

Effect of the usage of laboratory method in primary school education for the achievement of the students' learning

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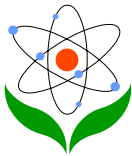
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Abstract

The purpose of this study is to research the effect of the application of “reproduction, growth and development in living things” unit which takes place in the science and technology lesson programme of 6th grade students in the primary school to the success of the student by applying the laboratory method. Also another purpose is to compare the traditional science education and the laboratory method. This study is conducted with totally 28 primary 6th class (12-13 years old) students in Turkey in 2006 – 2007 school year. Laboratory method is applied to the experiment group students and traditional science education method is applied to the control group. This

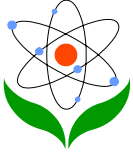


study is continued 5 weeks and at the beginning, it is given as a pre-test to both groups in order to compare their success situations of the science and technology success test related to the subject. After the five-week application, Science and Technology Success Test is given to both groups as a post test. In general, it is seen that the arithmetical averages of the correct answer ratios of post test of science and technology success test of the students are higher than the results of the pre-test in favor of the experiment group students.

Key words: Science education, laboratory method, reproduction, growth and development in living things

Introduction

Technology brings competition together with this century in which information and communication with a high speed. The winning way of this competition is to train the individuals better. In order to have successful individuals with good education, the share of the developed countries for education is standing in the first rank (Gezer et al., 1999). In Bahar et al. 2006 in all teaching programs developed related with science lessons in general meaning within last 30 years; it is seen that many points such as thinking students as inside learning process both mentally and physically in active, giving opportunities for the students to try, hypothesize and test, searching theoretical information instead of quoting them directly, presenting learning facility by means of interrogation based activities, gaining understandings relating to technology, society and environment become appear. They arrived the result that the experiments and other practical studies which will be made in the class or laboratory are significantly important in the realization of all these points and in providing of meaningful learning. The most important feature of science in which it differs from other sciences; is providing opportunity for experiment, investigation, asking of the student by minding the survey, establishing hypothesis, developing their researching skills and interpreting the results (Odubunni and Balagun, 1991). Together with the science education, besides bringing information to the students, supporting the development of their scientific thinking skills and submitting solutions to the daily problems are planned (Kaptan, 1999). It eases the material usage in education, perception and learning. It inspires and brings dynamism to the classroom. It shortens the time in learning, compacts knowledge and helps permanence. It provides the students to participate in the subject, arouses reading and searching interest. It carries the cases,

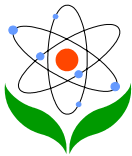


actualities and facts which are impossible to bring them in the class with their real faces (Aslan and Dođdu, 1993). The students are active when they are making experiments and they live the experiment with everything. Therefore, during an experiment, dynamism is seen in the classroom. Laboratory method which provides the activeness of the student, carries great value in terms of education. The most valid learning methods are learning by living and performing, preparing experiments and investigating (İvgen, 1997). Today in which science and technology are developing with a rattling rate, science education is performed with different techniques and methods. Inside these methods, one of the most efficient ones is the laboratory method (Lawson, 1995). Although there are several discussions on it, laboratory and applied studies have an important and central role on the science education and lots of scientific study results also support this thesis (Erten, 2000). Laboratory provides the students to participate in the activities related with science and to learn the scientific method. Laboratory for students is a place where new information is developed by sighting, developing ideas and interpreting the data (Adey, Shayer and Yates, 1995). Laboratory applications are the complementary part and the focus point of science education (Serin, 2002). Thus, in all the schools, developing and using the science laboratories matter a lot. However it is stated that today, in most of the primary schools in our country, there are no laboratories and although there are laboratories in some schools, they are not used sufficiently (Erdemir et al. 1999). Some of the investigation results show that some of the science teachers do not give importance to the laboratories and so they do not want to have their lessons in the laboratories. Together, most of the teachers who do not like laboratories are the people who did not gain laboratory habit in the universities or the people who do not have any laboratories in their schools (Şahin, 2001).

Purpose of the Research

The purpose of this research is to investigate the effect of teaching the “Reproduction, Growth and Development in Living Things” Unit in the 6th class of the primary schools by using the laboratory method on the success of the student. Also another purpose is to compare the traditional science teaching method with the laboratory method. The specific questions of the study were

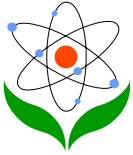
1. What is the success effect of traditional lesson teaching method on the students' unit named “reproduction, growth and development in living things”?



2. What is the success effect of laboratory method on the students' unit named "reproduction, growth and development in living things"?
3. Is there a difference between traditional science teaching method and laboratory method in processing of the unit "reproduction, growth and development in living things"?

Materials and methods

This research is in a testing model. In the research, an experiment group to which the laboratory method is applied, and a control group to which the traditional science teaching is applied, are used. This research has continued for 5 weeks in the fall semester of 2006-2007 school year by taking the necessary permissions from MEB official establishments. Totally 28 students has participated in the research in two different classes in which the same teacher from primary 6th classes, teaches the science and technology lesson. Two different applications are used in this research. In the control group, the traditional science learning method is used but in the experiment group, the laboratory method is used. Science and technology lessons are made in a regular way as four hours per week. The lesson is explained to the students in the control group in the traditional science teaching method. In this method, especially direct explaining method is used and the teacher is more active than the student. Also question-answer technique and the discussion method are used. It is explained to the students that they should read the subject of the lesson before they participate the lesson. The necessary precautions are taken in order to perform the discussions related to the subject in a democratic environment and during the lesson, these behaviors are also considered. It is highlighted that the students have to listen the teacher carefully during the lesson. Also if a subject cannot be understood in the lesson or there is problem that the students cannot solve, they need to ask their teachers directly. To avoid from the behaviors which can make concentration difficult during the lesson, the questions and requests except the subject of the lesson especially during the subject is being explained are highlighted. The students in the experiment group are worked with the laboratory method. Before the study, the students are informed about the importance of making experiments in the science and technology lessons and the necessity of the laboratory, the rules which they have to obey when studying in the laboratory, the scientific method stages which will be followed in the experiments, the security of the laboratory, the presentation of the laboratory materials, the preparation of the experiment report. Also the students are



notified about that some experiments will be done when the lesson is being explained and some lessons will be performed after the lesson is explained. The students are warned about that the experiment reports of the students after the experiments will be regularly controlled by the teacher and they are conducted into the lesson. Also it is reminded to the students that the behaviors of each student are examined during the study and process stages and the necessary evaluations will be performed immediately.

During the “reproduction, growth and development in living things” unit, suitable activities related to the subjects are developed. While the activities are developing; it is also benefited from the biology laboratory applications book which is written by Afyon et al. (2005) and Primary school 6th grade science and technology lesson book which is written by Keskin, Özer, M. et al. (2006). Because the applications are based on the student-based techniques, experiments, investigations and observations and measurements and activities developing creative thought, shortly the name “Activity” is given for all the applications generally.

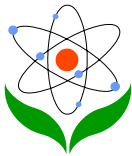
During this study, Science and Technology Success Test is given to the all the students in the experiment group and in the control group, at the beginning of the unit as a pre-test and as a post- test at the end of the unit which is prepared by the researchers. This test, which was developed by the researchers, consisted of 30 multiple choice questions. Every question had one right and four misleading answers. This test was examined by the experts and its reliability was calculated as 0.81. Example question related to the unit named “reproduction, growth and development of the living things” was given below;

Question: Which one of the following is reproduction by spores.

a) Pear b) Pine c) Plum d) Plane tree e) Bracken

At the beginning of the research, the necessary explanations about the pre-test and the post-test are made and the students are informed to give intimate answers when answering the test questions. Also the students are informed about the purpose of this study.

Two separate 6th grade students which the same teacher in Turkey have developed the working group of this research. It is paid attention to form the classes which form



the experiment and control groups to be in a homogenous structure. One written instrument is used in this research.

In the data analysis of the research, “t” test and percentage expressions are used. As the significance level, $\alpha = 0.05$ is used. ($p < 0.05$)

Results and discussion

Before the application, Science and Technology Success Test is applied as a pre-test to the experiment group and the control group. For the experiment group, the average of the correct answers of the pre-test is seen as 10.78 and the average of the correct answers of the pre-test for the control group is seen as 10.64. It is understood that there is no significant difference between the pre-test results of the experiment group and the control group. ($p = 0.547$). (Table I) .

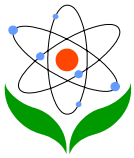
Table I. The “t” test results related to the science and technology success test, Pre-Test Grades of the Experiment Group and the Control Group Students

Test	Groups	N	X	SS	t	P
Science and Technology Achievement Test	Experimental Group	14	10.78	3.10	0.931	0.547
	Control Group	14	10.64	3.37		

As seen in Table II, the averages of the grades which the control group students having science teaching method by laboratory method, of the science and technology success test, post- test are higher than the grades that they have received from the pre-test application. While the correct answer average of the control group in the pre-test is 10.64, the correct answer averages which are gained from the test performed after the application of science teaching method with laboratory method in five-week session has increased to 15.50. Here, it can be understood that the control group students have developed their levels by increasing the correct answer ratios of the science and technology success test at the end of five weeks.

Table II. “t” test results of the control group students’ Science and Technology Success Test, Pre-Test and Post-Test Grades

Test	Control Group	N	X	SS	t	P
Science and Technology Achievement Test	Pre-Test	14	10.64	3.37	-5	.00
	Post-Test	14	15.50	5.03		



“t” test is applied to the control group in order to find a significant difference between the averages of the grades which they have received from the science and technology success test, pre-test and post-test applications and a significant difference is determined ($p=0.00$).

Table III. *the “t” test results of the experiment group students’ science and technology success test, Pre-Test and Post-Test Grades*

Test	Experimental Group	N	X	SS	t	P
Science and Technology Achievement Test	Pre-Test	14	10.78	3.10	-5	.00
	Post-Test	14	17.21	4.96		

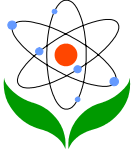
As seen in Table III, the averages of the grades which the experiment group students having science teaching method by laboratory method, of the science and technology success test, post-test are higher than the grades that they have received from the pre-test application. While the correct answer average of the experiment group in the pre-test is 10.78, the correct answer averages which are gained from the test performed after the application of science teaching method with laboratory method in five-week session has increased to 17.21.

“t” test is applied to the experiment group in order to find a significant difference between the averages of the grades which they have received from the science and technology success test, pre-test and post-test applications and a significant difference is determined ($p=0.00$).

Table IV. *The “t” test results related to the science and technology success test, Post-Test Grades of the Experiment Group and the Control Group Students*

Test	Groups	N	X	SS	t	P
Science and Technology Achievement Test	Experimental Group	14	17.21	4.96	0.418	0.942
	Control Group	14	15.50	5.03		

As seen in Table IV, the average of the grades which the experiment group students to whom the science teaching method by the laboratory method received from the science and technology success test post-test are higher than the average of the grades



which they have received from the post-test with traditional science teaching method. While the correct answer average of the experiment group in the post-test is 17.21, it is determined that the correct answer averages of the control group in the post- test are 15.50.

In general, according to the arithmetical averages of the correct answer ratios of the science and technology success test post- test results of the students, they are higher in favor of the experiment group (Table IV).

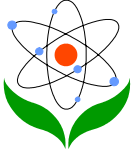
When the statistical values are considered in the experiment and control groups before the application, according to the pre-test results, there is no significant difference in the science and technology success test (Table I). At the end of the application, during the teaching of “Reproduction, Growth and Development in Living Things” Unit, it is given as the post-test to all the students in order to evaluate the effect of two different educations to the success of the students. It is seen that the experiment group students have gained more information than the control group students. It is found that both the experiment group and the control group students have gained achievements statistically according to the science and technology success test post-test data (Table IV). The arithmetical averages of the post-test results of the experiment group students are higher than the results of the control group students. These findings support the findings of Tobin, 1986; Gürdal, 1991; Freedman, 1997; Bağcı et al., 1999; Gürdal and Yavru, 1998; Serin, 2002.

Conclusion

The findings of this research, is to display that the experiment group students have higher results in learning the “Reproduction, Growth and Development in Living Things” Unit than the control group students. It is thought that the application of different methods in the application have caused this case. The results of this research, will provide help for the future studies in teaching the “Reproduction, Growth and Development in Living Things” Unit in the Primary education 6th science and technology lesson.

Implications

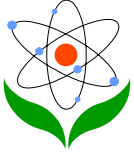
Based on the gained findings from this research, the below mentioned recommendations can be submitted: Science teaching needs to be done with a method



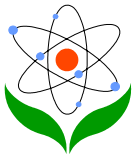
which is based on experiments, investigations and scientific periods. The most suitable method for this is the laboratory method. When the science and technology lessons are being prepared, the application section of this lesson must be emphasized. Laboratory-classes needs to be developed which are equipped with interesting materials and where only science and technology lessons will be taught. The teachers shall keep the students in an active position by providing the students to make the experiments and propelling them to think by asking open questions instead of loading them information. Teacher-oriented in-service trainings and courses shall be developed who teaches science and technology lessons.

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Appendix

Example Exercise 1: Examining the epithelium of the tongue.

The Aim of The Exercise: To observe the structure of an animal cell.

Tools Used in The Exercise: Microscope, methylene blue, slide, thin glass cover, medicine dropper, water.

Security Precautions: You should be careful while taking a sample from the inner part of your cheeks by using a toothpick! Chemical materials should not be come into contact with your skin and clothes!

Application of The Exercise: A drop of water and a drop of methylene blue are put on a clean slide. The inner part of the cheek is skinned more than once by a toothpick. The pattern acquired by this process is spread on the liquid already existing on the stage. The thin glass cover is put on the slide and it shouldn't meet with air. Postly the preparation is examined via microscope.

Questions About The Exercise:

1. How is the shape of the pattern that you examined via the microscope?
2. Which parts of the pattern did you observe?
3. What are the differences between the patterns received from a mouth and an onion?