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The Effect of Environmental Instruction on Environmental Attitudes of University Students

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The effect of environmental instruction on students' environmental attitudes was studied in two environmental classes and one business class of university undergraduates. Changes in students' environmental attitudes were assessed from a questionnaire survey administered before and after exposure to a 16 week course. The results indicated statistically significant differences in students' attitudes toward the environment between the pretest and the posttest. The two environmental classes had the positive effect and the students exhibited more environmentally favorable attitudes. Accordingly, this study confirmed the positive effect of environmental instruction on attitudes toward the environment at a university level.

Key words : environmental attitude, environmental instruction, effect, survey, pretest and posttest, university students

1. Introduction

It is widely recognized that solutions to current environmental problems necessitate not only technical change but also changes in attitude and behavior. The latter issue has become increasingly important since the focus of environmental policy has shifted from treating existing problems to prevention. This perspective emphasizes that the fundamental cause of many environmental problems is related to an egocentric worldview and irresponsible environmental behavior.

Clearly, one of the most important influences on behavior is attitude[13,16~18]. Environmental attitudes of young people are particularly important because they are the generation that will ultimately be affected by and need to find solutions to current and future environmental problems. Accordingly, effective environmental education for young people is crucial. Since, today's society is increasingly being faced with a wide range of extremely complex environmental problems, environmental education has received increased attention over recent years at both international and national levels. Since the late 1960s, environmental education has been actively debated and promoted globally, for example, at the 1970 IUCN/UNESCO meeting in Nevada, USA, 1975 Belgrade Charter, 1977 Tbilisi Declaration, 1980 World Conservation Strategy, 1987 Our Common Future, and most recently, 1992 Agenda 21. In parallel with the increasing concern about environmental education shown by the international community, Korea introduced an official program of environmental education in 1995 enabling junior high and high schools to select an environmental course as part of their independent curriculum. In addition, many universities and colleges have opened environmental classes as liberal arts and science elective courses in order to provide their students with opportunities to acquire the knowledge and attitudes to protect and improve the environment.

There is some agreement among researchers that increased knowledge about the environment promotes positive attitudes toward the environment[2,8]. It has been reported that junior high school, high school, and college students exposed to environmental courses demonstrate a more positive attitude toward the environment[1,4~6,13,15]. In contrast, some researchers argue that there is

no clear relationship between environmental knowledge and attitude[3,10,12,14].

To help address the question of whether environmental instruction can improve students' environmental attitudes, this study evaluated the effect of one semester environmental courses on environmental attitudes of university students.

2. Methods

2.1. Instrument

The Environmental Attitude Scale developed and reported by Woo et al.[19] was used to measure the changes in students' environmental attitudes over time, with and without attending an environmental class. This instrument with the tested reliability and validity is a Likert-type scale specifically designed to comprehensively measure attitudes toward the environment. The attitude inventory consisted of 46 emotion-evoking statements, equally divided into two domains of 23 statements related to either environmental pollution or nature conservation. These statements were intended to evoke reponses ranging from strongly agree to strongly disagree on a 5-point Likert scale. Each student obtained a single attitude score between a minimum score of 46 and a maximum score of 230 with a neutral score of 138. As such, an attitude score of above 138 indicated an overall positive environmental attitude, whereas a score of less than 138 meant an overall negative environmental attitude. Therefore, higher scores were more environmentally favorable.

2.2. Courses

Two environmental classes(Arts and Science elective courses), open during the Fall in 1997 to all students at A university located near Taegu Metropolitan City, were selected to investigate the effect of environmental instruction on environmental attitudes. These two classes(hereafter referred to as EC Ⅰ and EC Ⅱ) were considered as a form of treatment and used the same course title with the same course content and schedule, yet they were taught by two different instructors. The courses lasted for 16 weeks and the syllabus covered major topics related to environmental pollution and nature conservation, and included the use of lecture and video instruction. The same evaluation criteria were adopted for both classes. The aim of the environmental course was to provide introductory knowledge and stimulate an awareness of the environment and environmental issues. In addition, one more course(hereafter referred to as BC) was chosen as a control. BC was provided as an Arts and Science elective class by the Department of Business Administration at the same university in the Fall of 1997 and taught by one instructor. The focus of this course was to understand the nature, characteristics, creation, and management of business.

2.3. Survey

During the first week of class, the Environmental Attitude Scale[19] was distributed as a pretest survey to those students enrolled in the EC Ⅰ and EC Ⅱ classes and to those students enrolled in the BC class as a control. The posttest survey was then given to the same classes during the last week of the semester. The students were all asked to complete the Environmental Attitude Scale when responding to each statement. It was also emphasized to participating students that the surveys had nothing to do with their course grades, although their ID numbers were needed to pair the original survey with the posttest. The number of pretest, posttest, paired survey respondents, and courses sampled are summarized in Table 1. Of the total 203 paired students, 75 students were paired in EC Ⅰ, 68 students in EC Ⅱ, and 60 students in BC.

Table 1. Number of pretest, posttest, and paired surveys completed

Course	Pretest	Posttest	Paired
EC Ⅰ	104	90	75
EC Ⅱ	82	86	68
BC	78	73	60
Total	264	249	203

* EC Ⅰ =Environmental Class Ⅰ ; EC Ⅱ= Environmental Class Ⅱ ; BC=Business Class

2.4. Data Analysis

A SAS(Statistical Analysis System) PC Package

was used for analyzing the attitude changes between the pretest and the posttest. The Cronbach α was calculated to evaluate the reliability of the test instrument. Paired sample t tests were conducted to test for statistical significance between the pretest and the posttest. A GLM(General Linear Model) was used to test the differences between the classes.

3. Results and Discussion

3.1. Instrument Reliability

The reliability of a test instrument indicates how accurately and repeatedly it determines whatever it purports to measure. Garnett[7] previously proposed that the reliability needed only be between 0.5 and 0.6 to evaluate the difference between groups, whereas 0.9 or higher was recommended when making individual analyses. Munby[11] suggested a 0.7 minimum reliability for instrument use.

The results of the reliability analysis by test and class are summarized in Table 2. The Environmental Attitude Scale used in this study demonstrated a Cronbach alpha reliability of 0.8924 in the pretest and 0.9161 in the posttest. The reliability by test and class ranged between a minimum of 0.8699 for EC Ⅱ in the pretest and a maximum of 0.9266 for EC Ⅰ in the posttest. The reliability of the instrument was therefore determined as more than adequate to evaluate attitude changes within the treatment groups between the pretest and the posttest and to distinguish between the treatment groups in the pretest or posttest. It should also be noted that the high level reliability results produced by this study also serve to reinforce and reconfirm the reliability of the Environmental Attitude Scale developed and reported by Woo et al.[19].

Table 2. Reliability analysis by test and class (cronbach- α)

class \ Test	Pretest	Posttest
EC Ⅰ	0.9031	0.9266
EC Ⅱ	0.8699	0.9190
BC	0.8814	0.8953
Total	0.8924	0.9161

3.2. Environmental Attitude Changes Over Time

Environmental attitudes of those students who received the environmental instruction changed in a positive direction after the 16 week exposure to the environmental class. The total mean score of the students in EC Ⅰ increased by 3.5% with an increase of 5.60 points. The students' total mean score in EC Ⅱ also increased by 3.2% with an increase of 5.25 points. These increased scores of EC Ⅰ and EC Ⅱ were determined as statistically significant(p=0.0304 and p=0.0270 respectively) based on a paired sample t test comparison of the pretest and posttest mean results(Table 3). Interestingly, those students who received BC instruction, used as a control, showed a 2.9% decrease in their total mean score with a decrease of 5.00 points, thereby indicating an overall less favorable attitude toward the environment after exposure to business-related instruction.

The positive and negative changes in students' environmental attitudes over time were both mainly due to the instructional effect. At the end of the semester, the number of students in EC Ⅰ and Ⅱ with higher scores increased(Table 4) because they had acquired more environmental knowledge and were more aware of important environmental issues due to their environmental learning. Other studies have also reported that environmental instruction has a positive effect on environmental attitudes[1,2,5,8,9,13,15].

Despite their higher pretest total mean score (Table 3), the number of BC students with higher scores decreased in the posttest(Table 4) because their instruction emphasized business perspectives and focused on the characteristics, management, problems, and difficulties related to business.

Accordingly, although this business-focused in--struction helped these students understand and become more aware of significant business issues, their environmental attitudes appeared to weaken. Therefore, it would seem that students' environmental attitudes can be changed either positively or negatively based on the instructional content and focus. While an environmental class can foster a favorable environmental attitude, business or economic-focused instruction can also promote an unfavorable environmental attitude.

Paired sample t tests were used to compare

Table 3. Comparison of university students' overall environmental attitude score as indicated from paired samples t test

Class	NO.	Pretest		Posttest		T	Probability
		M[a]	SD	M[a]	SD		
EC I	75	160.947	15.870	166.547	17.108	2.207	0.0304*
EC II	68	163.206	14.656	168.456	16.345	2.261	0.0270*
BC	60	170.183	14.127	165.183	14.795	-2.397	0.0197*

[a] Possible overall attitude scores range from 46 to 230. An attitude score above 138 indicates an overall favorable attitude toward the environment.
* $p<.05$

Table 4. Distribution of environmental attitude scores

Range of scores	No. of students								Percentage of students							
	Pretest				Posttest				Pretest				Posttest			
	EC I	EC II	BC	Total	EC I	EC II	BC	Total	EC I	EC II	BC	Total	EC I	EC II	BC	Total
46-82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
83-119	1	1	0	2	0	0	0	0	1.3	1.5	0	1.0	0	0	0	0
120-156	28	20	9	57	20	15	12	47	37.3	29.4	15.0	28.0	26.7	22.1	20.0	23.2
157-193	45	47	48	140	48	49	46	143	60.0	69.1	80.0	69.0	64.0	72.1	76.7	70.4
194-230	1	0	3	4	7	4	2	13	1.3	0	5.0	2.0	9.3	5.9	3.3	6.4

individual pretest and posttest attitude statements to determine if the means differed among the statements. Of the 46 attitude statements, 7 statements in EC I and EC II, respectively, and 8 statements in BC revealed statistically significant($p<.05$) different mean scores between the pretests and the posttests(Table 5). In the case of EC I , 6 statements had statistically significant higher mean scores on the posttest compared with the pretest mean scores, and one statement had a lower mean score. For EC II, 7 statements had statistically significant higher mean scores on the posttest compared with the pretest scores. In contrast, for BC, 8 statements had statistically significant lower mean scores on the posttest compared with the pretest. A decline in the mean values indicated a less favorable change in the environmental attitude, whereas an increase indicated a more favorable change.

The statistically significant difference($p<.05$) in the attitude change between the pretests and the posttests was also analysed relative to the two domains of environmental pollution and nature conservation based on the Environmental Attitude Scale(Table 6). The increase in EC I 's total mean score was statistically significant (p=0.0482, p=0.0394) in both domains, yet the increase in EC II 's total mean score was only statistically significant(p=0.0110) in the environmental pollution domain. This difference would appear to be attributable to the different instructors for EC I and EC II, as both classes used the same course content, instruction methods, and materials. The only statistically significant(p=0.0123) lower mean value for BC was in the nature conservation domain. This result would seem to indicate that business-oriented instruction can have a negative impact on students' attitudes toward the environment, particularly in nature conservation, due to the emphasis of business perspectives instead of an environmental view.

3.3. Comparison of Environmental Attitude Changes Between Classes

In the pretest, the students' mean scores of environmental attitudes were significantly dif-

Table 5. Test means of environmental attitude and statistical significance based on paired sample t tests

Domain	Item No.[a,b]	Pretest mean			Posttest mean			Probability		
		EC I	EC II	BC	EC I	EC II	BC	EC I	EC II	BC
Environmental Pollution	X 1	3.400	3.500	3.817	3.573	3.662	3.667	0.1746	0.1743	0.1616
	X 2	3.920	3.750	4.033	4.013	3.838	3.883	0.4940	0.5064	0.2678
	X 3	3.427	3.500	3.783	3.680	3.706	3.633	0.0737	0.1321	0.2752
	X 4	3.013	3.162	3.467	3.387	3.309	3.267	0.0008*	0.2414	0.0832
	X 5	4.307	4.515	4.333	4.240	4.397	4.233	0.5953	0.2795	0.3589
	X 6	3.240	2.882	3.267	3.227	3.250	3.200	0.9113	0.0032*	0.5834
	X 7	3.093	3.191	3.283	3.267	3.235	3.233	0.1794	0.7283	0.6781
	X 8	3.293	3.088	3.350	3.480	3.309	3.533	0.1088	0.1367	0.0858
	X 9	3.280	3.324	3.483	3.373	3.471	3.467	0.4163	0.1913	0.8592
	X 10	4.053	4.235	4.200	4.027	4.191	4.033	0.8289	0.6507	0.2212
	X 11	3.000	3.118	3.100	3.227	3.324	3.183	0.0745	0.1545	0.5266
	X 12	3.747	3.926	4.000	3.747	3.912	3.933	1.0000	0.8919	0.5096
	X 13	3.387	3.176	3.517	3.453	3.574	3.633	0.6470	0.0087*	0.4413
	X 14	3.080	3.015	3.233	3.227	3.250	3.117	0.2181	0.1174	0.3970
	X 15	4.333	4.368	4.267	4.240	4.250	4.267	0.3397	0.2884	1.0000
	X 16	2.973	2.706	3.167	3.227	3.088	3.083	0.0893	0.0315*	0.6328
	X 17	3.520	3.529	3.950	3.560	3.544	3.650	0.7871	0.9238	0.0209*
	X 18	3.320	3.235	3.583	3.427	3.397	3.367	0.4613	0.2769	0.0795
	X 19	2.800	2.971	3.100	3.173	3.132	3.200	0.0011*	0.1875	0.3346
	X 20	4.307	4.250	4.417	4.267	4.221	4.267	0.7501	0.8016	0.1719
	X 21	3.707	3.647	3.983	3.827	3.824	3.650	0.3833	0.1347	0.0087*
	X 22	3.800	3.824	3.883	3.800	4.015	3.817	1.0000	0.1074	0.6365
	X 23	2.267	1.897	2.250	2.267	2.426	2.350	1.0000	0.0002*	0.4273
Nature Conservation	X 24	2.273	3.015	3.183	3.133	3.206	3.083	0.1468	0.0963	0.3471
	X 25	3.640	3.868	3.950	3.773	3.750	3.600	0.2207	0.1718	0.0016*
	X 26	3.760	4.044	4.100	3.893	4.162	3.917	0.2782	0.2511	0.1245
	X 27	3.520	3.515	3.633	3.533	3.588	3.450	0.9277	0.6323	0.2127
	X 28	4.107	4.250	4.183	3.867	4.191	3.983	0.0461*	0.5900	0.1819
	X 29	3.880	4.191	4.150	4.107	4.132	4.017	0.0680	0.5754	0.3362
	X 30	4.120	4.260	4.367	4.173	4.132	4.233	0.6257	0.5191	0.2515
	X 31	3.107	3.260	3.433	3.360	3.368	3.450	0.0408*	0.1168	0.8635
	X 32	2.773	2.735	2.750	3.053	3.147	2.917	0.0455*	0.0089*	0.2212
	X 33	3.427	3.485	3.650	3.653	3.559	3.583	0.1446	0.6116	0.6036
	X 34	3.147	3.074	3.300	3.467	3.338	3.317	0.0154*	0.0406*	0.8959
	X 35	3.760	3.662	3.850	3.813	3.824	3.500	0.6405	0.1675	0.0247*
	X 36	3.173	3.103	3.250	3.427	3.515	3.383	0.0815	0.0108*	0.4036
	X 37	3.627	3.706	3.817	3.653	3.706	3.567	0.8014	1.0000	0.0383*
	X 38	3.293	3.294	3.450	3.320	3.441	3.117	0.8529	0.3058	0.0318*
	X 39	3.373	3.353	3.583	3.547	3.618	3.650	0.2023	0.0600	0.6413
	X 40	3.627	3.809	3.883	3.773	3.853	3.767	0.2462	0.6942	0.3582
	X 41	3.147	3.500	3.417	3.293	3.353	3.283	0.2462	0.2209	0.3567
	X 42	3.560	3.706	3.850	3.693	3.779	3.800	0.3348	0.6725	0.7173
	X 43	3.627	3.765	3.883	3.800	3.779	3.600	0.1182	0.9066	0.0182*
	X 44	4.053	4.382	4.417	4.280	4.324	4.250	0.0490*	0.5410	0.1238
	X 45	3.880	4.044	4.050	3.947	3.985	3.967	0.5865	0.6361	0.5048
	X 46	4.107	4.485	4.567	4.280	4.382	4.083	0.1649	0.3740	0.0001*

Note. no. of EC I =75, no. of EC II =68, no. of BC=60

[a] Statement responses were graded on a Likert scale: 1=strongly disagree, 2=disagree, 3=neither, 4=agree, 5=strongly agree.

[b] Statements were recorded so that the most favorable response was 5 and the least favorable response was 1.

* $p < .05$

ferent(p=0.0015) by class(Table 7). However, a further analysis of the classes using GLM revealed that only BC was differentiated from the other two classes, EC Ⅰ and EC Ⅱ (Table 8). Although the pretest mean environmental attitude score of BC was significantly higher than either of the treatment classes, there was no significant difference between the pretest mean scores of EC Ⅰ and EC Ⅱ (p<0.05).

The major reason why the BC students had more favorable environmental attitudes than the EC Ⅰ and EC Ⅱ students before exposure to instruction was that most of the students taking the BC course were from the natural science area majoring in biology, environment, physics, chemistry, horticulture, and so forth, whereas those participating in the EC Ⅰ and EC Ⅱ courses were mostly from the humanities area majoring in economics, business administration, law, and public administration. Accordingly, most BC students already had more knowledge on the environment and environmental issues and more favorable attitudes toward the environment compared with the EC Ⅰ and EC Ⅱ

Table 6. Comparison of t test according to domain and class

Domain	Class	NO.	Pretest		Posttest		T	Probability
			M[a]	SD	M[a]	SD		
Environmental pollution	EC Ⅰ	75	79.267	8.662	81.707	7.492	2.009	0.0482*
	EC Ⅱ	68	78.809	8.742	82.324	8.408	2.615	0.0110*
	BC	60	83.467	7.448	81.667	7.260	-1.616	0.1113
Nature conservation	EC Ⅰ	75	81.680	8.675	84.840	10.784	2.097	0.0394*
	EC Ⅱ	68	84.397	8.468	86.132	9.312	1.332	0.1872
	BC	60	86.717	8.185	83.517	8.798	-2.584	0.0123*

[a] Possible attitude scores per domain range from 23 to 115. An attitude score above 69 indicates an overall favorable attitude toward the environment.

* $p<.05$

Table 7. Comparison of environmental attitude scores between groups in pretest and posttest

Test	Source	SS	df	MS	F	Probability
Pretest	Model	2997.965	2	1498.982	6.69	0.0015*
	Error	44803.888	200	224.019		
Posttest	Model	348.025	2	174.013	0.66	0.5163
	Error	52472.438	200	262.362		

* $p<.01$

Table 8. Comparison of environmental attitude scores between groups

Pretest				Posttest			
Duncan grouping	Mean	N	Groups	Duncan grouping	Mean	N	Groups
A	170.183	60	BC	A	168.456	68	EC Ⅱ
				A			
B	163.206	68	EC Ⅱ	A	166.547	75	EC Ⅰ
B				A			
B	160.947	75	EC Ⅰ	A	165.183	60	BC

* Significant at 0.05 level

students before the beginning of the course. However, after exposure to the 16 week instruction, changes were found in students' environmental attitudes. While the EC I and EC II total mean scores increased, the BC total mean score decreased. The total mean scores were not found to be significantly different between three classes in the posttest($p<0.05$, Table 8). Therefore, this reinforces that the environmental instruction had a positive effect on students' attitudes toward the environment.

4. Conclusions

This study was conducted to determine whether environmental instruction over one semester could effect a change in students' environmental attitudes. The instrument used to measure environmental attitudes before and after exposure to the instruction was the Environmental Attitude Scale developed and validated by Woo et al.[19]. The reliability of the measurement instrument ranged from 0.8699 to 0.9031 in the pretests and 0.8953 to 0.9266 in the posttests. The instrument reliability was, thus, sufficient to compare the attitudes and attitude changes of the class groups. The total mean score of the students receiving the environmental instruction increased by 3.5% in EC I and 3.2% in EC II after exposure to a 16 week course. A paired sample t test comparison of the pretest and posttest mean results confirmed that these differences were statistically signigicant($p<0.05$). Meanwhile, the total mean score of the BC students decreased by 2.9%, which was also a statistically significant difference between the pretest and posttest, thereby reflecting the negative impact of business-focused instruction on students' attitudes toward the environment. Although the BC students had a significantly higher mean score than the EC I and EC II students in the pretest, no significant difference among the three class groups was found in the posttest due to the positive effect of the environmental instruction on environmental attitudes of the EC I and EC II students, and the negative effect of the business instruction on environmental attitudes of the BC students. These statistically significant findings would appear to suggest that an environmental instruction of an appropriate duration can help change and improve environmental attitudes in a positive direction. Although external factors such as life experiences, socioecomic status, and culture influence overall environmental attitudes, it is encouraging for environmental educators to know that environmental education can also play a significant role in shaping attitudes toward the environment. Accordingly, it is clear that environmental education should play a leading role in forming our environmental worldview and promoting humanity.

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