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The Effect of Outdoor Education on Environmental Knowledge, Awareness, and Attitude: Case Study within In-Service Teachers*

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Abstract

There is a gap between theory and practice within environmental education (EE). Outdoor EE can cover this gap because experiential learning is the basis of it. The aim of this research to inquiry if outdoor EE is effective teaching method in terms of gaining environmental knowledge, awareness, and attitude of in-service teachers. The quantitative methodology and pretest-posttest-control (PPC) groups design are used. There are two control groups and one experimental group. The educators teach subjects via outdoor experimental activities for experimental group. The indoor experimental activities are used for control group 1; traditional methods (lecturing, question-answer, discussion) are used for control group 2. Indoor EE is more effective in terms of gaining knowledge while outdoor EE is more effective on developing awareness, and attitude.

Key Words: outdoor education, environmental education, quantitative methodology, PPC design, sustainable development, in-service teachers

Introduction

Scientists and educators point out to environmental education (EE) because of devastation of natural environment irrecoverably to have raw material for industry (Bolstad, 2003). Agenda 21 document which is prepared within Rio Summit especially touches on important subjects: Governments should lay out environmental politics, and enforce to governmental foundations and NGOs in order to take part in EE within sustainable development (United Nations Educational, Scientific, and Cultural Organisation [UNESCO], 1992, Chapter 36, p.320). EE is used in order to

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explain environmental knowledge (history, reasons, and results of pollutions etc) and, protection activities within existed environmental problems (Tilbury, 1995).

The 5.f section of Chapter 36 (p. 322) mentions to apply new teaching methods for EE. One of new methods is outdoor environmental education (OEE). Some of the literatures (Pfaffenwimmer, 1998; Bell, Russel, & Plotkin 1998; Elliot, 1999; Breidler, 1999; Posch, 1999; Rauch, 2002; Gokce, Kaya, Atay, & Ozden, 2008; Bozkurt & Kaya, 2008; Irwin, 2010) emphasize that there is a gap between theory, and practice within EE. OEE can cover this gap because experiential learning is the basis of OEE (Piller, 2002; Goudie, 2008). In terms of this research, OEE is based on ecopedagogical philosophy. In an other words, the educational program of OEE is designed within interdisciplinary perspective (Bunderson& Cooper 1997; Piller, 2002; Brookes 2004); ecologic and social contexts (Preston 2004; Robottom 1987, in Fien & Rawling, 1996); placed-based (Emmons 1997; Piller, 2002; Lugg& Slattery, 2003; Brookes, 2004; Irwin, 2010; Harrison, 2010); problem- based (Palmberg& Kuru, 2000; Piller, 2002) having connection with actual environmental problems; ontological perspective what I can do to solve/ prevent environmental problems (Thomashow, 1998; Ward, 1996). Three points stand out in the literatures review of OEE (Table 1).

- Qualitative methods are used in most of the researches. Quantitative and mixed methods are used rarely.
- Researches mostly focus on students, rarely on teachers.
- Program aims focus on mostly on environmental knowledge and awareness.

Piller (2002) asks that OEE is a kind of teaching method for EE but it isn't very clear if OEE is the most effective teaching method for EE. The aim of this research to inquiry whether OEE is effective teaching method in terms of gaining environmental knowledge, awareness, and attitude. On the other hand this research tries to cover the gap in OEE's literatures by using quantitative methods, studying with teachers, and having three of environmental aims –knowledge, awareness, and attitude-.

Method

The quantitative methodology and pretest-posttest-control groups (PPC) design are used. PPC is a powerful model to measure the effects of independent variable on dependent variable in experimental process, and to promote understanding of reason-result relationship (Buyukozturk, 2007b). There were three groups in the research: Experimental group (EG), Control group 1 (CG 1), Control group 2 (CG 2). An environmental knowledge test (EKT), an environmental awareness scale (EAS), and an environmental attitude scale (EAtS) were developed. The OEE program of the research was also based on ecology so the researchers determine four themes related to ecology: Physical environment (PE), Population and community ecology (PCE), Ecosystem ecology (EcE), Human ecology (HE) (Molles, 2008). EKT, EAS, and EAtS were designed according to four themes.

Environmental Knowledge Test

54 multi-selection questions were arranged within knowledge, and comprehension levels of Bloom Taxonomy. Preliminary study of EKT was applied with 270 teachers. Discrimination, and difficulties index, by the way KR 20 for reliability was calculated. KR 20 is 0.714, and it is acceptable 0.70, and upper (Sencan, 2005). The last version of test was formed with 54 questions.

Table 1.
Methodology, sample groups, and environmental aims of some of the OEE's literatures.

Country	References	Methodology			Sample group		Environmental aims		
		Qualitative	Quantitative	Mixed	Students	Teachers	Knowledge	Awareness	Attitude
USA	Clarke, 1967 [in Parker & Meldrum, 1973]	X			X		X		
USA	Hanna, 1995			X	X		X		X
Belize	Emmons, 1997	X			X				X
Finland	Palmberg & Kuru, 2000	X			X		X	X	
Canada	Piller, 2002	X			X			X	
Australia	Lugg & Slattery, 2003	X				X	X	X	
Australia	Preston & Griffiths 2004	X			X			X	
Australia	Preston, 2004	X			X		X	X	
Australia	Thomas, 2005	X			X		X	X	
Australia	Blair, 2008	X				X(Public)	X	X	
Turkey	Yardimci, 2009	X			X		X		
Turkey	Guler, 2009	X				X	X		
New Zealand	Irwin, 2010	X			X			X	
Turkey	Eryaman, Yalcin-Ozdilek, Okur, Cetinkaya, & Uygun, 2010	X				X	X		
Turkey	Keles, Uzun, & Varnaci-Uzun, 2010		X			X		X	
Turkey	Ozdemir, 2010			X	X			X	

Environmental Awareness and Attitude Scale

The researchers searched literature, and EAS/ EAtS of some of the ecology based OEE programs. 47 items were arranged for EAS, and 48 items were arranged for EAtS. Preliminary study was applied with 314 teachers. Explanatory (SPSS 13) and confirmatory (LISREL 8.51) factor analyses were used. Kaiser- Meyer- Olkin (KMO), Bartlett test, Cronbach alpha coefficient, item variance, and factor values were evaluated within explanatory factor analyses (Buyukozturk, 2007a). X^2/df, path diagram and goodness of fit values (RMSEA [Root Mean Square of Approximation], SRMR [Standardized Root Mean Square Residual], GFI [Goodness of fit index), AGFI [Adjusted goodness of fit index]) were evaluated within confirmatory factor analyses (Kline, 2005; Simsek, 2007).

Table 2.
Proposed and acceptable values of some criteria of EAS/ EAtS according to explanatory and confirmatory factor analyses.

	Factor analyses	Proposed value	Acceptable value of EAS	Acceptable value of EAtS
Explanatory	Item number		18	22
	Theme		1	1
	Cronbach alpha	≥ 0.80	0.858	0.800
	KMO	Around 1	0.895	0.832
	Bartlett test	Near to 0	0.000	0.000
Confirmatory	X^2/df	3-5	3.39	3.23
	p	<0.05	0.000	0.000
	RMSEA	≤ 0.08	0.08	0.08
	SRMR	≤ 0.08	0.05	0.07
	GFI	0.80- 0.89	0.86	0.84
	AGFI	0.80- 0.89	0.82	0.80

The item, which`s variance values were under 0.25 and factor values were under 0.40, were rejected from scale. The other variables had acceptable values (Table 2). The last forms (1 & 2) and path diagrams (3 & 4) of scales were presented at Appendix. Both of the scales had one theme, and they were named 'human ecology'.

The test and scales were applied for three groups as pretest (P1), posttest (P2), and follow up (F) (after 6 months). The same EE program was used, and same educators were on duty for three groups. The educators taught the subjects via outdoor experimental activities for EG. The indoor experimental activities were used for CG 1; traditional methods (lecturing, question-answer, discussion) were used for CG 2.

Statistical Analyses

It was firstly decided the status of normal distribution of data by Kolmogorov-Smirnov test. If p value is upper that 0.05, it is evaluated that data has normal distribution (Tabachnick& Fidell, 1989; Field, 2005; Buyukozturk, 2007a). The p value was lower than 0.05 in this research so it was decided that data hasn't got normal distribution, and to use nonparametric tests which were based on mean rank (MR)- Friedman (Fr), Wilcoxon Signed (W), Kruskal Wallis (K), Mann- Whitney U (M) (Peers, 1996; Huck, 2004; Field, 2005; Buyukozturk, 2007a). The comparisons of groups were analysed by Kruskal- Wallis, and Mann- Whitney U; the comparisons of tests were analysed by Friedman, and Wilcoxon Signed Rank.

It was also calculated effect size (r, ES) at Wilcoxon Signed, and Kruskal Wallis tests. Researchers should evaluate ES even p value is lower 0.05 according to literatures. In this way, it was determined the effect of independent variable on dependent variable. ES is low if r is 0.1; ES is middle if r is 0.3; ES is high is if r is 0.5 (Peers, 1996; Huck, 2004; Field, 2005).

Sample Groups

There was not sample and universe selection. Sonmez (2005) stated sample and universe selection is not essential for experimental designs. There were similar applications for some researches (Chapman, 2004; Madin& Fenton, 2004; Clinch, 2007; Balim, Inel & Evrekli, 2008).

The EG was formed from participants of an OEE project which is financed by TUBITAK (The Scientific and Technological Research Council of Turkey). A web-site was design in order to have application of participants. The advertisement of project was posted to Google search engine, and all primary and secondary schools' e-mails. It was asked why participants would like to join to this OEE project on web-site, and the participants were selected according to answers. There were 24 participants in the EG; 12 of them were male, 12 of them were female. The project was applied between 15.07.2011- 24.07.2011.

An official application which explained aims and contents of EE programs was written to Canakkale Education Principalship in 2010-2011 spring and summer education semesters; in this way it was wanted teachers to join to these EE programs in their summer terms. Some teachers appealed to the program by official applications to the university. Researchers draw lots among teachers, and separated them randomly between two control groups. CG 1 applied indoor experimental activities between 20.06.2011- 24.06.2011. There were 23 participants in the CG 1; 11 of them were male, 12 of them were female. Traditional methods were used, and there was not activity at CG 2. There were 19 participants in the CG 2; 9 of them were male, 10 of them were female. There were 66 participants as total in the research. The teachers who attended to all programs belonged to 13 different disciplines. These were primary school, science, chemistry, biology, social science, music, physics, philosophy, sport, preschool, geography, computer (information), and mathematic.

Results

Physical environment theme of Environmental Knowledge Test

There isn't significance at this theme either among P1-P2-F (PPF) in three groups or comparison among groups by Kruskal Wallis ($p > 0.05$). There is consistently increment from P1 to F at EG, and CG 2. On the other hand there is decreasing MR of P2 according to P1 at CG 1; the MR of F increases again but this increasing isn't at P1 level (Table 3). The three education programs aren't effective to gain knowledge about PE.

Population and community ecology theme of Environmental Knowledge Test

There are meaningful differences at this theme for three groups ($p<0.05$). The MRs of P2s are higher than P1 for all groups while the MRs of F tests lower than P2s but these decreasing aren't to P1 level (Table 3).

Table 3.
The comparison results of PPF tests in each group by Friedman

	EG					CG 1					CG 2				
	P1	P2	F			P1	P2	F			P1	P2	F		
	MR	MR	MR	X^2	p	MR	MR	MR	X^2	p	MR	MR	MR	X^2	p
PE	1.80	2.07	2.13	1.826	.401	2.18	1.82	2.00	2.098	0.350	1.80	2.00	2.20	1.714	0.424
PCE	1.33	2.70	1.98	23.093	.000	1.07	2.48	2.45	31.136	.000	1.10	2.50	2.40	19.263	.000
EcE	1.74	2.63	1.63	16.763	.000	1.59	2.64	1.77	17.014	.000	1.80	2.33	1.87	3.897	0.142
HE	1.76	2.93	1.30	34.814	.000	1.52	2.80	1.68	22.167	.000	1.50	2.93	1.57	19.966	.000
Test total score	1.24	3.00	1.76	38.044	.000	1.18	2.61	2.20	25.071	.000	1.07	2.43	2.50	19.966	.000

Table 4.
The comparison results of P2 and F of PCE theme among all groups by Kruskal Wallis

	Group	n	MR	sd	X^2	p	Meaningful Difference
P2	EG	24	27.92	2	8.168	.017	CG 1- CG 2
	CG 1	23	42.61				CG 1- EG
	CG 2	19	29.53				
F	EG	24	21.11	2	13.227	.001	CG 1- CG 2
	CG 1	23	39.89				CG 1- EG
	CG 2	19	31.13				

The MRs of P1s are compared by Kruskal Wallis, and there isn't difference among groups ($p > 0.05$). It is evaluated that the knowledge levels of three groups are close to each other. On the other hand there are meaningful differences between CG1- CG2 and CG1- EG within P2, and F test (Table 4) so effect sizes are calculated (Table 5).

Table 5.
The values of z and effect size regarding meaningful differences at PCE

	P1-P2		P2-F		P1-F	
	z	r	z	r	z	r
EG	4.118	0.5	2.189	0.3	2.210	0.3
CG 1	4.029	0.6	p> 0.5		4.018	0.5
CG 2	3.690	0.6	p> 0.5		3.301	0.5

There are meaningful differences according to comparison of P1-P2 (Table 4), and each education program has high effect size to gain knowledge about PCE (Table 5). There is only meaningful difference at EG comparison of P2-F ($p < 0.05$) because the MR of F is lower than P2. The effect size of comparison of P2-F is middle level (r: 0.3, Table 5). Its mean OEE program is middle level effect on gaining knowledge about PCE. The MRs of P2s, and F are very close to each other at control groups (Table 3) so there isn't meaningful difference. According to these results, CG1 and CG2 are more successful than EG in long term within PCE. This result is more apparent at comparison

of P1-F. The MRs of F are higher than P1s but the effect size of control groups (r: 0.5) are higher than EG (r: 03).

Ecosystem ecology theme of Environmental Knowledge Test

There are meaningful differences at EG, and CG 1 for this theme but significance at EG is happened because of level of P2. The P2 of EG is higher than other tests even P1 is higher than F. Its mean F knowledge level of participants decrease behind the P1, and OEE program isn't effective about EcE. The P2 of CG 1 is higher than other tests but P1 isn't higher than F. Its mean indoor EE is effective in order to gain knowledge about EcE. The P2 of CG 2 is higher than other tests but P1 and F are very close to each other. Traditional methods aren't effective in order to gain knowledge about EcE in long-term; the knowledge can be forgotten very quickly. (Table 3) There is only meaningful difference between CG 1 and CG 2 in terms of P2 comparison among groups ($X^2_{[sd: 2, n: 66]}$: 7.442, p<0.05, Table 6).

Table 6.
The P2s comparison of groups by Kruskal Wallis in terms of EcE

	Group	n	MR	sd	X^2	p	Meaningful Difference
P2	EG	24	33.63	2	7.442	.024	CG 1- CG 2
	CG 1	23	40.35				
	CG 2	19	250.05				

The MR of CG 1 is higher than other groups but there is only meaningful difference between CG 1- CG 2 at the end of dual comparisons (U: 121.5, p: 0.10, r: 0.28), and this significance is favour of CG 1 (Table 6). According to all these results indoor activities are more effective in order to gain knowledge about EcE than other two programs, and the effect size of indoor EE program is middle level.

Human ecology theme of Environmental Knowledge Test

There are meaningful differences among test comparison at three groups. The significance at EG is happened because of level of P2. The P2 of EG is higher than other tests even P1 is higher than F. Its mean F knowledge level of participants decrease sharply behind the P1, and OEE program isn't effective about HE theme in long-term. The P2 of CG 1 is higher than other tests but P1 isn't higher than F. Its mean indoor EE is effective in order to gain knowledge about HE. The P2 of CG 2 is higher than other tests but P1 and F are very close to each other. Traditional methods aren't effective in order to gain knowledge about HE in a long term. (Table 3)

Table 7.
The P2 comparisons of groups by Kruskal Wallis in terms of HE theme

	Group	n	MR	sd	X^2	p	Meaningful Difference
P2	EG	24	35.48	2	13.561	.001	EG- CG 2
	CG 1	23	42.07				CG 1- CG 2
	CG 2	19	20.63				

There is meaningful differences among MRs of P2 of groups ($X^2_{[sd: 2, n: 66]}$: 13.561, p< 0.05, Table 7). The MR of CG 1 is higher than other two groups. There are only meaningful differences between CG 1- CG 2 (U: 83, p: 0.001, r: 0.37) and EG- CG 2(U: 119, p: 0.007, r: 0.29) in dual comparisons. In terms of P2, OEE and indoor EE programs are more effective in short-term than traditional methods. (Table 7) According to all results, indoor EE program is more effective than other two programs to gain knowledge about HE theme.

Total score of Environmental Knowledge Test

There are meaningful differences for three groups in terms of total score of EKT ($p< 0.05$). The MRs of P2s are higher than P1s for all groups. The MRs of F tests are lower than P2s at EG, and CG 1 but these declining aren't to P1 level. The highest increasing of P2 and the biggest decreasing of F belong to EG. It's mean EG gain more knowledge in short-term than other two programs but in long-term, the participants of EG forget their knowledge. On the other hand the MR of F test at CG 2 is higher than P2, in other words the participants don't forget their knowledge in long-term (Table 3).

As a result, CG 1 is the most successful group either total score of whole test or total score of each theme. This group's scores are quite coherent, and the member of CG 1 gain knowledge either in long-term or short-term. CG 2 is more successful than EG at PCE, HE, and total score of EKT. EG is very unsuccessful at EcC, and HE theme, the member of EG forget very easily the knowledge related to EcC, and HE theme.

Environmental Awareness Scale

There are meaningful differences among PPF at each group about development of environmental awareness (Table 8, $p<0.05$). The MRs of P2 and F are higher than P1s. It shows three education programs develop environmental awareness. But the MRs of P2 and F of EG are equal (X^2: 6.742, $p<0.05$) while the MRs of F of CG 1 (X^2: 12.033, $p< 0.05$), and CG 2 (X^2: 6.269, $p< 0.05$) are lower than P2s, and this decreasing is more at CG 2 (Table 8).

Table 8.
The comparisons of PPF of EAS in each group by Friedman

	P1	P2	F		
	MR	MR	MR	X^2	p
EG	1.58	2.21	2.21	6.742	.034
CG 1	1.52	2.28	2.20	12.033	.002
CG 2	1.56	2.34	2.09	6.269	.044

The MRs of groups' P1s are very close to each other so there isn't difference among groups. The highest increasing at P2 belongs to CG 2. There are meaningful differences at dual comparisons in terms of P2 ($X^2_{[sd: 2, n: 66]}$: 6.606, $p<0.05$, Table 9).

Table 9.
The comparison results of EAS's P2s among groups by Kruskal Wallis

	Group	n	MR	sd	X^2	p	Meaningful difference
P2	EG	24	25.69	2	6.606	.037	CG 1- EG
	CG 1	23	38.41				CG 2- EG
	CG 2	19	37.42				

The highest MR belongs to CG 1 according to the comparison of P2 among groups. The MR of CG 2 is higher than EG. Dual comparisons show that there are meaningful differences between CG 1- EG (U: 176.5, p: 0.030, r: 0.22), and CG 2- EG (U: 140, p: 0.029, r: 0.23). (Table 9).

As a result, traditional methods (CG 2) are effective almost middle level (r: 0.23) in order to increase awareness in short-term but in long-term it isn't more effective (Table 8), because the MR of F decreases sharply. CG 1 (r: 0.22) is more successful than CG 2, and EG according to Table 9 but the MR of F of CG 1 decreases beside P2 (Table 8). On the other hand there isn't decrease between P2-F at EG so in short term EG isn't very successful besides other groups but EG is more successful in long-term.

Environmental Attitude Scale

There is only meaningful difference at CG 1 ($p<0.05$). The MRs of P2s, and F are higher than P1 for all groups. The MRs of F at CG 1, and CG 2 are lower than P2 however the MR of EG shows consistently increasing (Table 10).

Table 10.
The comparisons of PPF of EAtS in each group by Friedman

	P1	P2	F		
	MR	MR	MR	X^2	p
EG	1.79	2.04	2.17	1.816	.405
CG 1	1.43	2.41	2.15	11.934	.003
CG 2	1.69	2.22	2.09	2.772	.250

CG 1 has either the highest P2's MR or the sharpest declining. There isn't difference between dual comparisons ($p>0.05$). As a result OEE is more effective in terms of developing favourable attitude than other two programs. Indoor EE is more effective than traditional methods.

Discussion

Environmental Knowledge Test

The data sets of groups tend to increasing at P2s, and declining at F process. It is normal because forgetting may happen (Hanna, 1995; HSLS, 2010) in 6 months. All groups have environmental knowledge at the end of education, and this result is coherent with literature (Hana, 1995; Palmberg& Kuru, 2000; Lugg& Slattery 2003; Thomas, 2005; Blair, 2008; Guler, 2009). But we suspect that there may be some unforeseen problems because of test or education process. EKT has 54 questions, and it is a long test. But there are 19 subjects at the educations, and EKT should cover all the subjects. The participants might be bored, and answer the questions regardless. The researchers collect P1-P2 data face to face but F data is collected by e-mail after 6 months. The participants might think as if researchers disregard the education process, and didn't replay carefully. The questions' levels are knowledge, and comprehension according to Bloom Taxonomy. These levels may be suitable for indoor or traditional EE programs. After application level, there are meta-cognitive levels- analyse, syntheses, evaluation.- Meta cognitive levels cover sub-cognitive levels, and require to think wide point of view so the participants of EG may think problem-solution based, not only as question. This kind of research may repeat by using tests which's questions are at meta-cognitive level.

CG 1 is the most successful group of this research, and has coherent data set for all themes. Indoor experiential activities are effective on gaining environmental knowledge. CG 2 is more successful than EG, and has coherent data set, too. But the researchers observe some problems because of traditional methods during teaching process of CG 2. The members of CG 2 are bored, often yawn, sometimes have a nap. We cannot say traditional methods aren't effective for EE but it has some scantiness so these points can develop.

EG has the most inconsistent data set, especially at ECE, and HE. There are 19 activities in OEE program, and the participants can focus on how to do activities instead of learning during activities. Thomas (2005) emphasizes similar result in her research. The participants say -in Thomas's research- they learn incidentally some environmental knowledge, and mostly concentrate how to do the activities.

The literatures (Lucas, 1972; Brookes, 2004; Goudie, 2008; Auer, 2008) say EE should be experiential. In this way people can have ecological identity by personal experiences, and take active role solution of environmental problems (Thomashow, 1998). The main aim of EE is to have behavioural changing, and environmental activism. However it is unknown relationship between environmental knowledge- environmental behaviour changing. Barker and Rogers (2004) offer there can be relationship between environmental knowledge- attitude- activism but these kinds of opinions might be tested with modelling (eg. Structural Equation Modelling).

Environmental Awareness and Attitude Scale

The effective level of programs on environmental awareness and attitude are sequentially EG (Outdoor), CG 1 (Indoor), CG 2 (Traditional). Similar results can be seen in literatures (Hanna, 1995; Emmons, 1997; Palmberg& Kuru, 2000; Lugg& Slattery, 2003; Thomas, 2005; Blair, 2008; Irwin, 2010; Ozdemir, 2010). OEE is also effective in long-term either for awareness or attitude.

First hand experiences (Dewey, 2010) at EG may help participants to understand the nature's speech, love nature, and develop empathy with natural environment. CG 1 has also activities during education but activities are applied in a laboratory. Laboratory is an artificial area in terms of natural environment. There is countless interaction in nature between biotic- biotic, abiotic-abiotic, and abiotic and biotic factors in same time. It is so difficult to show this interaction directly in a laboratory.

Preston (2004) also offers EE should have social and ecologic context. However people can have independent observation, and be aware these interactions in natural environment. Naturally if there isn't experience and activity at an education, it will be difficult to develop awareness, and have favourable attitude in terms of CG 2. Notwithstanding traditional methods promote developing of environmental awareness at CG 2 but this effect is short-term. People need long-term effects for sustainable environmental development.

According to Agenda 21, UNESCO (1992) wants governments to support and finance EE activities for all age groups, and in this way it is possible to have common effect on public. In this perspective it is pointed out that teacher education is ignored whereas teachers want to be in EE education process (Fien& Rawling, 1996; Fien& Maclean, 2000; Csobod, 2002). Teachers clearly are reference point for common effect of EE in many educational components: educational programs, activities, experiential learning, assessments, lifelong learning, students etc. OEE is an effective method especially in terms of environmental awareness, and attitude. We evaluate OEE is a kind of melting point of EE with all these educational components because we use either these components or traditional/ active learning methods together. Shortly we use life in OEE. We don't say indoor activities or traditional methods are ineffective in terms of EE. We need all together so OEE is a kind of melting point of EE.

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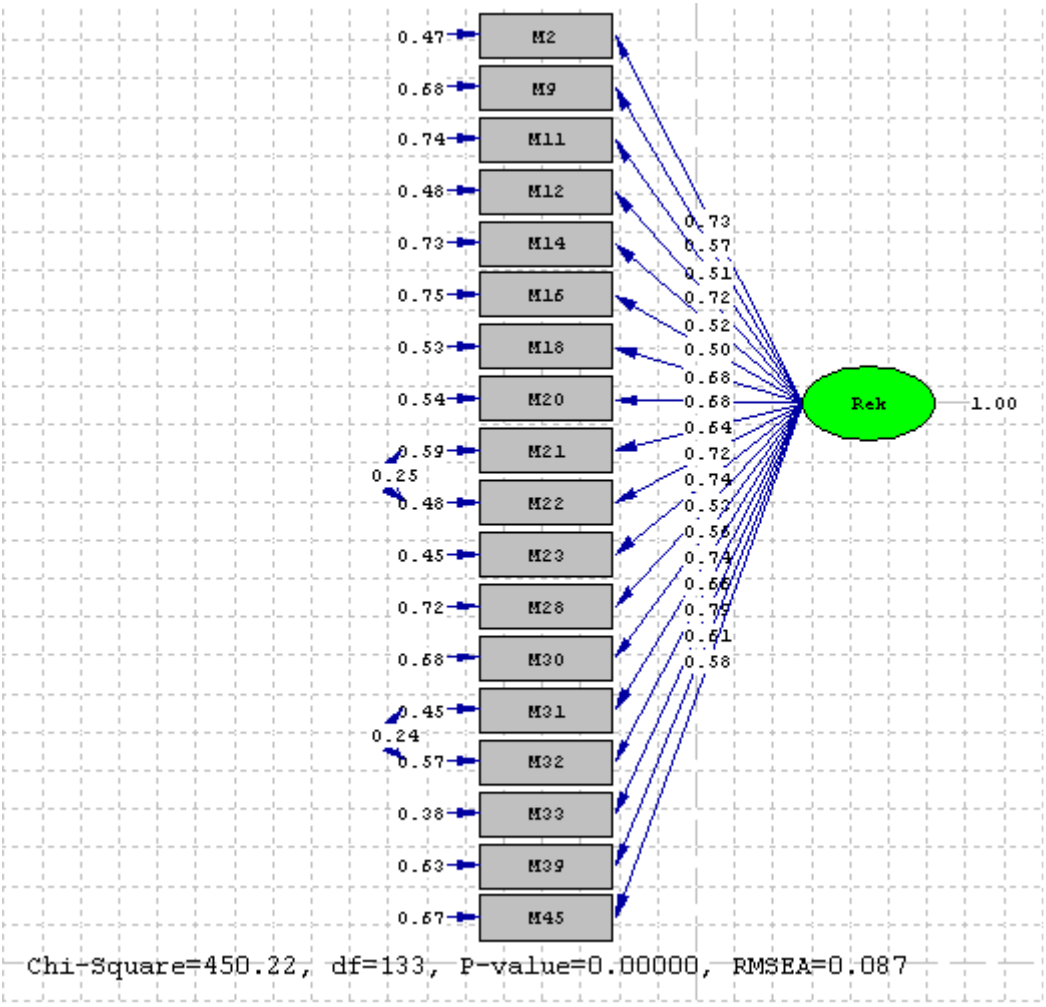
Appendix-1: The last form of Environmental Awareness Scale

	Totally	Agree	Not sure	Not agree	Never
	5	4	3	2	1
Deforestation should be prevented for protecting biodiversity.					
Forests should be protected for carbon compensation.					
Bicycle should be ridden for decreasing fossil fuel.					
Guttiferous taps should be repaired for using water effectively.					
Green places shouldn't be destroyed for renewing water resources.					
Shopping craziness should be stopped for protecting nature.					
Consumers should tend to buy renewable materials for selling renewable products at markets.					
Global warming should be controlled because of having negative effects on biodiversity.					
Solar power should be used all sunny places.					
Energy should be used efficiently for reducing carbon releasing.					
Heat insulation should be used for using energy efficiently.					
Fertilizer shouldn't be used as uncontrolled for preventing pollution of natural spring water resources.					
Biological combat should be used for preventing soil, and water pollution.					
Recycling should be used to have less waste.					
Garbage should be disposed according to separating their substance in order to have less waste.					
Filter should be placed to chimney of factories for protecting biodiversity of soil.					
Industrial waste shouldn't be discharged as uncontrolled to nature because of negative effects on human health.					
Compact fluorescent lamp should be used for reducing electric consumption.					

Appendix-2: The last form of Environmental Attitude Scale

	Totally	Agree	Not sure	Not agree	Never
	5	4	3	2	1
I think electric should generate by solar at sunny region.					
I think one bucket water is enough for washing a car.					
I think it's silly to go to work by bicycle.	Negative item (NI)				
I believe it's wastefulness to leave open the taps.					
I like to be in afforestation campaign.					
I think it's not necessary to switch off TV by on-off button instead of remote control.	NI				
I think it's silly to shut down computer when it is not used.	NI				
I think it's a good selection to purchase water saving washer.					
I think it isn't necessary to collect rain water for irrigating garden.	NI				
I don't care about to use dual flush tank in home.	NI				
I think to provide hot water necessity of home by solar power.					
I like to cultivate my garden with local plants.					
I prefer to buy local production.					
I prefer to dispose my garbage according to their contents.					
I like to share my knowledge related to nature.					
I worry about natural disasters which destroy to human.					
I think containing additive foods are harmful for people.					
I think it's silly ecologic advertisement on TV.	NI				
I don't care to buy organic foods.	NI				
I prefer to shop at village bazaar.					
I believe all snakes should be killed because of I am afraid of them.	NI				
I think algae at cost cause view pollution.	NI				

Appendix-3: Path diagram of Environmental Awareness Scale



Appendix-4: Path diagram of Environmental Attitude Scale