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EFFECT OF COOPERATIVE LEARNING MODEL ON SCIENCE AND TECHNOLOGY LABORATORY PRACTICES LESSON

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ABSTRACT

Laboratories are the settings which provide facilities enabling students and teachers to gain unique experiences that are hard to get in other ways. Science lessons learned through experiments improve students' motivation and enable them to learn science persistently. What is important in science learning is that students face a wide variety of materials in conducting science laboratory processes. Using these materials in laboratories requires a high degree of readiness. At this point, it is very important to determine which method we will apply to students and with which approach we can improve their success. The aim of this study is to demonstrate the effect of learning together model which is used in implementation of cooperative learning model on academic success, attitudes towards the lesson of students who attend the science and technology laboratory lesson. Sample of the study consists of a total 43 students from two classes in second – grade in the department of primary school teaching who attended the science and technology lesson during 2010 – 2011 academic year. With the method of cluster sampling, one class was determined as experiment group and the other as control group. Learning together method used in the implementation of cooperative learning model was applied to experiment group and proof based method used in traditional laboratory applications was used for control group. Data were gathered with data collecting instruments called Prior Knowledge Test (PKT), Experiment Achievement Test (EAT). Experiment Retention Test (ERT) and Science and Technology Lesson Attitude Scale (STLAS). Data analyze showed a significant difference favor of experiment group between control and experiment groups in view of academic success, retention of knowledge and attitudes towards science.

Key Words: Cooperative Learning Model, Learning Together Method, Proof Based Method, Retention of Knowledge, Science and Technology Laboratory.

INTRODUCTION

Scientific knowledge included in Science is the one that originates from the information people have acquired to meet their necessities during their interaction with natural environment since they came to life, and that has been transferred from one generation to another for centuries and tested and prove to be reliable (Taşdemir et al., 2005). With this aspect, science is the actual source of technology and has an important role in the development of countries and economic revival. Thus, countries pay a special attention to science education in order not to fall behind in scientific and technological developments and to maintain advancement with the purpose of bringing up individuals who can contribute to technology (Coştu et al., 2005).

Laboratory activities have had a special and central role in science education for long time. Science lecturers have suggested that it gives benefit to students to make them engage in laboratory activities (Hofstein & Lunetta, 2003). Laboratory experiments conducted on science education enable students' concrete experiences in order to learn both science terms and methods (Bybee, 2000). In science education, students are observed to gain manipulative skills and the knowledge and abilities like experiments, observing and concluding, critical thinking, implementation, analysis and synthesis, scientific interpretation, the way scientists work, kinds of scientific methods, relation between science and technology, curiosity, interest, taking risk, cooperation and objectivity (Yıldız et al., 2006).

Experiments in science education are carried out in order to make students clearly realize what they haven't known yet and recognize the accuracy of the knowledge acquired in many ways. Science lessons learned through experiments add to motivation of students (Friedler & Tamir, 1990).They enable students to be insistent on science education. In science education, students face a wide variety of materials in the application of such important science laboratories (Aksoy, 2011). At this point, it is very significant to determine which method we will apply to students and with which method we can improve their success (Coştu et al., 2005; Aydın, 2011; Şimşek, 2012).

In recent years, studies on this subject of Hofstein and Lunetta (2003) discuss on the adequacy of the practices and include suggestions related to applications must be done in 21 century in the literature. There are many studies belonging to the problems posed by conventional laboratory applications (Hamurcu, 1998; Gezer & Köse, 1999; Güven, 2001).

These problems are as follow: the number of students higher than should be (Akgün, 2000; Yaman & Öner, 2003), physically insufficency of laboratories in schools (Ayas et al., 2002; Harvey, 2007; Kırıkkaya & Tanrıverdi, 2009), the teachers who took the role of method editor in laboratory applications didn't have enough knowledge and skills (Lang et al., 2005; Panichas, 2006) and laboratory method carried out was wrong or insufficient (Chiappetta & Kaballa, 2002; Özmen & Yiğit, 2006). In the researchers conducted in parallel with this, it was observed that many challenges were encountered during laboratory studies, and that students weren't completely qualified in understanding the relation between the observations in laboratory and theoretical information and finally that laboratories were much far away from enabling a meaningful learning place (Nakhleh & Krajcik, 1993). Besides, it is told in the studies carried out that the reason why laboratories drew away from being meaningful learning places derives from the fact that laboratory applications weren't structured properly and in a sufficient way (Doymus, Şimşek & Karaçöp, 2007; Aksoy, 2011). Thus, as in theoretical lessons, the necessity of applying new approaches in laboratory studies has become the center of attention of researchers.

Active learning is the leading one among new education strategies. Problem based learning, inquiry based learning, project based learning and cooperative learning models rank as part of active learning. One of active learning strategies is cooperative learning model. Cooperative learning is one of widely encountered models in the areas of theory, research and education applications besides it calls much attention to teachers and researchers (Graham, 2005; Maloof & White, 2005; Şimşek, 2009).In parallel with this, it is seen that a big increase has taken place in today's use of cooperative learning model, which is more beneficial that other learning models (Webb et al., 2002; Siegel, 2005; Doymuş et al., 2010).Cooperative learning can be defined as a learning model in which students help each other's learning on academic topics by forming small coed groups, self-confidence of individuals grow, their skills for communication develop, power of solving problem and critical thinking rises and they actively attend the education period (Eilks, 2005; Lin, 2006; Hennessy & Evans, 2006; Prichard et al., 2006; Şimşek, 2007; Doymuş, 2008).

It is stated that if cooperative learning is used in both theoretical and laboratory applications, it enables students to actively take part in teaching processes and paves the way for advanced academic and social skills (Carpenter, 2003; Doymuş et al., 2009; Şimşek, 2012).

Cooperative learning model has many ways of application. Besides cooperative learning models give place to different learning experiences, they vary in view of education philosophy they adopt, the way they cooperate and their evaluation and reinforcement processes. During cooperative learning activities, researchers developed many methods in order to create positive learning environment, contribute to the success of students and help teachers. Among these, commonly used methods can be summed up as Learning Together, Team-Game-Tournament, Reading-Writing-Application, Jigsaw, Group Investigation, Cooperative-Cooperative, Students Team Achievement Division and Academic Controversy (Hines, 2008; Doymuş, Şimşek & Karaçöp, 2009).

One of the commonly used cooperative models in science education is learning together method (Maruyama, 1991) .The most important aspect of learning together method is that there is one-shared group aim, thoughts and materials are shared and there are divisions of labor and group rewards.

When the circumstances which are stated in literature belonging to laboratory applications being vital in science education are considered, the necessity of the fact that science laboratory implementations should be structured in terms of today's education insight appears. First level which students face science laboratory practices is primary level. Firstly, teachers at this level should be trained on laboratory practices. Thus, in this study, teacher candidate students in the department of primary school teaching were chosen. When the fact that the candidate teacher students are considered to develop their skills for laboratory practices, importance of this study becomes more visible.

The aim of this study is to find out the effect of learning together method used in the implementation of cooperative learning model on the academic success, retention of knowledge and attitudes towards the lesson of students who attended science and technology lesson. During this process, answers were sought for the following research questions.

1. Is there any significant difference in the academic success and retention of knowledge between the students who are in the group in which learning together method is applied in science and technology lesson and those of students in the group in which experimental practices based on proof based method are conducted?

2. Will the attitudes to science and technology lesson of students who are in the group in which learning together method is applied be different from the manners of other students who are in the group in which experimental implementations based on proof based method is applied?

METHOD

In this section, there are research model, sample, data collection instruments and implementing of research.

Research Model

In different teaching environments, use of quasi-experimental research design is proper while the effect of teaching materials or teaching methods is being researched (McMillan & Schumacher, 2006). In this design, classes are taken into researches for educational purposes as they are (Karasar, 2005). Thus, the study was carried out within pretest-posttest design randomly selected groups by quasi-experimental structure. It is as in Figure 1;

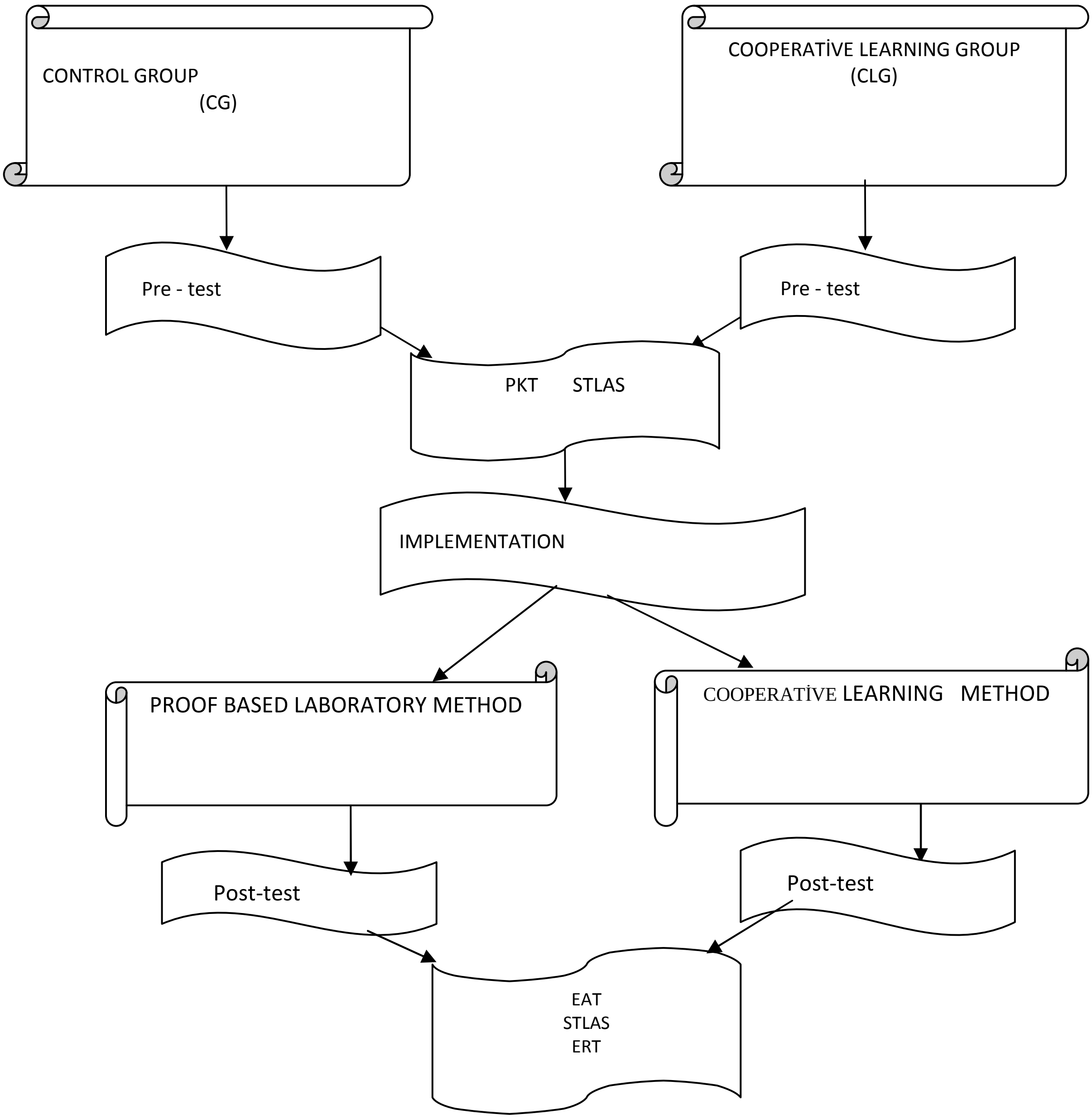

Figure 1: Design of research

Sample

The study was carried out with the attendance of a total 43 second-grade students from two different classes who attended to science and technology laboratory applications lessons in the department of primary school teaching of the faculty of education in a university during 2010-2011 school year. One of these different classes was determined as experiment group (n=21) applied learning together method used in the application of cooperative learning model and the other one as control group (n=22) applied proof based learning method used in traditional laboratory applications.

Data Collection Instruments

Research Data for both groups were gathered by using; Prior Knowledge Test (PKT) for the determination of prior knowledge of students before the application of related methods; Science and Technology Lesson Attitude Scale (STLAS) for the attitudes towards science and technology lesson and Experiment Achievement

Test (EAT) for the measurement of academic achievement levels of students during laboratory practices. Besides, one month after the experiment, Experiment Retention Test (ERT) was used to determine retention of academic knowledge of the groups attending to the study including the experiments done.

Prior Knowledge Test (PKT)

In the study, a multi-choice PKT was created from questions made up of 50 items including main subject in science and technology lesson which is thought to effect students' understanding the experiments carried out in science and technology laboratory. With PKT, it was aimed to understand on what level prior knowledge of students was for the subjects who were fundamental for understanding the experiment to be conducted in science and technology laboratory. In order to see the reliability of PKT, questions prepared were applied to third-grade students from school teaching department didn't join research but had taken this lesson before and reliability coefficient of the test was found as (Cronbach Alpha) α=0,79. For the validity of PKT, thoughts and ideas of lecturers and academics who teach on science and technology lesson in the department of primary education were gathered. Lecturers and researchers stated that the test was in the quality for evaluating the attainment on the subjects thought to effect on students' understanding the experiments to be conducted in science and technology laboratories. In the PKT, each right answer was equivalent to 2 points; every wrong or blank left answer was equal to 0 point.

Science and Technology Lesson Attitude Scale (STLAS)

This scale was prepared by the researcher in order to determine the attitudes of students studying in the department of school teaching in the university towards Science and Technology lesson. In the first stage, as a result of reviewing publications on occupational experiences, a 50-question repository was prepared. And then, with the purpose of determining the comprehensibleness of these questions, a scale was given to 35 of the students from the department of school teaching in the university and it was marked and a Likert- type scale was created which had 5 points with 15 items chosen as a result of questioning these people's views while the scale was being prepared, reliability, understandability of the questions and the fact that they are in the quality of easiness and include a wide variety of variations were tried to be taken into account. Answers choices for the scale were as follow; completely agree, agree, uncertain, don't agree and don't agree at all. The subjects were asked to give 1 point for "don't agree at all", 2 points for" don't agree", 3 points for "uncertain", 4 points for "agree" and 5 points for "completely agree".

This scale was given to those who studied in second, third and fourth grades in the department of school education and 320 people who accepted to take part in this scale. For internal consistency of the scale, Cronbach alpha method was used. With this scale and that question was suitable for existing in this scale. With this purpose, each item was observed for its correlation to total score and Cronbach alpha coefficient was 0,78 and it was found that it was consistent in itself.

Experimental Achievement Tests (EAT)

Experimental Achievement Tests were divided into 5 groups. Each of them represents an experiment. These groups are; 1) Representing the buoyancy of water (EAT-a), 2) Representing the examination of temperature change when heating the different liquids in the same amount (EAT-b), 3) Representing the experiment of pressure effect on boiling point (EAT-c), 4) Representing the experiment of finding the unknown resistance by benefitting from Ohm's law, (EAT-d) and 5) Representing the experiment of ray reflections to concave mirror at different directions (EAT-e). The experimental achievement tests created from 10 multiple-choice questions with 5 options. All of these questions in the test are related to experiment that is going to happen during that week in science and technology laboratory. Each of the prepared question types aimed a different attainment measurement related to experiments in the laboratory. EAT's applied to students who know about the experiments' subjects and test's reliability parameters' were determined with the (Cronbach Alfa) order;

For EAT-a; α=0,69
For EAT-b; α=0,64
For EAT-c; α=0,65
For EAT-d; α=0,67
For EAT-e; α=0,61

Science and Technology Teachers' opinions related the subject were considered about the developed EAT's validity in the Research Section. Experts remarked the high validity. Also to collect to qualitative data in the EAT's which made every week open-ended questions which involved that week's experiment were asked. Categories were created for the open-ended questions of EAT and results were evaluated by getting percentage frequencies.

Experiment Retention Test (ERT)

Experiment Retention Test (ERT); It was consisted of 25 multiple-choice questions with 5 options consisting the experiments in the science and technology laboratory in research. It's aimed on determining the more permanent method between learning together method and proof based learning method for students' academics knowledge after 1 month with the prepared experiment retention test. All of the multiple-choice questions are related to experiments in the science and technology laboratory. ERT created in this way was applied to third year's students of science who saw the experiments included in the field of the research, and test's reliability coefficient was determined as (Cronbach Alfa) 0.68. Opinions of instructors and researchers who were working at science and technology teaching department were asked to determine ERT's validity. Feedback given by instructors and researchers indicated that the test could measure attainment related to experiments.

Implementation

In the study, PKT and STLAS was applied as pretest in order to determine whether there is a difference in terms of prior knowledge and attitudes towards science and technology courses belong to science and technology laboratory applications course between the experimental group made the experimental implementation based on learning together method with the control group made the experimental implementation applied proof based learning method. After pretests were applied, experiment and control groups started to apply. Implementing was made as 2 class hour in a week by researchers and took 5 weeks for the both groups.

Teaching Through the Learning Together Method

The students in the classroom that was chosen as experimental group in which use the experimental applications based on learning together method were carried out were separated into five groups one of which composed of five the other four of which composed of four students for each. The groups were requested to get a name and choose a head of group among themselves. Later on, each group was handed in group forms. In these forms were determined; name of the group, the number of members, the experiments that would be done each week, the study subjects that were allocated to each member and the responsibilities that were to be fulfilled by each members before coming up for the experiment to be carried out that week. Every other week, the members of each group were handed in the subjects concerning to his/her duties related to science and technology laboratory practices class and each member were put under individual responsibilities. This was realized by means of heads of groups. One of the group members was responsible for the theoretic knowledge about the experiment and one another for the set up and the others were responsible for the experiment to be carried out and concluded. Then each week, each of group members was given various pre-experimental assignments about the experiment and commanded to hand in their assignments as reports. The groups were made complete each individual responsibility before they turned up to the classroom environment. At the beginning of the classes, some oral examinations were held about that week's experiments before the students started to the experiment in order to detect the level of students' readiness. If found any during the oral examinations, the deficiencies were compensated. The group member, failing to fulfill his/her individual responsibilities, was mentioned that his/her own and his/her group success would be affected negatively and the deficiencies were completed by the researcher. Then, the group members were requested to present the assignments that each of them was responsible to prepare and to discuss on them. Meanwhile, by making the inter group interaction to be high; the researcher had the reports presented effectively. After group members completed the report presentation, the researcher casted lots for a group and requested them to make a presentation before the classroom. The other groups were allowed to ask question to the presenting group and in this way the deficiencies that were detected were assessed. Later on, it was come to the phase that each group would conduct the experiments by letting each member fulfill his/her own responsibilities in the lab.

First in this phase, the first student conveyed the theoretic information about the experiment to his/her other friends and controlled their learning. Later, setting up the system, the other student introduced the materials to be used in the experiment and explained their features. In the end the experiment practice was concluded after the individual performance of the rest of group members. Observing the groups along the experiment in the lab, provided the groups with necessary precautions, help and support. Completing the experiment each group was requested to speak, discuss and repeat the whole process among them. Along this process as well, the researcher walked through the groups observing their assessment levels and provided help where needed. Every week, the same experiment with each group was conducted with the participation of one instructor and one assistant. After the experiment conducted first week, the application of other weeks' experiments was carried out by different group member by swopping the responsibilities.

Teaching Through the Proof Based Learning Method

For the control group; students were divided into 5 groups. Some of them had 4 and the others had 5 students. Students put in these groups randomly. They were requested to come to laboratory by preparing from lab implementation lesson book for every week's implementation through 6 weeks. Researcher transferred pure information, how to set experiment machinery, at the end of experiment what results to get to the students before the experiment. Researcher lectured by tendering education materials and doing an exhibition experiment in this process answered the students' questions. After he finished his lecture about the subject, researcher shaped the groups to do their own experiments. After the experiment was finished, groups finished their works by preparing their reports about the experiment. For both workgroup, after 5 experiments EAT and ERT applied as the last tests. Also one month later from the work ERT was applied.

Data Analysis

In this section, data was evaluated by using SPSS packet program. Evaluating of data and analysis are declared in an order;

1. Descriptive statistics and independent samples t-test was performed for the scores obtained from PKT, EAT and ERT of students participated in the study.
2. Qualitative analysis of students' written responses to open-ended questions of the EAT were made and formed categories of students' views. Percentages of these views were calculated.
3. MANOVA was made for data obtained from STLAS's pre-test and post-test

FINDINGS AND RESULTS

Evaluations of data that come from the data collection instruments, which used during the research, are interpreted in an order.

Descriptive statistics and independent samples t-test for the scores obtained from PKT applied to students participating in the study are given in Table 1.

Table 1: Result of independent simple *t* test analysis of the PKT

Groups	N	X	Sd	t	P
Experiment	21	26,19	9,009	1,001	0,450
Control	22	28,55	11,096		

According to results of Table 1; it says that there was no significant difference between the experiment group made the experimental implementation based on learning together method with the control group made the experimental implementation based on proof based learning method ($t = 1,001$; $p > 0.05$). The levels of students' prior knowledge in subject that will be the basis to understand experiments to do science and technology laboratory in experimental and control group are closer to each other at the beginning. EAT's data is given in the Table 2.

Table 2: Results of independent simple *t* test of the EAT

Test	Groups	N	X	Sd	T	p
EAT-a	Experiment	21	32,48	11,170	1,528	0,134
	Control	22	27,27	11,153		
EAT-b	Experiment	21	34,86	4,757	4,367	0,001
	Control	22	26,09	8,059		
EAT-c	Experiment	21	33,33	5,704	3,981	0,001
	Control	22	25,82	6,616		
EAT-d	Experiment	21	32,24	5,458	3,353	0,002
	Control	22	26,55	10,800		
EAT-e	Experiment	21	32,00	7,043	2,968	0,005
	Control	22	25,82	6,616		

[a]:Max point=40

According to results of Table 2; It shows that there was significant difference among EAT-b, EAT-c, EAT-d and EAT-e in term of the results of the answers given to DBT of the students for each experiment [EAT-b (t=4,367; p=0,001), EAT-c (t=3,981; p=0,001), EAT-d (t=3,353; p=0,002), EAT-e (t=2,968; p=0,005)]. It is seen that this differences in favor the experiment group. But it shows that there was no significant difference in EAT-a [EAT-a (t=1,528 p=0,134)].

The reason for the success of students in the experiment group made the experimental implementation based on learning together method may be referred to the increase the relationship among the students in due to the method, formation of a positive classroom atmosphere, providing the convenience of the students in understanding of the experiments of this atmosphere and remedying incomplete information. The results of these experiments are coherent with Maloof & White (2005), Barrier (2005) and Doymuş et al.,(2007)'s work results. Both of the groups showed the same success in Eat-a. The reason for this, it can be said that the EAT-a-related applications can be accomplished with a small amount of theoretical knowledge.

The frequency and percentage of students' answers given to open-ended questions of EAT are indicated for each of the experiments in below.

EAT-a: What are the things depend on buoyancy applied to substance in a liquid? The answers of students are given in the table 3 for this question.

Table 3: The frequencies and percentage of students' response to open-ended questions of EAT-a

Groups	Students' Answers	f	%
Experiment	*- Density of liquid and volume of substance's sunken part	21	100
	- No answer	-	-
Control	* Density of liquid and volume of substance's sunken part	19	87
	- Density of substance	2	9
	- No answer	1	4

*Scientifically correct answers

According to table 3, %100 of students in the experiment group made the experimental implementation based on learning together method and %87 of students in control group gave the right answer by writing depending on density of liquid and substance's sunken part.

EAT-b: What does temperature change depend on when the same amount heat is given to different amounts of water mass and when the same amount heat is given to same amounts of different liquids? All groups' answers are given in the table 4 about this question.

Table 4: The frequencies and percentage of students' response to open-ended questions of EAT-b

Groups	Students' Answers	f	%
Experiment	*When the same amount heat is given to same kind of substances, small mass one would have more temperature change than the other. Temperature change is inversely proportional with mass. *When the same amount heat is given to equal mass of different kind of substances, because their specific heats are different, temperature change is different.	19	90
	-No answer and wrong answers	2	10
Control	* When the same amount heat is given to same kind of substances, small mass one would have more temperature change than the other and when the same amount heat is given to equal mass of different kind of substances, because their specific heats are different, temperature change is different.	15	68
	- No answer and wrong answers	7	32

*Scientifically correct answers

According to findings in Table 4, when %90 of students in the experiment group, %68 of students in the control group answered question correctly, %10 of students in experiment group and %32 of students in control group couldn't answer or answered wrongly.

EAT-c: How would you explain the effect of pressure on boiling point? Both groups' answers are given in the table 5 to this question.

Tablo 5: The frequencies and percentage of students' response to open-ended questions of EAT-c

Groups	Students' Answers	f	%
Experiment	* Pressure change causes to change on liquid's boiling point. If the pressure increases, liquid's boiling point increases	10	48
	* Decreasing the pressure on the liquid makes liquid's boiling point decrease	5	24
	* If we want to makes liquid's boiling point decrease we reduce the pressure on the liquid	6	28
	-No answer and wrong answers	-	-
Control	* If the pressure increases, liquid's boiling point increases, if the pressure decreases, liquid's boiling point decreases	10	45
	* Liquid's boiling point is inversely proportional with pressure.	7	32
	- No answer and wrong answers	5	23

*Scientifically correct answers

According to table 5, all of the students in experiment group answered correctly but %77 of the students in control group answered correctly.

Eat-d: How can you find resistance by benefitting from Ohm's law? Both groups' answers to this question are given in the Table 6.

Table 6: The frequencies and percentage of students' response to open-ended questions of EAT-d

Groups	Students' Answers	f	%
Experiment	* As the proportion to the current intensity passing from conducting of the potential difference in between the two ends of the conductors in most of the conductors is constant, I can find the resistance by dividing to potential difference observed in the voltmeter and measure the current intensity after installing the electric circuit	15	72
	- No answer and wrong answers	6	28
Control	*I find the current intensity passing from the electric circuit. I find the resistance by dividing to the current intensity to potential difference	12	55
	- No answer and wrong answers	10	45

* Scientifically correct answers

According to Table 6, %72 of students in experiment group, %55 of students in control group answered correctly. It is seem that both of the groups' students' rates are lower than the other experiments' rates. I consider that the reason of this is experiment's measuring set values couldn't be read correctly so there were mistakes in the mathematical operations.

EAT-e: How do the lights sent in different directions to concave mirror reflect? Both groups' answers to this question are given in the table 7.

Tablo 7: The frequencies and percentage of students' response to open-ended questions of EAT-e

Groups	Students' Answers	f	%
Experiment	* The light sent in principal axes direction return with the same way after reflect from concave mirror * The light sent to mirror's peak with principal axis by an angle reflects with the same angle * The light sent parallel to principal axis reflects by passing focal point	20	95
	- No answer or wrong answers	1	5
Control	* The light sent in principal axes direction return with the same way after reflect from concave mirror. The light sent to mirror's peak with principal axis by an angle reflects with the same angle. The light sent parallel to principal axis reflects by passing focal point.	18	82
	- No answer or wrong answers.	4	18

* Scientifically correct answers

According to table 7, %95 of students in experiment group, %82 of students in control group, answered correctly. It shows that the correct answer rates of both groups' students are high. The reason of this can be the lights sent in different directions to concave mirror are easily watched.

To determine retention of knowledge of both experiment and control group's students, EKPT was applied. The data obtained from this test are given in the table 8.

Table 8: Results of independent simple *t* test of the EKPT

Groups	N	X	Sd	T	p
Experiment	21	75,71	8,701	8,372	0,001
Control	22	55,23	7,316		

According to table 8, there was a significant difference favor of the experimental group in terms of retention the academic knowledge gained in Science and Technology laboratory between the experiment groups made the experimental implementation based on learning together method with the control group made the experimental implementation based on proof based learning method ($X_{experiment}$=75,71; $X_{control}$=55,23) (*t*=8,372 p=0,001). The cause of this significant difference is, learning together method keeps the students active, makes student to join into the events, helps them to combine their own knowledge and helps them to understand the subject better. These results conform with researches' results that related to active based lab setting (Sachs et al., 2003; McKee et al., 2007).

STLAS was applied also before and after the implementation to determine difference in students' attitudes towards Science and Technology Lesson and the Manova analysis results are given in the table 9.

Table 9: Results of Wilks' Lambda obtained from MANOVA according to pretest and posttest's data of STLAS

		Value	F	Hypothesis df	Error df	p	Partial Eta Squared
Group	Wilks' Lambda	0,615	12,505	2,000	40,000	0,001	0,385

According to table 9, it seems that there is a statistical difference between experiment and control groups in score of STLAS. [Wilks Lambda= 0,615 and $F_{(2,40)}$ = 12,505, p<0,05]. To determine this difference's direction one-way ANOVA results were examined.

Table 10: Results of one-way ANOVA according to pretest and posttest's data of STLAS

Dependent Variable		Mean's Square	X	*F*	*P*
Pretest	Experiment	239,223	49,810	3,722	0,061
	Control		45,091		
Posttest	Experiment	1851,617	62,810	23,460	0,001
	Control		49,682		

In table 10, it seems that there isn't a significant difference between experiment group and control group according to pretest's data of STLAS [STLAS for pretest $F_{(2,40)}$ = 3,722, p = 0,061]. According to these results, it is said that both groups' attitudes toward Science and Technology Lesson were same.

According to posttest' data of STLAS in the same table, There is a statistically significant different between the groups [$F_{(2,40)}$ = 23,460, p= 0,001]. According to findings of posttest, it shows that experiment group's attitudes scores towards Science and Technology Lesson are higher than the control group [$X_{experiment}$=62,810, $X_{Control}$ = 49,682]. According to these results, it is said that using learning together method influences students' attitudes in a positive way.

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CONCLUSION AND RECOMMENDATIONS

The findings obtained from this research aimed to find out the effect of learning together method used in the implementation of cooperative learning model on the academic success, retention of knowledge and attitudes towards the lesson of students who attended science and technology lesson showed that learning together method has more positive effects than proof based learning method in term of students' academic achievements, retention of knowledge and attitudes towards science and technology lesson.

These results conform with the results that states active based education' lab settings'; to make students participate the events, to make students understand the subject better, make the knowledge transfer into the requested behavior, increase students' motivation and abilities. (Aladejana & Aderibigbe, 2007; McKee et al., 2007).

According to student's attitudes towards Science and Technology Lesson. Learning together method groups' students gained more positive attitudes than the proof based learning method groups' students. The cause of this is; students' helping each other and active participating to lessons in groups implemented learning together method.

These results conform to the other researches' results that researched the effect of l learning together method's attitudes and found positive effects. (Okebukola, 1986; Altıparmak & Nakipoğlu, 2005; Venman,et al., 2002; Gök et al., 2009; Zakaria et al., 2010; Aksoy, 2011).

As a result, it can be said to affect in a positive way the students' academic achievements, laboratory experiences and skills the use of learning together method in laboratory applications. Considering the data of students' academic achievements, retention of knowledge and attitudes towards Science and Technology Lesson;

This Method;
1. Will be useful about not only science and technology laboratory also about physics, chemistry and biology laboratory fields in the future works.
2. Using in different subject fields and experiments will be more useful for students' academics and laboratory abilities.

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