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The Effect Of Project Based Learning On Students' Science Success

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Abstract

In this research, it is aimed to analysis the effect of the Project-Based Learning Method in success degree and motivation of 6th grade students while learning the unit called "Electricity in life". Pre-test and post-test control group experimental model is applied to the study. Research is implemented in the first period of 2010-2011 academic year. The sample of research is 92 sixty-grade students. The experiments have been carried out in two elementary schools students whose pre-test scores of achievements show no statistically significant difference. During the Electricity in Life unit instruction, lesson is given in accordance with the principles of project-based learning method to experimental group, while teaching the control group in accordance with the Ministry of Education program. Before and after the experimental procedure both groups are given Unit of "Electricity in life" success tests as pre-test and post-test. Difference between successes is analyzed and found in favor of the experimental group in which Project Based Learning instruction was done.

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Keywords: Science- Physics Teaching, Project-Based Learning, Electricity in Our lives

1. Introduction

Project-based learning method is one of the student-centered teaching methods which have been in use both in our country and in the world. It is one of the methods providing students with the opportunity to take part in the learning environment, making them take the responsibility of their own learning, developing students, and having them comprehend and structure information. In the project-based learning approach, students build up and direct their own learning, develop their creativity, prefer to solve problems they face in cooperation and life is brought to the classroom. In brief, the project-based learning is an approach based on students' working alone or in small

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groups with the aim of producing concrete products (Gültekin, 2007).
There is project at the base of the project-based learning. At the base of the project is students' finding solutions to problems they face in any way and order in the direction of their own will Moreover, this approach supports students in acquiring manual skills and learning more by performing original activities (Chen, 2004). Due to these characteristics, the thought of using of project-based learning environments providing many advantages for students is gradually becoming widespread especially in lessons where daily life is related more such as science and technology (Ayvacı and Çoruhlu, 2010).

Studies made in recent years have shown that students face difficulties comprehending some concepts related to electric circuits. Determining the real shape of an electric circuit diagram or determining a real electric circuit diagram is among problems which students have (Engelhardt and Beichner, 2004). As Yılmaz, Huyugüzel and Cavaş (2006) state that there are many studies available in the literature on students' misconceptions about electric and characteristics of electric.

2. Purpose

This study aims to examine the effects of the project-based learning method prepared according to the elementary 6th grade Electric in our Life unit acquisitions compared to the teaching made in accordance with the current program on students' academic success. Within the framework of this purpose, the problem "Does the project-based learning method prepared according to the elementary 6th grade Electric in our Life unit acquisitions compared to the teaching made in accordance with the current program make any statistically significant changes in students' academic success?" was investigated through practicing.

3. Method

In the study, in order to determine if the teaching made in accordance with the Project-Based Learning Method and the one made in accordance with the current program had different effects on students' success, the experimental method with pretest-posttest control group.

The population of the study is composed of all the 6th graders in the province of Bursa. The sample of the study is composed of a total of 92 students studying at two different elementary schools. That the success levels of the experimental and control groups selected from both schools for the subject of science and technology were close to one another was determined as a result of the pre-tests made. With the experimental and control group students at both schools, 4 lesson hours were spent for the first part acquisitions and 6 lesson hours were spent for the second part acquisitions. To measure the students' success levels, two identical "Electric in our Life Achievement Tests" were administered in pre-test and post-test sessions.

There are totally eighteen student acquisitions in the 'Electric in our Life' unit. An achievement test of 40 items including all the acquisitions was prepared. The measurement tool was determined as a multiple-choice test with four alternatives. The achievement test prepared was administered to 60 7th grade students. The KR- 20 reliability coefficient of the test was calculated as 0,89 and the mean difficulty was found as 0, 58. According to the results obtained in the item analysis, the 32nd item was rearranged with the aim of testing all the acquisitions and two tests of 20 items were prepared to be administered in the pretest and post-test sessions. The experimental and control group students at two separate schools were administered the pre-test one week before the time determined according to the annual curriculum for the 'Electric in our Life' unit. The unit was finished in ten lesson hours in the experimental and control groups and after that the post-tests were applied.

To examine the effectiveness of the teaching made with the Project-Based Learning Method, the experimental and control group students were administered the "Electric in our Life Unit Achievement Test" applied in pre-test and post-test and results were obtained by applying t-test and ANCOVA to the data.

4. Findings

The first sub-problem was stated as "Is there a significant difference between the experimental and control groups in terms of achievement pre-tests?" To determine if there is a statistically significant difference between the experimental and control groups in terms of preliminary knowledge acquired with respect to the 'Electric in our Life' unit, t-test was applied and the pre-test score mean for the experimental group was found as X=10,10 and that

for the control group was calculated as X= 8,93 and no statistically significant difference was observed between the experimental and control groups.

The second sub-problem of the study was stated as "Is there a significant difference between the experimental and control groups in terms of achievement post-tests?" To determine if there is a statistically significant difference between the post-test scores of the experimental and control groups by equalizing the pre-test scores of the groups for the purpose of the study, ANCOVA was applied. The post-test means of the experimental and control groups corrected according to their pre-test achievement scores are given in Table 1.

Table1. Post-Test Means Corrected according to Experimental and Control Groups' Pre-Test Achievement Scores in Science and Technology Lesson

Groups	N	Mean	Corrected Mean
Experimental Group	46	14,60	14,44
Control Group	46	12,47	12,65

When the corrected post-test mean scores of the experimental and control groups were examined, it was observed that the post-test mean of the experimental group was higher than that of the control group. As seen in Table 1, while the 'Electric in our Life' Unit Achievement Test means of the experimental group students taught with the Project-Based Learning Method was X=10,10 before the experiment, this value became X= 14,44 as a result of the practice. The results of the ANCOVA made to see if the difference observed between the corrected post-test mean scores of the groups was statistically significant are given in Table 2.

Table2. ANCOVA Results of Post-Test Means Corrected according to Achievement Pre-Test for Experimental and Control Groups

Source of Variance	Sum of Squares	df	Mean Square	F	p
Pre-test	65,65	1	65,65	6,12	,015
Groups	70,43	1	70,43	6,57	,0012
Error	952,88	89	10,70		
Total	1122,83	91			

*p<.05

According to the ANCOVA results, it was observed that there was a statistically significant difference between the experimental and control groups in the post-test belonging to the 'Electric in our Life' unit (F=6, 57 and p<.05).

The third sub-problem of the study was stated as "Does the project-based learning method prepared in accordance with the acquisitions of the 6th grade 'Electric in our Life' unit make a significant difference on the experimental group students' success levels?" Whether there occurred a statistically significant difference between the experimental group students' achievement scores at the beginning and end of the study was analyzed with using t-test and the results are given in Table 3.

Table 3. T-Test Result of Experimental Group Students' Pre-Test Achievement Scores and Post-Test Achievement Scores in Science and Technology Lesson

Experimental Group	N	X	SS	Sd	t	P
Pre-test	46	10,10	2,86	45	8,34	.000*
Post-test	46	14,60	3,08			

*p<.05

When Table 3 was examined, it was observed that there was statistically significant difference between the experimental group's pre-test scores and post-test scores in favor of the post-test (p<,05). According to these findings, with the occurrence of a significant difference between the experimental group's pre-test score mean and post-test score mean, it can be stated that the Project-Based Learning Method makes a positive effect on students' success. The fourth sub-problem was stated as "Does the teaching method made in accordance with the current program make a significant difference on the control group students' success levels?" Whether there occurred a statistically significant difference between the control group's pre-test achievement scores and post-test achievement scores was analyzed with using t-test and the results are shown in Table 4.

Table 4. T-Test Result of Experimental Group Students' Pre-Test Achievement Scores and Post-Test Achievement Scores in Science and Technology Lesson

Experimental Group	N	X	SS	Sd	t	P
Pre-test	46	8,93	2,95	45	23,41	.000*
Post-test	46	12,47	3,62			

*p<.05

When Table 4 was examined, it was observed that there occurred a statistically significant difference between the control group's pre-test and post-test scores in favor of the post-test. According to these findings, with the occurrence of a significant difference between the control group's pre-test score mean and post-test score mean, it can be stated that the teaching method prepared in accordance with the current program made a positive effect on students' success.

5. Conclusion

In the study, with respect to the success levels achieved by the experimental group who were taught with the Project-Based Learning Method and the control group who were taught with the current program in obtaining acquisitions, a statistically significant difference was observed in favor of the experimental group. This is an indication of the fact that the teaching made with the Project-Based Learning Method contributed to the students' success more when compared to the teaching made according to the current program.

The third sub-problem of the study was stated as "Does the project-based learning method prepared in accordance with the acquisitions of the 6th grade 'Electric in our Life' unit make a significant difference on the experimental group students' success levels? When the experimental group's pre-test score mean (X=10, 10) and post-test score mean (X=14,44) were examined, it was observed that the students' sore means increased in the post-test. The occurrence of a statistically significant difference between the experimental group's achievement pre-test and post-test score is an indication of the fact that the Project-Based Learning Method made positive contribution to the students' success.

That a statistically significant difference was found between the control group's achievement pre-test scores and post-test scores when if the teaching method made in accordance with the current program made a significant difference on the control group's success levels was examined is an indication of the fact that the current program contributed to the students' success as well. However, when the increase in the control group's post-test score was compared to the results of the experimental group, it was observed that the increase in the control group students' achievement levels was less than that in the experimental group. This result is related to students' active participation in the process and reaching conclusions by inquiring in the teaching made with the Project-Based Learning Method. The learning of the topic of 'electric' including abstract concepts by making projects made positive contributions to students' academic success. There are studies available on the effects of the use of the project-based learning method on students' science achievement (Korkmaz and Kaptan (2002), Yurttepe ,2007; Toprak 2007; Serttürk 2008; Keser 2008; Çakallıoğlu 2008; İmer 2008; Panasan ve Nuangchalerm, 2010; Baran and Maskan, 2010). As seen in these studies, too, the use of the project-based learning method is observed to increase students' science success and support the results of this study. Sufficient substructure should be prepared in the selection of the project-based learning method for both the teacher and the student and every student should be assigned a duty according to his or her own ability when projects are presented. Moreover, the availability of tools used in a project and the time to be allocated should be planned both when preparing projects and teaching is going on.

Suggestions about the Implementation of the Project-Based Learning Method

- Making the Project-Based Learning Method widespread in the curriculum, arranging and implementing appropriate units according to this method will increase students' success.
- In the renewed science program, it is targeted to have students acquire higher-level thinking skills. For this purpose, the use of the project-based learning method by teachers in science lessons more frequently will make positive contributions in attaining acquisitions and increasing student success.
- For arranging units appropriate for the MNE program and implementing the method, teachers' being in interaction with one another might be useful.

- Teachers' and students' being in interaction with each other in the stage of the design and implementation of the project-based learning method and sharing their experience over the Internet will be useful in terms of the use of the method widely.

Suggestions about the Development of Learning-Teaching Process

- The most important characteristics of the project-based learning method achieving students to increase their success are making available a teaching method including student acquisitions and implementing a teaching method where students will be responsible for their own learning. For students to be successful in lessons taught with the Project-Based Learning Method, the method should address all students in a class.
- Selection of project topics from daily life, forming working groups heterogeneously will increase the practicability of the method.
- Teachers' following literature and preparing their works in accordance with changes in literature will increase the practicality of the method.

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