Bilim Kampının Ortaokul Öğrencilerinin Bilimsel Süreç Becerilerine ve Fene Karşı Tutumlarına Etkisinin İncelenmesi¹

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Öz

Bu çalışmanın amacı, ortaokul öğrencilerinin Bilimsel Süreç Becerilerine ve Fene Karşı Tutumlarına olan Artvin Doğa ve Bilim Kampı'nın etkinliğini değerlendirmektir. 115B089 koduyla TÜBİTAK 4004 Doğa ve Bilim Okulu programı kapsamında desteklenen bu proje, öğrencilere öğrenmeyi öğrenme yaklaşımı kullanarak çeşitli uygulamalı etkinlikler tasarlanmıştır. Araştırmada veriler, projeye katılmış Artvin il genelindeki altı ortaokulda öğrenim gören ortaokul 6. ve 7. sınıf öğrencilerinden toplam 30 öğrenciden toplanmıştır. Araştırmada nicel araştırma yöntemlerinden tek grup ön test-son test modeli uygulanmıştır. Araştırmada veri toplama aracı olarak Burns, Okey, ve Wise tarafından (1985) tarafından geliştirilen ve Geban, Aşkar ve Özkan (1992) tarafından Türkçeye çevrilen Bilimsel Süreç Becerileri Testi ve Fraser (1978) yılında geliştirilen ve Telli, Cakiroglu, ve Rakici (2003) tarafından Türkçeye çevrilen Fen Tutum Testi kullanılmıştır. Geban vd. çalışmaların da ölçeğin güvenilirlik katsayısı 0.81 olarak tespit etmişlerdir. Telli vd. çalışmaların da güvenilirlik katsayısının Türk örneklem için 0.62 ila 0.85 arasında değiştiğini bildirmişlerdir. Bu çalışmanın ışığında elde edilen verilerin analizinden deneyleri deneyerek ve gözlemleyerek yaparak ve öğrenerek öğrenmenin öğrencilerin bilimsel süreç becerilerini ve fen ile ilgili tutumlarını olumlu yönde arttırdığı tespit edilmiştir. Öğrencilerin proje sonunda bilimsel süreç becerilerini kullanma düzeyleri anlamlı olarak son test lehine değişmiştir. Bu çalışmanın sonucu, bize bilim kampının öğrencilerin bilimsel süreç becerilerine ve fene karşı olumlu tutum geliştirmelerine yardımcı olduklarına dair ampirik kanıtlar verdi.

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What do Middle School Students Gain From A Week-Long Science Camp in Terms of Science Process Skills and Attitudes Toward Science?

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Abstract

The purpose of this study was to evaluate the effectiveness of a science camp, namely Artvin Nature and Science Camp, on middle school students' SPS and ATS. Supported by TÜBİTAK 4004 Nature and Science School program of Turkey with a code of 115B089, this project is designed to provide students with diverse hands-on activities using learning-by-doing approach. In the research, data of the current study was collected total of 30 6th and 7th grade students in six middle schools in Artvin province who participated in the project. In this study, the one-group pretest-posttest design, a type of quantitative research methodology, was adopted. In the research, as data collection tools, Science Process Skills Test developed by Burns, Okey, and Wise (1985) and translated to Turkish by Geban, Ařkar and Özkan (1992) and the Science Attitude Test, which was developed by Fraser (1978) and translated into Turkish by Telli, Cakiroglu, and Rakici (2003) were used. In the same study, Geban et al. reported the reliability coefficient of the test 0.81. In the same study, Telli et al. reported the reliability coefficient of Turkish version of the test between 0.62 and 0.85. From the analysis of the data that were obtained from this study, it has been found that learning by doing and learning by experimenting and observing approaches contributed students' science process skills and science related attitudes in a positive way. The students' level of using scientific process skills at the end of the project significantly changed in favor of the post-test. The result of this study gave us empirical evidence that science camp help students to gain SPS and to develop favorable ATS.

INTRODUCTION

In the globalizing world, many countries need educational indicators in order to demonstrate their situation in the field of education. In addition to these countries, Turkey also participates in PISA (Program for International Student Assessment), which is one of the international comparative programs, to determine its current situation in education and demonstrate the factors that are effective on educational developments (Ministry of Education [MEB], 2009).

Turkey made some changes in the primary and middle schools' science programs due to the low scores received from international tests (PISA, TIMSS, etc.) and started to implement the educational program developed based on constructivist learning approach in 2005. In accordance with this program implemented, development of scientific literacy with other areas was one of the most important issues highlighted.

Raising individuals who are literate in the field of science is one of the main objectives of many countries including Turkey in the education of science (BouJaoude, 2002; Dillon, 2009; MEB, 2006; Zembylas, 2002). Although there is no common definition of science literacy, researchers agree that science process skills (BSB) and attitudes toward science (FYT) are important factors in the process of gaining science literacy. Seven subscales related to science literacy have been identified in science and technology curriculum in Turkey. Considering this curriculum, two of these seven subscales are science process skills and attitudes towards science, which are also included in international programs (MEB, 2006).

Science process skills which is an important aspect of science literacy, is important in gaining the scientific research ability (Lederman, 2009). Therefore, it is unlikely to be able to produce scientific solutions to problems and making scientific research without gaining these science process skills.

Science process skills are divided into two groups as basic and integrated skills. Basic science process skills are used to explore the natural world. Making predictions, making inferences, classification, measurement, communication and observation skills are examples of this group.

Integrated science process skills are the skills that lead to scientific research. Some of these skills are identifying variables in scientific studies, creating hypotheses to solve a problem, examining the accuracy and source of the data, analyzing the data and creating charts and tables using these data, defining the variables and designing an experiment to be able to test a research question (Rebza et al., 2007).

Developing science literacy level of students at early ages and in school environments is very important. Furthermore, organizing additional activities towards developing science literacy level of students outside of the school is also needed. In this study, which is titled "Artvin Nature and Science Camp" and supported by TUBITAK with project number 115B089, it is expected to develop science literacy level of students and improve their sensitivity to nature by using test-observation and active learning methods.

From this perspective, in this study, it was aimed to determine whether organizing activities using learning approaches through live experiences in nature and test-observation methods has any impacts on middle school students' science process skills and attitudes toward science. For this purpose, the question "Do activities performed within Artvin Nature and Scientific Camp have a significant impact on the development of science process skills and gaining attitudes toward science by middle school students?" was tried to be answered.

METHOD

The study was designed as single group pretest-posttest experimental model, which is one of the qualitative research methods. In this model, selected independent variables are applied in a

randomly selected group. In addition, measurements are conducted both before and after the experiment. If premise of the model is smaller than post-test scores (O12) and greater than the pre-test scores (O11), it can be interpreted as the impact of "X" independent variable.

2.1. Participants

The study group consists of a total of 30 students including 14 7th grade and 16 8th grade students from middle schools of Artvin in accordance with the purpose of the study. The study was conducted on data obtained from this group of students

2.2. Research Instrument and Procedure

In the study, science process skills and attitudes toward science tests were administered on the students. The science process skills tests, which was developed by Burns, Okey and Wise, consist of multiple-choice questions and scored as (1, 0). This test was first adapted to Turkish by Geban, Aşkar and Özkan (1992) and then adapted for middle school students and its reliability studies were conducted by Can (2008). In the adaptation study, it was determined that 26 questions of the original test can be used on elementary school students. In this study, since the target group is elementary school students (7th-8th grades), the form adopted by Can (2008) used.

Another scale used in the study is Science Attitude Test (TOSRA). This test was developed by Fraser in 1978. The reliability coefficient of the original scale was reported between 0.66 and 0.93. This test was adapted to Turkish by Telli, Cakiroglu and Rakici (2003) for the first time and they have stated that this test is appropriate to be implemented on Turkish sample groups. In the same study, Telli et al. reported the reliability coefficient of Turkish version of the test between 0.62 and 0.85.

Students' pre- and post-test scores were compared using paired-samples t-test. Moreover, students' SPS and Science ATS compared regarding gender and grade level using a non-parametric test, Mann Wihtney U Test.

RESULTS

"The pre-test and post-test scores were compared by paired samples t-test in order to determine whether learning approaches used in this study have any impacts on students' science process skills and attitudes toward science.

Table 1. Comparison of Pre-Test and Post-Test Scores of The Students by Paired Samples t-Test

	Mean	N	Std. Dev.	t	df	Sig.
Atititude pretest	3.30	30	0.99	-2.99	29.00	0.01
Atititude posttest	3.85	30	0.67			
SPSkills_pre	13.63	30	4.54	-6.31	29.00	0.00
SPSkills_post	17.63	30	4.95			

As a result of the analyses, post-test scores (X=17.63) of the students were found to be significantly higher than their pre-test scores (X=13.62) in the Science Process Skills test ($t_{(29)} = -6.31$, $p < 0.05$). Thus, it can be suggested that learning activities based on active experiments/observations and learning by experience help students developing their science process skills in a positive manner. This is similar for attitudes toward science test results. Post-test scores (X=3.85) of the students were found to be significantly higher than their pre-test scores (X=3.30) in the attitudes toward science test ($t_{(29)} = -2.99$, $p < 0.05$). Thus, it can be suggested that activities implemented contributed to the development of positive attitudes toward science.

Mann Whitney U test, which is one of the nonparametric tests, was used to determine whether

there is any significant difference between science process skills and attitudes toward science tests scores of the students by their gender and grade. The analysis results are given in Table 2 and Table 3.

Table 2. Mann Whitney U Test Regarding Science Process Skills Scores of the Students by Their Gender and Grade

			N	Mean Rank	Sum of Ranks	Z	sig.
SPSkills_pre	Gender	Female	14	16.50	231.00	0.59	0.55
		Male	16	14.63	234.00		
SPSkills_pre	Gender	Female	14	15.71	220.00	-0.12	0.90
		Male	16	15.31	245.00		
SPSkills_pre	Grade	7	14	16.32	228.50	-0.48	0.63
		8	16	14.78	236.50		
SPSkills_pre	Grade	7	14	17.79	249.00	-1.33	0.18
		8	16	13.50	216.00		

Considering the data given in Table 2, there is no significant difference between science process skills scores of the students by their gender and grade ($p>0.05$).

Table III. Mann Whitney U Test Regarding Attitudes Toward Science Scores of The Students By Their Gender and Grade

			N	Mean Rank	Sum of Ranks	Z	sig.
Attitude_pre	Gender	Female	14	15.71	220.00	-0.13	0.90
		male	16	15.31	245.00		
Attitude_post	Gender	Female	14	16.11	225.50	-0.36	0.72
		male	16	14.97	239.50		
Attitude_pre	Grade	7	14	14.07	197.00	-0.84	0.40
		8	16	16.75	268.00		
Attitude_post	Grade	7	14	15.54	217.50	-0.02	0.98
		8	16	15.47	247.50		

Considering the data given in Table 3, there is no significant difference between attitudes toward science scores of the students by their gender and grade ($p>0.05$).

CONCLUSIONS AND RECOMMENDATIONS

As a result of the research, it has been found that learning approached based on experience and experiment-observation methods have positive contribution on students' science process skills and attitudes toward science. According to the studies conducted, some factors such as traditional learning methods (Doğruöz, 1998), high classroom capacities, excessive course contents and poor quality of the activities prevent the development of science process skills (Ercan, 1996). In this regard, activities performed in the nature with many experiments, observations and site visits and experiences help students to gain awareness about science and contribute to the development of their science process skills. Performing life-based and significant learning activities with individuals has an important role the development of their science process skills. If these skills are not well-developed, the newly created concepts will not help individuals to understand the world. Therefore, development of science process skills is important to science education (Harlen 1999).

According to the results obtained from the research, unlike traditional teaching approaches, planning courses offered in schools in accordance with activities towards life that enable students to be more active may help to have a more permanent learning process in the direction desired.

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