

Effect of Environmental Education Based on Transformational Learning Theory on Perceptions towards Environmental Problems and Permanency of Learning

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Abstract

The aim of the study is to determine effect of environmental education based on transformational learning theory on primary school teacher candidates' perceptions towards environmental problems and permanency of learning. Pretest-posttest quasi-experimental design have been used in this study. The study group consists of 66 teacher candidates who were continuing their education in fourth grade in Primary School Teaching Department of Faculty of Education in Kastamonu University in two different sections in fall term of 2014-2015 academic years. One of the section has been selected as experimental group (N=32) and the other section has been selected as control group (N=34) with random assignment method. Environmental problem knowledge test, responsibility behavior scale towards environment and the scale of attitude towards environmental problems have been used as data gathering tools. In order to compare average scores of the groups, t-test has been used for independent groups. According to findings, there was a statistically significant difference between experimental and control groups' knowledge and retention test in favor of experimental group. Also there was a statistically significant difference between experimental and control groups' responsibility scale and attitude scale scores in favor of experimental group.

Keywords: Attitude, environment, retention, transformational learning.

Introduction

Animals Increasing living standards and growing population of the world cause overuse of natural resources. Besides such an overuse, society's unconscious attitude towards environment makes environmental pollution inevitable. Needs of growing population like nutrition and housing accelerates natural source usage and causes significant environmental problems together. Nowadays, all of these problems become threat to whole world (Oweini & Hour, 2006).

Cars, which are getting their models updated every day, smartphones, new and powerful computers are creating consuming envy for people. In the time period we live, people are getting affected by a new product and join shopping madness. More than one television per house, computer, refrigerator and unused pair of shoes are only some of the unconscious consumer products. Production aspect of every consumer product, in other words, their effect on environment is ignored by many people (Çimen & Yılmaz, 2014). While the latest advanced developments in science and technology makes human life easier and more enjoyable, they are also affecting natural balance negatively. Considering human and environment relationship, it is seen that this

interaction continues from the day humans seen in nature till now. Environmental problems caused by increasing population, developments in technology and society's changing lifestyle and habits give rise to decrease on natural resources, decrease their quality and put all of the living systems under threat (Deniş & Genç, 2007).

At this point of environment quality, environmental education has significant role in decreasing and eliminating negative effects. Environmental education ensures increased awareness towards environmental activities and helps developing attitudes needed for solving environmental problems (Milton, Cleveland & Bennett-Gates, 1995). It is seen that traditional approaches to solve environmental problems are not successful. In recent years, different approaches have been under debate about environmental education and one of these approach is transformational learning theory (Çimen & Yılmaz, 2014).

Transformational learning theory has been developed by Mezirow (1978) for the first time. Adult learning is the basic property of this approach. Transformational learning is transforming people's mentality and emotion, thought, belief and knowledge related to their mentality and transforming knowledge to new approaches in learning process (Mezirow & Associates, 2000). By its challenging emerge, this theory which brings different aspects by criticizing established concepts on education from pedagogic perspective got attention from educational theorists and practitioners (Dirkx, 1998). In this theory, theorists like Dewey, Piaget, Bruner, Vygotsky and traces of constructivist principles can be seen. While the transformational learning theory can be seen as mixture of theories and models by its current state, it have had significant changes after it emerges firstly, and experimental and theoretical studies made in this topic integrate different aspects to this theory and these additions continues (Akpınar, 2010).

In the heart of the transformational learning theory, people's studies on their own with a critical point of view, evaluation of experiences and renaming by interpreting these experiences are located (Çimen & Yılmaz, 2014). Analyzes and self-assessments made in transformational process allows understanding of experiments that are referring actions. Elaboration or creating meaning is an important content on adult learning. Analysis and criticisms made in this social process by making experiments which cause these actions meaningful (Mezirow, 1994). According to Mezirow & Associates (2000) transformational learning process consists of 10 steps. These are: 1. Creating a dilemma. 2. Self-evaluation with guilty and emotion of shame (Evaluating yourself related to said topic by asking questions, for example, do I have enough knowledge on environmental topics or fears and concerns on this topic?). 3. Evaluating individual's assumptions with a broader aspect. 4. Awareness in transformation process. 5. Sharing thoughts on new roles, behaviors and relations. 6. Preparing a road map, a plan about what to do. 7. Gaining knowledge and skills in order to implement plans. 8. Trying new roles. 9. Building new roles, self-confidence relationship between individuals. 10. Appending new perspectives that individuals gained to their life.

Transformational process starts with creating dilemma. Dilemma which is creating process continues with self-scrutiny and evaluating assumptions with a critical point of view. Participant should know that creating dilemma process is a part of transformation. At this point, participant look for new roles, new relations and new actions in a conscious way. Participant should start a new learning course in order to pass these actions. In this course, knowledge and skills needed for these new roles and new plans are gained. Developing self-confidence and sufficiency is provided with the help of experiences related to new roles and relations. By this way, the participant includes new roles and relations that he gained into his life. If such a transformation happens in a correct way, this process is called as new perspective (McWhinney & Markos, 2003).

Transformational learning theory has been uncovered as a student's efforts to become a unique approach with several properties like self-motivated and self-governing, rational, empathic, in collaboration with scientific studies. This theory is based on how the individuals can make efficient judgment and gain foresight by learning how they can isolate themselves from untested ways of thinking in order to avoid it to stop their self-development (Akçay, 2012). Basic property of this theory is to ensure changing characteristics of the people and helping them to develop different point of view on life and experiences they have. In order to make recovery of the environmental problems and negativities, salvation of environment can happen by changing humans' point of view, attitude, knowledge, behavior, belief etc. towards environment (Çimen & Yılmaz, 2014).

According to many scientist, the reason of people on not behaving sustainable about environmental problems is their limited knowledge on environment and their inability to consider results of their actions (Williamson & Lynch, 2001). Recently, predicting environmental knowledge from environmental behaviors has been discussed. In some of the environment related studies, it is underlined that environmental knowledge is not effective on increasing awareness and environment related behavior on its own (Hungerford & Volk, 1990; Ramsey & Rickson, 1976). Besides the environmental knowledge, different factors effect environmental awareness and behavior (Hungerford & Volk, 1990).

There are a lot of studies in literature which studies different environmental education methods and their effects on environmental actions and behaviors. Keleş, Uzun & Varnacı-Uzun (2010) have studied the effects of environmental education on teacher candidates' environmental knowledge, attitudes and behaviors. Çimen & Yılmaz (2014) have studied effects of transformational learning theory on teacher candidates' perceptions towards environmental problems. In the study conducted by Dettman-Easler & Pease (1999), effects of outside learning activities on environmental attitudes of students have been studied. In their study conducted on adult individuals, Smith-Sebasto & Semrau (2004) have studied efficiency of environmental programs. Significant amount of studies from literature shows that environmental teaching programs are effective on developing positive attitude towards environmental awareness. In their studies, Çimen & Yılmaz (2014); Dresner & Gill (1994); Hungerford & Volk (1990); Jordan, Hungerford & Tomera (1986); Şimşekli (2004) underline that practices towards environmental problems increase students' environmental behavior positively.

In order to make the living-environment better, societies should be changed and a new environmental approach should be developed. Human-being should be the basic object of this change. By this way, individual and social change can be fulfilled by building awareness in different layers of society (Çimen & Yılmaz, 2014). In this context, environmental education based on transformational learning theory which is based on individual's all characteristics and their transformation are needed. It is seen that studies about transformational learning theory are outnumbered in literature. It is believed that this study in which effects of transformational learning theory on learning process and teacher candidates' environmental responsible behavior will be beneficial to literature. From this opinion, aim of the study is to determine effects of environmental education based on Transformational Learning Theory on primary school teacher candidates' perceptions towards environment and permanency of learning. For this aim, answers for sub-problems listed below were tried to be found:

Experimental and control groups';

1) Is there any significant difference between knowledge test of environmental problems, behavior scale and attitude scale pre-test scores?

- 2) Is there any significant difference between knowledge test of environmental problems, behavior scale and attitude scale post-test scores?
- 3) Is there any significant difference between retention test results?

Methodology

Model of Study

Pretest-posttest quasi-experimental design have been used in this study. Fraenkel & Wallen (2006) states that the underlying basic idea of all of these experimental studies is “trying something and observe what happened in a systematic way”. In line with this idea, effects of environmental education based on transformational learning theory on primary-school teacher candidates’ perceptions towards environmental problems and permanency of learning have examined. While learning process happens in a teacher-centered way in control group, environmental education based on transformational learning theory has been used in experimental group. Symbolic view related to study’s experimental pattern is shown in Table 1.

Table 1.

Symbolic view related to study’s experimental pattern

<i>Group</i>	<i>Pre-test</i>	<i>Procedure</i>	<i>Post-test</i>	<i>Retention test</i>
Experimental	T1 - S1 - S2	X	T1 - S1 - S2	T1
Control	T1 - S1 - S2	-	T1 - S1 - S2	T1

T1: Environmental Problems Knowledge Test

S1: Responsibility Behavior Scale to Environment

S2: Attitude Scale towards Environmental Problems

X: Environmental Education Based on Transformational Learning Theory

Working Group

The working group consists of 66 teacher candidates who were continuing their education in fourth grade in Primary School Teaching Department of Faculty of Education in Kastamonu University in two different sections in fall term of 2014-2015 academic year. While 32 of the teacher candidates from two separate section were in experimental group, 34 teacher candidates from other section were in control group. Groups were selected randomly.

Data Gathering Tools

In this study, “Environmental Problems Knowledge Test” (EPKT), “Responsibility Behavior Scale to Environment” (RBSE) have been used as data gathering tools, which were developed by Çimen (2013). Moreover “Attitude towards Environmental Problems Scale” (AEPS) has been used as data gathering tool, which was developed by Şama (2003).

EPKT has been used in order to determine teacher candidates’ academic achievement level related to environmental problems. There are 25 questions in EPKT. KR-20 reliability value of the test is .74. Expert opinions have been taken in order to ensure the content validity of the test. Correct answers of the test problems have been marked as ‘4’ points. By this way, maximum score which can be got from this test is ‘100’.

RBSE has been used in order to determine environmental responsibility scale of teacher candidates. Scale consist of 11 entries and it is quintet Likert type. After validity and reliability tests, Kaiser-Meyer-Olkin (KMO) coefficient of the scale has been detected as .789 and Bartlett Sphericity test meaningfulness scale has been detected as 0.00. The scale consist of three factors. Total described variance of these factors has been calculated as 61.1%. Cronbach Alpha (α) reliability coefficient of RBSE has been found as .79. After a scan of literature and contents of the expressions from the scale, scale factors were named as environmental concern, environmental protection and recycling. For the content validity of the scale, opinions of expert academicians have been used. The most positive response of the scale has been coded as '5' points. By this way, maximum score which can be got from this scale is '55'. The most negative response of the scale were coded as '1' points. By this way the lowest score which can be got from this scale is '11'.

AEPS has been used in order to determine teacher candidates' attitude towards environmental problems. AEPS consists of 21 entries. Scale is quintet likert type, choices from scale have been determined as "absolutely disagree", "disagree", "undecided", "agree" and "absolutely agree". While '10' entries from the scale are negative, other '11' entries are positive. It is a single dimension and Cronbach Alpha (α) reliability value has been calculated as .77. Expert opinions have been used in order to provide content validity of the scale. The most positive response of the scale has been coded as '5' points. By this way, maximum score which can be got from this scale is '105'. The most negative response of the scale have been coded as '1' points. By this way, the lowest score which can be got from this scale is '21'.

Implementation Process

Experimental process of this study took 10 weeks. In the experimental process, lectures were held in a teacher-centered format by using lecturing method for control group. However, in the experimental group, lectures were held by environmental education based on transformational learning theory.

In the transformational learning theory scope, writing and reading biography, self-evaluation, recycling center trip, nature trip, problem-based activities, scenario activities, educational games activities, selected topic presentation and worksheets activities have been conducted. By biography writing activities, primary-school teacher candidates reflect their existing knowledge on environmental problems in a multidirectional way. In biography writing activities, they have seen each other's assumptions and made sharing about it. Self-evaluation activities provide self-inspection opportunity with a critical point of view to pre-school teacher candidates with the help problem-based activities, scenario and educational games activities which they develop diverse point of view on environmental problems. Recycling center trip and nature trip are effective on developing environmental awareness. Selected topic presentations and worksheets activities have been conducted transformation of environmental problem related knowledge of primary-school teacher candidates. Eight weeks after experimental application process, environmental problems knowledge test have been conducted on both experimental and control groups again as retention test.

Analyzing Data

SPSS 21.0 statistical software package has been used to analyze the data in this study. Independent t-test analysis has been applied in order to compare scores of control and experimental groups. Findings have been tested on $p < .05$ significance level.

Findings

Findings Related to First Sub-Problem

Is there any significant difference between knowledge test of environmental problems, behavior scale and attitude scale pre-test scores? In order to compare environmental problems knowledge test's pre-test scores of experimental and control groups, independent t-test has been used. Data related to this analysis is shown in Table 2.

Table 2.

Independent t-test result regarding environmental problems knowledge test pre-test scores of experimental and control group

Group	N	M	SD	df	t	p
Experimental	32	36.87	8.48	64	-1.118	.271
Control	34	39.52	10.73			

According to Table 2, it is seen that there is not any significant difference on comparison of environmental problem knowledge tests' pre-test scores of experimental and control groups ($t_{(64)} = -1.118$; $p > .05$). According to such findings, it can be said that the experimental and control group had same level on knowledge variable before the experimental process.

In order to compare regarding responsibility behavior scale to environment pre-test scores of experimental and control groups, independent t-test has been used. Data related to this analysis shown in Table 3.

Table 3.

Independent t-test result regarding responsibility behavior scale to environment pre-test scores of experimental and control group

Group	N	M	SD	df	t	p
Experimental	32	28.93	4.97	64	.708	.481
Control	34	28.08	4.76			

Results from data analysis of Table 3 show that there is not any significant difference between experimental and control groups' pre-test values about responsibility behavior scale to environment ($t_{(64)} = .708$; $p > .05$). Starting from this finding, it can be said that both groups have equal level of responsibility behavior to environment awareness before the experimental process.

In order to compare attitude towards environmental problems pre-test scores of experimental and control groups, independent t-test was used. Data related to this analysis is shown in Table 4.

Table 4.

Independent t-test result regarding attitude scale towards environmental problems pre-test scores of experimental and control group

<i>Group</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>df</i>	<i>t</i>	<i>p</i>
Experimental	32	57.31	6.01	64	-1.181	.242
Control	34	59.02	5.79			

Results from data analysis of Table 4 shows that there is not any significant difference between experimental and control groups' pre-test values about attitude towards environmental problems ($t_{(64)} = -1.181$; $p > .05$). According to this finding, it can be said that both groups have equal level of attitudes towards environmental problems before the experimental process.

Findings Related to Second Sub-Problem

Is there any significant difference between knowledge test of environmental problems, behavior scale and attitude scale post-test scores? In order to compare environmental problem knowledge test post-test scores of experimental and control groups, independent t-test was used. Data related to this analysis shown in Table 5.

Table 5.

Independent t-test result regarding environmental problems knowledge test post-test scores of experimental and control group

<i>Group</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>df</i>	<i>t</i>	<i>p</i>
Experimental	32	82.12	8.67	64	4.491	.000*
Control	34	71.41	10.52			

In Table 5, it is seen that there is a significant difference between environmental problems knowledge test post-test scores of experimental and control groups and it can be said that this significant difference is in behalf of experimental group ($t_{(64)} = 4.491$; $p < .05$). According to this finding, environmental education based on the transformational learning theory can be said to be quite effective to increasing knowledge of environmental issues.

In order to compare responsibility behavior scale to environment post-test scores of experimental and control groups, independent t-test was used. Data related to this analysis is shown in Table 6.

Table 6.

Independent t-test result regarding responsibility behavior scale to environment post-test scores of experimental and control group

<i>Group</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>df</i>	<i>t</i>	<i>p</i>
Experimental	32	49.43	4.13	64	2.722	.008*
Control	34	46.55	4.43			

In Table 6, it is seen that there is a significant difference between responsibility behavior scale to environment post-test scores of experimental and control groups and it can be said that such a significant difference is in behalf of experimental group ($t_{(64)}=2.722$; $p<.05$). According to this finding, environmental education based on the transformational learning theory can be said to be quite effective to increasing responsibility behavior to environment. The experimental and control groups' changes of responsibility behavior to environment in the experimental process can be seen as a column chart in Figure 1.

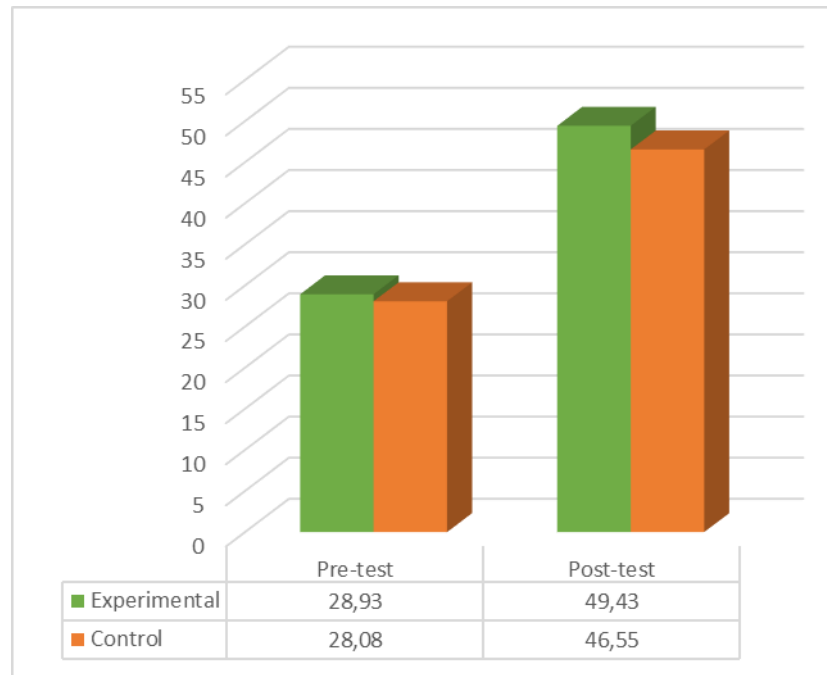


Figure 1. The experimental and control groups' changes of responsibility behavior to environment

When examining Figure 1, it is seen that the experimental and control groups were similar levels of sensitivity to the environment before the experimental implementation. However, it is said that the experimental group have more sensitive behavior towards the environment after the experimental application process. Accordingly, it can be said that the teaching based on transformational learning theory, which has been applied in the experimental group was more effective than the teacher centered method.

In order to compare attitude scale towards environmental problems post-test scores of experimental and control groups, independent t-test was used. Data related to this analysis shown in Table 7.

Table 7.

Independent t-test result regarding attitude scale towards environmental problems post-test scores of experimental and control group

<i>Group</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>df</i>	<i>t</i>	<i>p</i>
Experimental	32	96.03	9.08	64	3.262	.002*
Control	34	88.14	10.45			

In Table 7, it is seen that there is a significant difference between attitude towards environmental problems post-test scores of experimental and control group and it can be said that this significant difference is in behalf of experimental group ($t_{(64)} = 3.262$; $p < .05$). According to this finding, environmental education based on the transformational learning theory can be said to be quite effective to increasing positive attitudes towards environmental problems. The experimental and control groups' changes of attitudes towards environmental problems in the experimental process can be seen as a column chart in Figure 2.

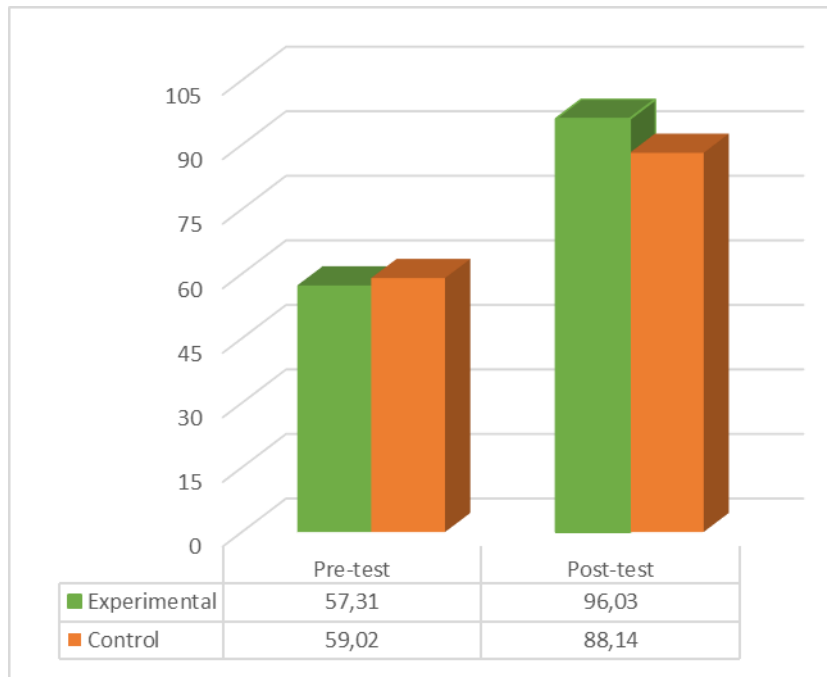


Figure 2. Changes the attitudes towards environmental problems of experimental and control groups

When looking at the Figure 2, it is seen that the experimental and control groups were similar levels of attitudes towards environmental problems before the experimental process. But after the experimental implementation process, it is said that the experimental group have more positive attitudes towards the environmental problems. According to this, it can be said that the teaching based on transformational learning theory, which was applied in the experimental group, quite effective than the teacher centered method.

Findings Related to Third Sub-Problem

Independent t-test was used in order to compare environmental problems knowledge retention test scores of experimental and control groups. Data related to this analysis shown in Table 8.

Table 8.

Independent t-test result regarding environmental problems knowledge retention test scores of experimental and control group

Group	N	M	SD	df	t	p
Experimental	32	76.62	2.29	64	16.654	.000*
Control	34	50.94	8.43			

In Table 8, it is seen that there is a significant difference between environmental problems knowledge retention test scores of experimental and control group and it can be said that such a significant difference is in behalf of experimental group ($t_{(64)}=16.654$; $p<.05$). According to this finding, environmental education based on the transformational learning theory can be said to be quite effective to increasing permanency of learnings. The experimental and control groups' changes of environmental problems knowledge levels within a total of 18 weeks in the process can be seen as a line chart in Figure 3.

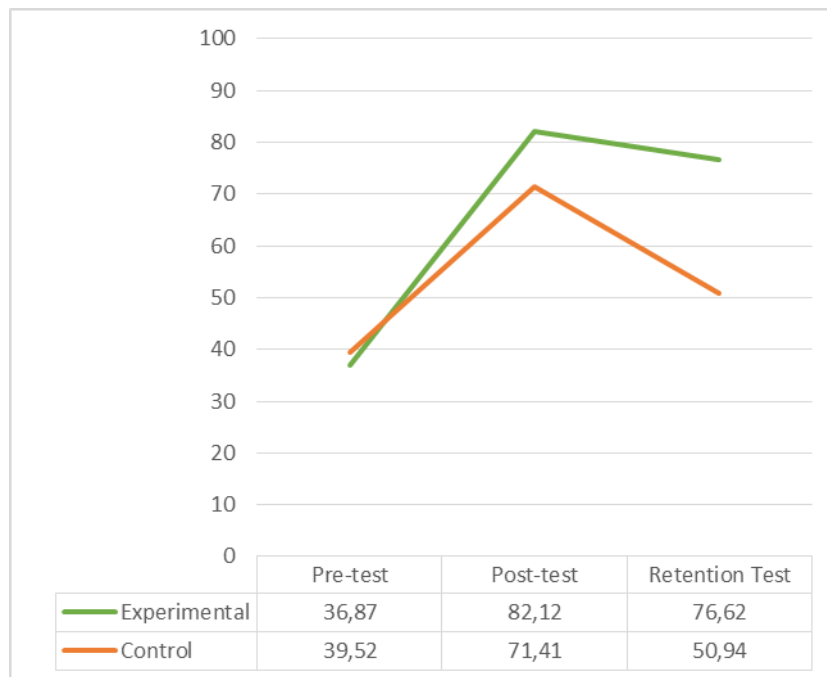


Figure 3. Changes the environmental problems knowledge levels of experimental and control groups

When looking at the Figure 3, it is seen that the experimental and control groups were similar levels to knowledge of environmental problems before the experimental

application. However, knowledge on the environmental problems of the experimental group showed more increase after the experimental application process. Even more, retention test was conducted after 8 weeks of the experimental implementation process and according to the result of this test, the success level of the experimental group fell slightly. However, the score of the control group showed quite a lot of decline. Accordingly, it can be said that the teaching based on transformational learning theory, which has been applied in the experimental group, was quite effective to provide permanency of learning.

Results and Discussion

One of the most challenging problem in today's world is the environment's negative transformation caused by humans. Environmental problems are not only belong to an individual, a society or a nation, they also belong to all universe together. There are lots of precautions to stop human negative effects on environment and different environmental education approaches are the basic method to bringing them to daily life. Also, in this study, a new teaching method, environmental education based on transformational learning theory's effects on primary-school teacher candidates' attitudes towards environmental problems and permanency of the environmental knowledge have been learned in the learning process. The results obtained at the end of the study are described below. Before the experimental application, it was detected that both study and control group have similar awareness level from pre-test, in other words, it was seen that both groups have same level of properties on said areas before the experimental process.

Palmer (1998) underlines that one of the most important aspect of humans' perceptions towards environment is their related knowledge level. While there is not any difference on environmental knowledge variable between both groups before the experimental process, when analyzing the post-test scores, it is seen that there is a statistically significant difference on environmental knowledge variable on behalf of experimental group. This results can be explained as in environmental education based on transformational learning theory is more effective than lecturing method. Such a result is supporting result of studies conducted by Feinstein (2004) and Çimen & Yılmaz (2014). Feinstein (2004) underlines that environmental education based on transformational learning theory improves students' regional environmental knowledge. In their study, Çimen & Yılmaz (2014) concluded that environmental education based on transformational learning theory provided better results than lecturing method.

One of the important element of transformational learning theory is human's emotional properties (Neuman, 1996). Outdoor activities like nature trip and video and photography review activities are considered to be helpful in developing environmental related awareness in study group. In their study, Collins et al. (2008) has found that activities based on transformational learning theory are helpful for developing positive behavior towards protecting environment in local people of Africa. The study conducted by Wyneen, Kylee & Tarrant (2012) and D'Amato & Krasny (2011) indicates that environment education based on transformational learning theory and activities related to it are helpful for developing positive changes on students' environmental responsibility behaviors.

Also in this study, after analyzing findings related to environmentally responsible attitude, it is stated that environmental education based on transformational learning theory has affected experimental group positively. In other words, after the experimental process, it is seen that experimental group have developed more awareness towards environmentally responsible attitude.

At the end of the study, significant increase at post-test results is seen both experimental and control group. It is said that such an increase has occurred in experimental group. However, according to retention test held after 8 weeks after the post-tests, scores difference between experimental and control groups has been significantly increased in behalf of experimental group. This result shows that environmental education based on transformational learning theory provides more permanent learning. If the retention could not be achieved, knowledge and behavior gained would be forgotten and the efforts and time spent in learning process would be wasted. In this context, importance of retention is underlined. As a result, it is understood that study group has increased their knowledge on environmental problems and environmentally responsible behavior has increased significantly with the environmental education based on transformational learning theory. In addition to this, it is determined that permanency of learnings and positive behaviors have been gained because of based on this theory.

Based on the results obtained in this study, importance of including implementations based on transformational learning theory when planning environmental learning techniques and its positive outcomes can be stated. In this scope, student-centered activities like nature walks, photography and video showing, news related to environment should be taken seriously. Especially, considering nature walking activity's positive effect on study group's emotions towards environment, nature-based activities will be very beneficial for environmental education applications. Additionally, self-evaluation activities let students make assessment about themselves. Such a kind of activities can be used in order to let students develop awareness themselves. Reflective thinking activities, scenario, photography and video study, writing biography also can be used in environmental education courses to reveal students' knowledge and environment related behavior.

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Dönüşümsel Öğrenme Kuramına Dayalı Çevre Eğitiminin Çevre Sorunlarına Yönelik Algılara Ve Öğrenmenin Kalıcılığına Etkisi

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Özet

Bu araştırmanın amacı, dönüşümsel öğrenme kuramına dayalı çevre eğitiminin sınıf öğretmeni adaylarının çevre sorunlarına yönelik algılarına ve öğrenmenin kalıcılığına etkisini belirlemektir. Araştırmada öntest-sontest kontrol gruplu yarı deneysel desen kullanılmıştır. Çalışma grubu, 2014-2015 eğitim-öğretim yılı güz döneminde Kastamonu Üniversitesi Eğitim Fakültesi Sınıf Öğretmenliği lisans programında dördüncü sınıfta iki farklı şubede öğrenim gören 66 öğretmen adayından oluşmaktadır. Şubelerden biri deney (N=32), diğeri kontrol grubu (N=34) olarak seçkisiz atama yoluyla belirlenmiştir. Deneysel uygulama süreci boyunca deney grubunda dersler dönüşümsel öğrenme kuramına dayalı olarak işlenirken, kontrol grubunda öğretmen merkezli eğitim verilmiştir. Veri toplama araçları olarak çevre sorunları bilgisi testi, çevreye duyarlı davranış ölçeği ve çevre sorunlarına yönelik tutum ölçeği kullanılmıştır. Verilerin analizinde SPSS 21.0 istatistik paket programından yararlanılmıştır. Grupların ortalama puanlarını karşılaştırmak amacıyla bağımsız gruplar için t-testi kullanılmıştır. Elde edilen bulgulara göre, deney ve kontrol grubunun çevre sorunları bilgisi testi, çevre sorunlarına yönelik duyarlılık ölçeği ve çevre sorunlarına yönelik tutum ölçeği son-test puanları arasında deney grubu lehine istatistiksel olarak anlamlı bir fark olduğu belirlenmiştir. Bu sonuca bakarak, dönüşümsel öğrenme kuramına dayalı çevre eğitiminin, öğretmen merkezli eğitime göre akademik başarı, çevre sorunlarına duyarlılık ve çevreye sorunlarına yönelik olumlu tutumların geliştirilmesi bakımından daha etkili olduğu söylenebilir.

Anahtar Kelimeler: Tutum, çevre, kalıcılık, dönüşümsel öğrenme.