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THE EFFECT of ACTIVE LEARNING BASED ACTIVITIES on STUDENTS' LEARNING LEVELS in PRIMARY SCHOOL SIXTH GRADE SCIENCE COURSE

ABSTRACT

In this study, a research was made to find out whether using the active learning based activities have any effects on the learning level of 6th grade primary school students. Semi-experimental design was used in the study. The study was implemented in a primary school in Adana, in autumn semester of 2006-2007. 62 students participated in the student study group in all, consisting 30 students in the experimental group and 32 students in the control group. The study lasted for 8 weeks. The lessons were performed according to the active learning based activities in the experimental group and according to the traditional teacher-centered approach in the control group. Science learning level test were used as pretest and posttest for the experimental and control groups. According to posttest grades obtained from the knowledge level of cognitive domain test, there were no statistically significant differences between research groups.

Keywords: Active Learning, Science Course, Learning Levels, Cognitive Domain, Active Learning based Science Activities

İLKÖĞRETİM ALTINCI SINIF FEN BİLGİSİ DERSİNDE AKTİF ÖĞRENMEYE DAYALI ETKİNLİKLERİN ÖĞRENCİLERİNİN ÖĞRENME DÜZEYLERİNE ETKİSİ

ÖZET

Bu çalışmada aktif öğrenmeye dayalı uygulamaların ilköğretim altıncı sınıf öğrencilerinin öğrenme düzeyleri üzerinde etkili olup olmadığı araştırılmıştır. Çalışmada yarı deneysel desen kullanılmıştır. Çalışma 2006-2007 eğitim öğretim yılının güz yarısında Adana ilinde bir ilköğretim okulunda gerçekleştirilmiştir. Çalışmaya deney grubunda 30, kontrol grubunda 32 olmak üzere toplam 62 öğrenci katılmıştır. Çalışma 8 hafta sürmüştür. Dersler deney grubunda aktif öğrenmeye dayalı etkinliklerle gerçekleştirilirken kontrol grubunda öğretmen merkezli geleneksel öğretim kullanılmıştır. Çalışmada veri toplama aracı olarak öğrenme düzeyleri testi öntest ve sontest olarak kullanılmıştır. Çalışma sonucunda bilişsel alanın bilgi düzeyi testi sontest sonuçlarına göre araştırma grupları arasında farklılık bulunmamıştır.

Anahtar Kelimeler: Aktif Öğrenme, Fen dersi, Öğrenme Düzeyleri, Bilişsel Alan, Aktif Öğrenmeye Dayalı Fen Etkinlikleri



1. INTRODUCTION (GİRİŞ)

Every country in the aspect of the general goals of their education, they generate specific educational programmes to train the students to the aimed level. One of these programmes is science education programme (Gücüm and Kaptan, 1992). In modern education programme approach, it is accepted that development in the modern science and technology is directly related to achieving success in science. Therefore, in schools, the students should be trained not only having high level knowledge, but also, comprehension, application and other higher thinking cognitive levels of Bloom's Taxonomy. The prerequisite of having those skills is to have a learning process which have developed perfectly from primary school to post graduate.

According to Hernandez (2002), using Bloom's taxonomy of cognitive levels, in the traditional course, learning is equated with recalling or memorisation. The instructor lectures, and the students memorise the material covered in class for the exam (Hernandez, 2002). The traditional method is not a satisfactory one for the students to learn and to get information due to the fact that it is overloading information, it has a difficult curriculum far from the likes of the students and the evaluation is only made by the students' memorization of all the information (Dearn, 1996). Active learning, through which students become active participants in the learning process, is an important means for development of higher level thinking (Bonwell and Eison, 1991). Recalling or memorization represents the lowest level of learning outcomes in the cognitive domain (Bloom, 1956). Using Bloom's Taxonomy (1956) of cognitive levels, team learning is related to stimulating student thinking at the application, analysis, synthesis, and evaluation levels.

Nowadays, in the field of learning science, active learning based science education appliances become very popular subject. Many of the teachers are busy trying to find the best way to use the active learning methods where the students should be busy and stop with the passive learning (Fink, 1999). The reason why active learning turned out to be one of the most discussed subject is because the students are given the chance to make the necessary adjustments in process of education rather than being an inactive listener and note taker (Jayawardana, Hewagamage and Hirakawa, 2001). During the use of active learning, students move from being passive recipients of knowledge to being participants in activities (Bonwell and Eison, 1991). As a result of the discussions made, we focus on the science learning students to have an active and a responsible role on their learning process (Lunenbergh, Volman, 1999; Mattson, 2005; Euge`ne, 2006). In other words, on an active learning based science education, the students have responsibility to reach their academic goals and to their educational and research strategies (Jayawardana, Hewagamage and Hirakawa, 2001; Carborano, 2003).

Active learning force the students to contemplate and to make comments on applied information by involving them in activity-based research practices. In this approach students not only listen to the presentations, but at the same time, they improve their skills through their practices, and analyse, integrate and evaluate the knowledge which they have acquired by asking and writing at the end of the peer-work. In short, according to this approach, the students are forced to demonstrate their ideas and how they use them by means of research-based activities (Prostko, 1993) and consequently, results in deeper understanding and better application and transfer of the

knowledge in the future. Students can utilize some active learning activities after having little faculty preparation and they can do them spontaneously. Active learning can occur in class or outside of the class (e.g., computer simulations, internships, www assignments, class Internet discussion lists, independent study research) (McKinney, 2004). In active learning, instructors are seen as designers of learning environments who improve the quality of student learning rather than delivering content knowledge (Barr and Tagg, 1995).

2. RESEARCH SIGNIFICANCE (ÇALIŞMANIN ÖNEMİ)

Cognitive domain provides a useful framework for documenting the various cognitive levels at which the brain operates. Bloom's (1956) six-step hierarchical system of thinking moves from the knowledge level, which emphasizes recalling subject matter, to the evaluation level, which entails making judgments. Thus, in the cognitive domain the basic thinking skills cover knowledge, comprehension and application, higher thinking skills cover analysis, synthesis, and evaluation (Whittington, Lopez, Schley and Fisher, 2001). Each level is reflected through cognitive activities. Given that learning is enhanced by increasing the percentage of cognitive activity occurring at the higher levels of Bloom's Taxonomy, this framework gives focus and direction to teachers who are looking to improve the quality of learning in their classrooms (Whittington and Bowman, 1994).

There are some factors affecting learning and recalling process in science education. Choosing suitable learning methods and techniques is directly pertinent to constituting hands-on activities for students. Meanwhile, another important factor is that, active participation of the students to learning process is active learning which is one of the learning approaches to engage students more actively. Active learning based activities which need active involvement of the students can contribute to more productive and functional science teaching in the primary schools.

3. EXPERIMENTAL METHOD (DENEYSSEL YÖNTEM)

This research was conducted in a semi-experimental design by using pre-test and post-test design with a control group during the academic year of 2006-2007, in Turkey. Although the semi-experimental design is less ideal, it can serve as a credible one when experimental designs are not feasible. In the semi-experimental design, people don't spent any effort to choose research groups randomly. They must care the research groups to have equality and experimental and control groups are chosen randomly (Cohen, Manion & Morrison, 2000). The students in the experimental group were instructed by the active learning based activities which were adapted according to the purpose, content and acquisition of Turkish National Science course curriculum prepared by The Ministry of Education in 2005. On the other hand, the control group was instructed according to Turkish National Science course curriculum that does not consist of any active learning based activities. The topic was a journey to the internal structure of the living for sixth grades in both groups.

At the beginning of the study, an awareness-raising program was applied to the experimental group in order to assist with their adaptation to the active learning based activities. This awareness program also covered activities helping students in the experimental

group to develop behavior appropriate for the method applied during the experimental period.

3.1. Research Group (Çalışma Grubu)

Although that research was done in a limited area, the points which were considered for choosing that school were anticipated to raise the generalization of the research results. The information about the success level of that schools was taken from the Adana Education Management. All the primary schools' success level averages are taken and then the schools which have the highest and the lowest success level average are eliminated. At the end, the only one is chosen by drawing lots out of the whole.

The participants are 6th grade students from a public school in Adana, Turkey. Among the sixth grade classes, two classes having equal performance grading based on previous year science course and pre-test results were chosen randomly. After choosing the two classes, they were randomly assigned to the experimental (n= 30) and the control group (n= 32).

3.2. Purposes (Amaçlar)

The main purpose of this study is to investigate the effectiveness of active learning based activities on the learning level of cognitive domain within Bloom's Taxonomy on sixth grade primary school students. In the study, dependent variables are students' learning levels. Besides, independent variables are active learning based activities adapted from topics about a journey to the internal structure of the living. Other questions associated to the main purposes are as follows:

- Is there a statistically significant difference between mean scores of experimental and control groups in terms of knowledge level of cognitive domain?
- Is there a statistically significant difference between posttest mean scores of experimental and control groups in terms of comprehension level of cognitive domain?
- Is there a statistically significant difference between posttest mean scores of experimental and control groups in terms of application level of cognitive domain?

3.3. Data Collection Tool (Veri Toplama Aracı)

In this research, "Science Learning Level Test" developed by researchers was applied as a pretest and posttest in order to make a comparison between the students' learning level in terms of Bloom Taxonomies, knowledge, comprehension and application. The scale consists of the learning level of the unit "a journey to the internal structure of the living".

"The Science Learning Level Test" was used in order to determine students' knowledge, comprehension and application levels of cognitive domain in Science Course. This instrument is composed of 30 items regarding students' learning level in four point type. It has mainly three factors. The factors are named as the following: "Knowledge Level of Cognitive Domain Test (11 items, Kr-20=.87)", "Comprehensive Level of Cognitive Domain Test" (12 items, Kr-20=.77) and "Comprehensive Level of Cognitive Domain Test" (7 items, Kr-20= .78). In the pilot study, the instruments' reliability was checked by KR-20 value. The reliability of 'Science Learning Level Test' is found to be .82.

3.4. Data Analysis (Veri Analizi)

Data analysis was made according to the purpose and subpurposes of the research. For the analysis of the data, SPSS computer programme was used. The groups' pretest and posttest scores were compared with regard to their scores by independent sample t-test. 0.05 meaningfulness level was taken into consideration during the data analysis.

4. FINDINGS (BULGULAR)

The purpose of this research was to investigate the effects of active learning based activities on science course on students' learning level of cognitive domain about the topic "a journey to the internal structure of the living". At the beginning of the research, "Science Learning level Test" about the topic "a journey to the internal structure of the living" was improved.

According to the results of t-test analyses of "Science Learning Level Test" before the instruction, there was not any significant difference between the experimental group and the control group for all learning levels and presented in Table one.

Table 1. Control and experimental group students' learning level test pre-test scores

(Tablo 1. Kontrol ve deney grubu öğrencilerinin öğrenme düzeyi testi öntest puanları)

	Experimental Group (n=30)		Control Group (n=32)		T	P
	\bar{X}	SD	\bar{X}	SD		
Knowledge Task	3,40	.80	3.90	1.20	.76	.45
Comprehension Task	5.09	1.50	5.20	2.90	.17	.86
Appliance Task	4.1	1.69	4.5	3.30	.55	.58

This result showed that the experimental group and the control group were identical before the instruction. To understand the affect of active learning based activities on students' learning level, independent group t-test analysis was concluded examining its affect on posttest scores and results were presented on Table two.

Table 2. T-test results of control and experimental group students' learning level test post-test scores

(Tablo 2. Kontrol ve deney grubu öğrencilerinin öğrenme düzeyi testi son test puanlarına ilişkin t-test sonuçları)

	Experimental Group (n=30)		Control Group (n=32)		t	p
	\bar{X}	SD	\bar{X}	SD		
Knowledge Task	7.5	2.2	6.9	1.6	1.3	.18
Comprehension Task	6.9	2.3	5.3	3.03	2.3	.02
Appliance Task	5.4	1.5	3.8	1.3	4.4	.00

The results of t-test analysis about "Knowledge Level of Cognitive Domain Test" questionnaire after the instruction show that there was not any significant difference between the experimental group (\bar{X} = 7.5, SD = 2.2) and the control group (\bar{X} = 6.9, SD = 1.6), $t(62)$ = 1.3, p =.18. The mean scores of 'Comprehensive Level of Cognitive Domain Test' posttest results in the experimental group (\bar{X} = 6.9, SD = 2.3) have increased more significantly than the mean scores of the control

group ($\bar{X} = 5.3$, $SD = 3.03$), $t(62) = 2.3$, $p = .020$. Thus, it may be said that the use of active learning based activities in Science Course affected students' comprehensive level learning meaningfully. The mean scores of 'Appliance Level of Cognitive Domain Test' posttest results in the experimental group ($\bar{X} = 5.4$, $SD = 1.5$) have increased more significantly than the mean scores in the control group ($\bar{X} = 3.8$, $SD = 1.3$), $t(62) = 4.4$, $p = .000$. Thus, it may be said that the use of active learning based activities in science course affected students' Appliance Level learning meaningfully. Related graphics with this tests are shown as follows:

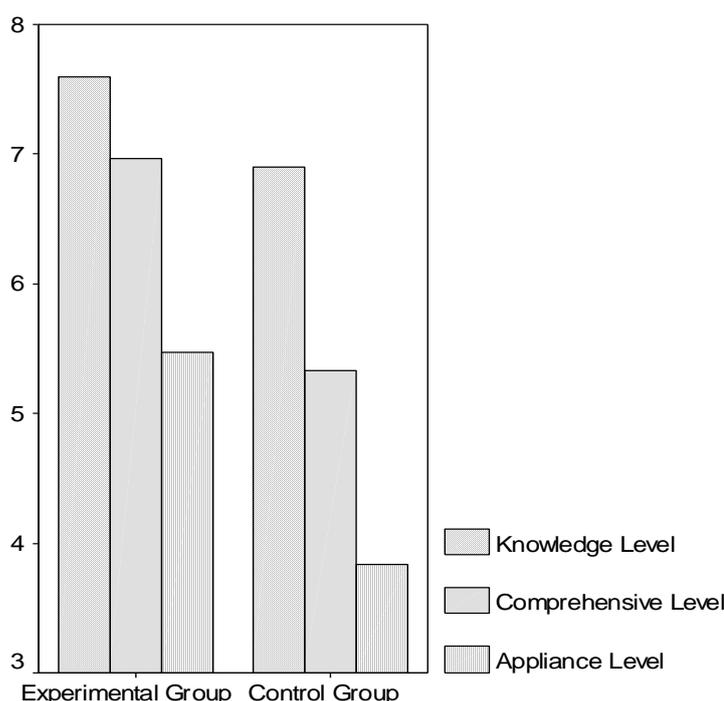


Figure 1. Bar graphic for mean scores of research group students' learning level test

(Şekil 1. Araştırma grubu öğrencilerinin öğrenme düzeyi testi aritmetik ortalama puanlarının sütun grafiği)

5. CONCLUSIONS AND DISCUSSION (SONUÇLAR VE TARTIŞMA)

Analysis of the learning level test data indicated posttest grades obtained 'Knowledge Level of Cognitive Domain Test', there were no statistically significant differences between research groups. According to posttest grades obtained from 'Comprehension Level of Cognitive Domain Test', there were statistically significant differences supporting the experimental group. According to posttest grades obtained from 'Application Level of Cognitive Domain Test', there were statistically significant differences supporting the experimental group.

In general, this research outcomes indicate that the active learning based activities can be used in Turkish National Science course Curriculum prepared by The Ministry of Education in 2005. The evaluation of tests shows that the new teaching program affected students' conceptual learning and their learning attitudes meaningfully.

In their research, Kincal, Ergül and Timur (2007) examined the affect of cooperative learning method on student learning level in science teaching. At the end of the research it is perceived that when teaching 'a journey to the internal structure of the living' subject in science lesson at primary school seven grade 'a journey to the internal structure of the living' cooperative learning is more effective since it enhances students' success in terms of knowledge, comprehensive, appliance and general level more than classical method does. This research have similar results with Kincal, Ergül and Timur's (2007).

Öner and Arslan (2005) carried out a research on two groups of sixth grade primary school students of science course. Learning and recalling levels of the students in study groups to which concept mapping were taught were found to be significantly higher than the learning and recalling levels of the students in the control group to which no learning strategy was taught.

Mark and Maribeth (1985) found that knowledge task was learned at a faster rate in more depth, and it was retained more fully than either the comprehension or application tasks. The comprehension task was learned more efficiently and retained longer than the application task. It is suggested that the 3 different tasks were hierarchical in complexity, as originally contended by Bloom.

To develop the usability of this new teaching program, we advise that;

- This study investigated the effects of active learning activities on students' learning levels. It should be expanded to investigate the effects of active learning activities on students' creativity, scientific skills and critical thinking skills etc.
- This study can be repeated with different widened participants and data collecting tools.
- 3.This teaching program should be used for other different topics rather than 'a journey to the internal structure of the living' of Science Course.
- Active learning activities should be applied into the contents of other courses such as math, biology, geography, astronomy and etc.

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Lesson Plan

Course	Science
Grade level	6 th
Unit	Systems
Subject	Circulatory System
Duration	40'

First Part

Teaching Methods and Techniques	Scenario based learning, discussion, computer based learning
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Second Part

Engage	The student will begin the class by answering preparation questions. After approximately five minutes, students will share their answers with each other and the answers will be discussed by the whole class and teacher.
Explore	The teacher will introduce the circulatory system and students begin discussion about the heart. Teacher shows students the poster of the Circulatory System and tell them that we are going to turn the room into a circulatory system like the one in the poster and show students how blood passes through the right side of the heart, to the lungs, to the left side of the heart and out to the body. Students try to find where they locate their pulse. The students will describe how their pulses feel.
Explain	The teacher and the students will brainstorm ideas on keeping hearts healthy.
Elaborate	Students will go to their individual computers in the classroom and click around the circulatory system and read about the parts that we discussed in class. The teacher will hand out worksheets to students and the students use the web page to complete the worksheet. Teacher asks for student volunteers to be the lungs, capillaries, left heart, and right heart. Instruct them where to stand and explain their jobs.
Evaluate	Group evaluation and self-evaluation form is used to assess students.