In the addition, male like experiment and show his opinion to public meeting. But female were train to be kind, polite, obey parent and hole community tradition and culture, religion and love about beauty (Thanasathit, 2004). Because of those reasons, female got environmental knowledge and environmental ethics more than male. Instructional process by using ethics infusion could develop students' environmental knowledge and environmental ethics at a high level which were greater than the control group. Therefore, the teachers should be supported to implement it in teaching environmental education at the undergraduate level. Whereas, recommendation need to take environmental ethics infusion into environmental education.

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