The Effect of Problem Based Learning Method on the Environment Awarness of 7th Graders ("Human and Environment" Unit Example)

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Abstract

The aim of the current study is to investigate the effects of 7th grade Science and Technology class "Human and Environment" Unit, prepared according to problem based learning method, on the students' environmental awareness and retention of information. The research design is based on pretest posttest control grouped semi-experimental model. The experimental group was taught with problem based learning method and the control group was taught with the method, activities and applications in the Science and Technology learning program. The research procedure took place in a middle school in Denizli with 42 7th graders over a period of six weeks and four lessons a week in 2013-2014 academic year second semester. Before the procedure the Elementary School Students' Environmental Attitude Scale was administered as pretest, after the procedure as posttest and two months after the procedure was over as retention test. The findings of the current research concluded that teaching the "Human and Environment" Unit with problem based method in 7th grade developed the environmental attitude of students and it increased the retention of information.

Key Words: Problem Based Learning Method, Environmental awareness, Environmental Education, Science Education

INTRODUCTION

Living beings are in constant interaction with other animate and inanimate beings within the environment they live in. As part of living beings within this interaction, humans have sometimes destroyed the environment and other times caused pollution. As a result, environmental issues started to build up. It was gone unnoticed until the human life was threatened. While environmental issues were a concern of people affected by the problems at first, these problems grew to global lengths (Bozkurt and Koray, 2002). Thus, environmental issues have been argued and solutions to these issues have been seeked in international conferences. Environmental issues were first

addressed by the Massachusetts (USA) Public Health Committee in 1869 and a decleration was issued. The decleration stated that every human being needed clean air, water, and land and they should not be polluted. The same decleration also stated that these are common values for all humans, not just a select few and nobody even unwittingly could pollute these sources (Gündüz, 2004). When the international conferences arranged in the name of seeking collaborative solutions to preserve the environmental values and decision taken are examined it is confirmed that one of the most important components to a sustainable nature and preserve natural sources is to establish environmental education (Yüksek, 2010). Environmental edication was mentioned in 1972 in the United Nations Human and Environment Conference for the first time and gained an international qualification. In our country, Turkey Environmental Education and Teaching National Environmental Strategy and Application Seminar was held by UNESCO and Prime Ministary Undersecreteriat of Environment in 1990. In this seminar, environmental education was defined as: "Forming environment sensitive behavior, maintaining cultural, historical, and natural values and insuring active participation in resolving issues by developing environmental awareness in students" (Özoğlu, 1993). Although, at the beginning, environmental education appeared to teach students about the environment, it included raising students as volunteer participants among its objectives in time (Buhan, 2006). The general goals and how to apply environmental education were presented in the Tblisi Decleration. In the Tblisi Decleration, the main goals of environmental education were established as skill, awareness, attitude, knowledge and participation (Ünal and Dımışkı, 1999). The main purpose of the environmental education is to ensure raising individuals who have knowledge, skill and values that will ensure them to be able to display responsible behavior toward environment protection (Ulutaş, 2013).

As understood from all the information provided above, an environmental education that will prevent environmental issues, change today's humans' views and reconstruct their values and attitudes on the environment is crucial. One of the most important methods ensuring the active participation of students and that can positively structure their environmental attitudes and awareness is problem based learning (PBL). While PBL method generates solutions on how students may handle everyday environmental issues they may face, it also provides students to realize the importance of the environment for the human kind by constructing positive environmental attitude and awareness. PBL method was first used by Howard Borrows in medical education in the 60's in McMaster University, Canada. Today, it is used in various fields (Şenocak and Taşkesenligil, 2005). In our country, PBL method was first used in Dokuz Eylül University Faculty of Medicine in 1997 (Akınoğlu and Tandoğan, 2007). PBL method is a learning approach that helps students realize their learning needs, perform group study, gain problem solving skill, and help them understand the lesson in depth as a whole (Cantürk, 2006). The PBL method is based on the philosophy of students learning by researching like scientists. In order for this to happen, students need to try to solve a problem like a researcher does. In PBL method, the teacher writes scenarios with problem cases (Boran and Aslaner, 2008). Students obtain new information by using their former knowledge and doing research. Students form various alternatives to resolve the

problems in the scenarios with the information they obtained (Treaguest and Peterson, 1998). The problems in the PBL method serve as the student activities, the stimulant of the teacher and the focus of the learning process (Chin and Chia, 2004). The most important characteristics of the problem scenario is that there is not one right answer, it is unstructured and complex, it is difficult to solve with a simple formula, it can change directions in the light of new information surfacing (Torp and Sage, 1998). The basic concepts and information needed to be learned according to the educational attainments in educational programs should be able to be learned during the process of resolving the problem in the scenario (Karamustafaoğlu and Yaman, 2006). The steps of PBL method are as follows (Walsh, 2005; Pelech, 2006);

- Encountering the problem and defing the problem.
- Making a list of what information we have and what we need to know.
- Collecting acquired data and sharing it with the group.
- Offer solutions depending on the findings of the research.
- Defining learning topics.
- Applying the information gathered to the problem and determining the best way to resolve the problem.
- Briefing about resolving the problem.

The duty and responsibilities in the PBL method are different compared to the traditional learning approach (İnel and Balım, 2010). In the PBL method the teacher does not directly intervene in the learning process; instead s/he guides the students by giving responsibilities to students so that they can learn for themselves, s/he encourages them to think like scientists, s/he provides a collaborative active learning environment (Yenilmez and İşgüden, 2007; Karakuş, 2006). PBL method is a student centered method. While solving the problem, students work in a group, develop collaborative learning and problem solving skills, and they are encouraged to become autonomous lifelong learners (Demirel and Turan, 2010; Kaptan and Korkmaz, 2001; Murray-Harvey, Curtis, Cattley and Slee, 2005; Visshers-Pleijers et al., 2006; Hmelo-Silver, 2004). Moreover, with this method students gain communication and collaboration skills as well as develop their cognitive ability (Hamalainen, 2004; Sungur and Tekkaya, 2006). Thus, the PBL process does not only encourage students to take responsibility for their own learning but also serves to develop group work skills (Hughes and Lucas, 1997). PBL provides students to gain knowledge and skills necessary to solve the problems they face in their own lives as well as develop metacognitive and self-regulated learning (Dunlap, 2005; Yuzhi, 2003). PBL, increases students' interest and motivation in the class, as well as positively develop their creative thinking skills (Norman and Schmidt, 2000; Berkel and Schmidt, 2000; Yaman and Yalçın, 2005; Hmelo-Silver, 2004). When PBL is administered correctly, it can be accepted as an effective learning method. However, issues such as the students' insufficient cognitive levels, problems of the leader, not being able to prepare suitable scenarios and and not leading the sessions well, crowded classes, insufficient time may hinder PBL method from being administered effectively (Karamustafaoğlu and Yaman, 2006).

If PBL method is applied properly in environmental education, then positive development in individuals' behavior will occur and environmental protection will take place (Ünal, 2011). When elementary school curriculum is examined it is established that the class dealing with environment most intensely is the Science and Technology class. In fact, among the objectives of the Science and Technology class, environment and environmental protection occupy quite an important place (Ministry of National Education (MNE), 2005; 2006). Within the scope of the Science and Technology class there is a chance of correcting or replacing the imperfect thoughts and perceptions toward the environment with the correct ideas. Thus, this is important in the name of raising volunteering participants to protect the environment. Based on the information above, in the current research the effect of PBL method on the students' awareness was tested in middle school 7th grade Science and Technology class. The sub-questions of the research are as follows:

1. Is there a statistically significant difference in the Elementary School Students' Environmental Attitude Scale pretest score means of students taught with the PBL method in the experimental group and the students taught with the method, activities and applications in the Science and Technology teaching program in the control group?

2. Is there a statistically significant difference between the Elementary School Students' Environmental Attitude Scale pretest and posttest score means of students taught with the PBL method in the experimental group?

3. Is there a statistically significant difference between the Elementary School Students' Environmental Attitude Scale pretest and posttest score means of students taught with the method, activities and applications in the Science and Technology teaching program in the control group?

4. Is there a statistically significant difference in the Elementary School Students' Environmental Attitude Scale posttest score means of students taught with the PBL method in the experimental group and the students taught with the method, activities and applications in the Science and Technology teaching program in the control group?

5. Is there a statistically significant difference in the Elementary School Students' Environmental Attitude Scale retention score means of students taught with the PBL method in the experimental group and the students taught with the method, activities and applications in the Science and Technology teaching program in the control group?

METHOD

In the current research, a pretest posttest control grouped semi experimental model was used to elicit the effect of PBL learning method on students' environmental awareness within the method, activity and applications in the Science and Technology class. The universe of the research is middle school 7th graders in Denizli in the 2013-2014 academic year. The sample of the research

consisted of a total of 42 students; 22 of which were in the experimental group and 20 of which were in the control group.

Data Collection

In order to measure the students' environmental awareness the "İlköğretim Öğrencileri Çevre Tutum Ölçeği (İÇTÖ)" [Elementary School Students' Environmental Attitude Scale (EEAS)] developed by Gökçe, Kaya, Aktay and Özden (2007) was used. The scale consists of 34 items answered in a three-point Likert Scale. The Cronbach alpha of the scale was given as 0.87 when it was developed.

The scale was administered to both the experimental and control groups before the procedure started. The "Human and Environment" unit was administered by the researcher using PBL method with the experimental group and using the method, activities and applications within the Science and Technology program with the control group. The PBL method scenarios were developed by the researcher and they were structured according to expert opinions. When the scenarios were prepared the level of the students was carefully taken into consideration. Before the procedure, information on how the "Human and Environment" unit will be studied by the PBL method and how the scenarios will be used were given to the experimental group. Students were divided to 4-5 people groups in the classroom. Then, the PBL scenarios were distributed to the students and students were asked to provide solutions to the problems in small groups. The students were asked to discuss the problems they were given and write down the solutions with the scenarios on the emplty papers they were provided. The students provided solutions to the scenarios by making use of lesson books, testing books, magazines and the Internet under the supervision of the researcher. The procedure lasted for six weeks, 4 hours a week. After the treatnment was over, the scale was administered as posttest to both the experimental and control groups in order to determine whether the subject matter's objectives were met and if they were met to what degree they were met. Finally, in order to determine the retention of the procedure and applications in both groups the scale was readministered two months after the procedure.

Data Analysis

The data collected from the pretest, posttest and retention of the scale were compared by the total score means of both groups. The data acquired were tested by Shapiro-Wilk test for normal distribution. The analysis indicated that all scale data had normal distribution (pretest p= 0,089, posttest p= 0,167, retention test p= 0,668). Thus, when comparing the pretest, posttest and retention test scores of the experimental and control groups independent samples t-test, and comparing the scale results within the groups themselves paired samples t-test were administered. The hypotheses of the research were evaluated according to 0,05 level of significance.

FINDINGS

In order to to answer the sub question: “Is there a statistically significant difference in the EEAS pretest score means of the students in the experimental group and the control group?” an independent samples t-test analysis was performed with the student scores.

Table 1. Independent Samples t-Test Analysis Findings of EEAS Pretest Scores Comparison of the Experimental and Control Group

Pretest	N	$\overline{X}$	Ss	Sd	t	p
Control Group	20	1,42	0,17	40	-1,66	0,11
Experiment Group	22	1,51	0,17			

As can be seen in Table 1, the independent samples t-test results did not reveal any statistically significant differences between the EEAS pretest scores of the experimental and control group (t=-1,66 and p>0,05). It could be said that the environmental attitute of both groups are quite similar depending on the findings.

In order to to answer the sub question: “Is there a statistically significant difference between the EEAS pretest and posttest score means of the students in the experimental group?” a paired samples t-test analysis was performed with the student scores.

Table 2. Paired Samples t-Test Analysis Findings of the Comparison of the EEAS Pretest Posttest Scores of the Experimental Group

Tests	N	$\overline{X}$	Ss	Sd	t	p
Pre-test	22	1,51	0,17	21	-2,28	0,03
Post-test	22	1,60	0.09			

As seen in Table 2, the paired samples t-test findings of the EEAS pretest and posttest scores' comparison of the students in the experimental group shows a statistically significant difference (t=-2,28 and p<0,05). The findings indicate that environmental education done with PBL method may have a positive effect on increasing the students' environmetal attitude.

In order to to answer the sub question: “Is there a statistically significant difference between the EEAS pretest and posttest score means of the students in the control group?” a paired samples t-test analysis was performed with the student scores.

Table 3. Paired Samples t-Test Analysis Findings of the Comparison of the EEAS Pretest Posttest Scores of the Control Group

Tests	N	$\overline{X}$	Ss	Sd	t	p
Pre-test	20	1,42	0,17	19	-1,19	0,25
Post-test	20	1,46	0,17			

As seen in Table 3, the paired samles t-test findings for the pretest-posttest of the control group scores were statistically insignificant (t=-1,19 and p>0,05). It can be concluded that the method, activities and applications in the Science and Technology learning program has no positive effect according to the pretest-posttest comparison of the control group' score means.

In order to to answer the sub question: "Is there a statistically significant difference in the EEAS posttest score means of the students in the experimental group and the control group?" an independent samples t-test analysis was performed with the student scores.

Table 4. Independent Samples t-Test Analysis Findings of EEAS Posttest Scores Comparison of the Experimental and Control Group

Posttest	N	$\overline{X}$	Ss	Sd	t	p
Control Group	20	1,46	0,17	40	-3,37	0,00
Experiment Group	22	1,60	0,09			

As seen in Table 4, the independent samples t-test findings of the EEAS posttest scores comparison of the experimental and control groups are statistically significant (t=-3,37 and p<0,05). The analysis findings reveal that the environmental attitudes of the students in the experimental group are stronger compared to the students in the control group. The findings indicate that the procedure in the experimental group has a higher effect on environmental attitudes compared to methods used with the control group.

In order to to answer the sub question: "Is there a statistically significant difference in the EEAS retention score means of the students in the experimental group and the control group?" an independent samples t-test analysis was performed with the student scores.

Table 5. Independent Samples t-Test Analysis Findings of EEAS Retention Test Scores Comparison of the Experimental and Control Group

Retention test	N	$\overline{X}$	Ss	Sd	t	p
Control Group	20	1,42	0,16	40	-3,37	0,00
Experiment Group	22	1,56	0,10			

The retention test administered to control and experimental groups independent samples t-test findings revealed a statistically significant difference (t=-3,37 and p<0,05) between the groups as seen in Table 5. The findings indicate that the experimental group students have higher environmental attitudes compared to the students in the control group. It is seen that the PBL method used in the experimental group has higher retention effect compared to the method, activities, and applications within the Science and Technology learning program used in the control group. However, both groups have weak environmental attitude after two months of the procedure.

CONCLUSION and SUGGESTIONS

The pretest scores mean of the experimental group was calculated as 1,51 and the pretest scores mean of the control group was calculated as 1,42. According to the findings there was no statististical significance between the environmental attitudes of either group before the research began (Table 1). This finding indicates that the environmental attitudes of both groups were almost equivalent before the research. Thus, this conclusion shows that the research would be conducted with two equivalent groups. This result is important in order to measure the PBL method's effect on the students' environmental attitudes. Moreover, when both groups' general environmental attitudes were investigated it was determined that their environmental attitudes were weak.

There was a statistical significance between the pretest (1,51) and posttest (1,60) environmental attitude scores of the experimental group (Table 2). According to the findings, the environmental education with the PBL method increased the environmental attitudes of the students positively. This finding concurs with previous studies (Kızılcık, 2012; Kuzey, 2013; Williams, Woodward, and Symons, 2010). However, it is concluded that the experimental group's environmental attitudes were still weak in general even after the procedure. When studies related to PBL method's effect on environmental attitude are researched; Şenel's (2010) study investigated the PBL method's effectiveness in comparison with direct narration method on developing pre-service teachers' environmental awareness. The research findings indicated a positive effect of PBL method on pre-service teachers' environmental awareness which is parallel to the findings and conclusions of the current research. İşeri Gökmen's (2008) study revealed that the students in the PBL method group had stronger environmental attitudes in general and higher environmental solutions in general compared to the students in the traditional method group which is parallel to the findings and conclusions of the current research as well. Yet, another study that parallel to the findings and conclusions of the current research is the Alagöz (2009) study. Alagöz's study included social

sciences pre-service teachers. The research compared PBL method to traditional method to reveal which method increased the students' environmental awareness more. The findings concluded that the increase in higher academic achievements in resolving environmental issues was achieved more by the group that was taught with PBL method. Moreover, the findings also indicated that there was an increase in the problem solving skill in the group that was taught with PBL method.

In the current research there was no statistical significance between the pretest (1,42) and posttest (1,46) environmental attitude scores of the control group (Table 3). According to the pretest and posttest score means of the control group the method, activities, and applications within the Science and Technology learning program only slightly increased the environmental attitudes of the control group student and this finding was statistically insignificant. The conclusion to draw from this finding is that the method, activities, and applications within the Science and Technology learning program are insufficient to increase students' environmental attitudes. The control group's environmental attitudes were weak in general after the procedure was over as well.

There was a statistical significance between the posttest scores of the experimental group (1,60) and the posttest scores of the control group (1,46) (Tablo 4). These findings conclude that environmental education taught by PBL method is more effective in increasing students' environmental attitudes compared to the Science and Technology learning program. This finding concurs with previous research (Gül and Yeşilyurt, 2011; Balgopal and Wallace, 2009; Özsevgeç and Artun, 2012; Artun 2013; Elbistanlı, 2012). However, it could be said that the environmental attitudes of both groups were weak after the procedure in the current study.

There was a statistical significance between the retention test scores of the experimental group (1,56) and the retention test scores of the control group (1,42) (Table 5). When these findings are studied it is seen that the students in the experimental group have stronger environmenta attitudes compared to the control group students. Thus, the conclusion is that PBL method is more effective compared to the method, activities, and applications within the Science and Technology learning program. However, the environmental attitudes were still weak of both groups after two months of the procedure.

All the findings of the current research show that there is a direct relation between environmental attitude and environmental education. It could be said that the environmental education an individual receives is important in order to resolve environmental issues, gaining awareness of environmental issues and increasing sensitivity. In order to resolve environmental issues, environmental education should raise environmental awareness and increase environmental attitudes in students. Only if these criteria are met, a livable world can be left for future generations. According to the findings of the current research, it could be concluded that environmental education taught by problem based learning method is an effective method in creating environmental awareness in students.

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