Research Article

# THE EFFECT OF MOBILE SCIENCE SCHOOL II PROJECT ON THE STUDENTS' ATTITUDE AND MOTIVATION

***Nilay KEFELİ***
*Ph. D., Ministry of National Education of Turkey, nilaykefeli@gmail.com*
*ORCID Number: 0000-0002-9402-5561*

***Erol TAŞ***
*Asst. Prof. of Science Education, Science Education Depertmant, Faculty of Education, Ordu University, eroltss@gmail.com*
*ORCID Number: 0000-0003-4077-7351*

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**ABSTRACT**

In this study, it was aimed to analyze the effect of a sample science school implementation designed on the basis of students' stroll in different teaching environments and using different kinds of student-centered teaching methods on the attitudes of the secondary school students towards science and their motivation for learning science. In the science school designed for this purpose, "Mobile Science School II" program including planetarium, observatory, laboratory, outdoor, hands-on activities, games, art workshops, seminars and creative drama applications were presented to the students. In this context, 46 7$^{th}$ grade students participated in the nature education project carried out in Samsun province of Turkey and supported by The Scientific and Techological Research Council of Turkey (TÜBİTAK) constituted.

**Keywords:** Science school project, project model, motivation, attitude.

**INTRODUCTION**

Unlike other living things, human beings try to solve the events that occur around them as a way of perceiving and holding on to the nature. Since childhood, a human being tries to find solutions to the problems by asking and investigating the questions with innate curiosity. The science education that we give to children has a significant influence on this ability of questioning to improve. Science education is to answer children's questions about nature that they always ask in the most effective way while the other is to adapt children to a constantly changing environment (Kaptan, 1999). The emotions and habits that we can create in children will enable life to preserve its superior qualities in future generations.

Science education is the process of interrogating, investigating and reaching outcomes about the events that occur in and around the child himself, using his or her own mental processes. In this process, it is quite significant for instructors to be able to create rich interactive environments where children actively take part in effective teaching of science. In order for meaningful and permanent learning, the educational environment in which the child is actively involved and the teaching methods used in this environment are important. Using methods and techniques that encourage students to think, produce, and enjoy at the same time in the learning environment will enable meaningful learning to realize. As science educators, one of our duties is to be able to create instructional environments that enable children to connect with daily experiences based on observation, practice, and also support their emotional development. For this purpose, science school projects are needed as alternative learning environments.

Meaningful learning in science teaching is not only related to the competences of the students in the cognitive domain but also to their competences in the affective domain. There are many researches that reveal the effect of the cognitive aspect of the learner as well as the attitude and motivation from the affective aspect on learning (Altınok, 2005; Linn, 1992; Napier, & Riley, 1985; Nolen, 2003; Tuan, Chin, & Shieh, 2005). Motivation is an impulse for students to achieve success, work and learn (Martin 2001). Students whose motivation towards science were increased participate more in class activities and as a consequence there is a significant increase in their academic achievement (Yenice, Saydam & Telli, 2012). Attitude is a psychological process that is acquired later, learned through the experience, persisted for a certain period of time, can not be observed directly, and can lead to positive or negative behaviors (Tavşancıl, 2006). Students' positive attitudes towards science provide them with a better understanding of subjects and science activities (Doğru & Kıyıcı, 2005). As a result, the development of students' motivation and attitudes in the affective domain are important factors for effective and meaningful science teaching. For this purpose, the development of motivation and attitudes of the students in this study is discussed. It is thought that this science school project model developed in this study will be influenced by the various teaching method-techniques and application areas that are included in this study in order to provide the students with the change in this affective domain.

One of the learning environments that aims to provide effective and meaningful teaching in science education is science school projects. The main purpose of the science school projects is to present students with a teaching

environment in which they can learn from the firsthand experience by making it possible for them to be actively involved in the process by extracting them from the monotonous classroom environment in the school and presenting different activity implementation that will make it easier to associate the learned knowledge with daiy life.

In the literature, there are many projects carried out under the names of science school, science camp, summer school. It has been revealed that some of these projects have positive effects on cognitive and affective development of students (Erdogan, 2011; Foster and Shiel-Rolle, 2011; Gibson and Chase, 2002; Knox, Moynihan, and Markowitz, 2003; Schacter and Jo, 2005). For this purpose, a new science school model has been developed in science teaching by taking similar project studies into account. The science school model was first supported by The Scientific and Techological Research Council of Turkey (Türkiye Bilimsel ve Teknolojik Araştırma Kurumu, TÜBİTAK) in Turkey in 2014, and was redeveloped with some changes taking into account the feedback from the students as a result of the implementation. The science school model, which was developed for the second time, was supported for the second time by TÜBİTAK in 2015 and the name of the project was named as "Mobile Science School: Little Scientist Training Project II" (MSS II). In the MSS II Project, the learning process of students has been enriched by using various applications such as planetariums, observatories, labratory workshops, outdoor education, art workshops, field trips, hands-on learning, seminars and creative drama. The "mobile" statement in the name of the project was used in the MSS II project program due to the inclusion of teaching environments in different locations. By the MSS II project study, it was aimed to increase the motivation of secondary school children living in rural areas with difficult access and low economic level and to gain a positive view towards science.

**The Design of MSS II Project**

The MSS II project was designed with changes and additions after taking the feedbacks from students participating in the MSS I project, which was implemented in 2015. These changes include; increasing the duration of the project from five days to eight days, increasing the use of planetarium, observatory and creative drama, adding glass factory and recycling center field trips, processing a different theme each day and art workshop implementations. The aim of the changes and additions is to increase the students' practical experience with the topics and contribute to their affective development. The design of the MSS II project, in which different teaching areas and methods are used, together with the changes and joints, is shown in Figure 1.

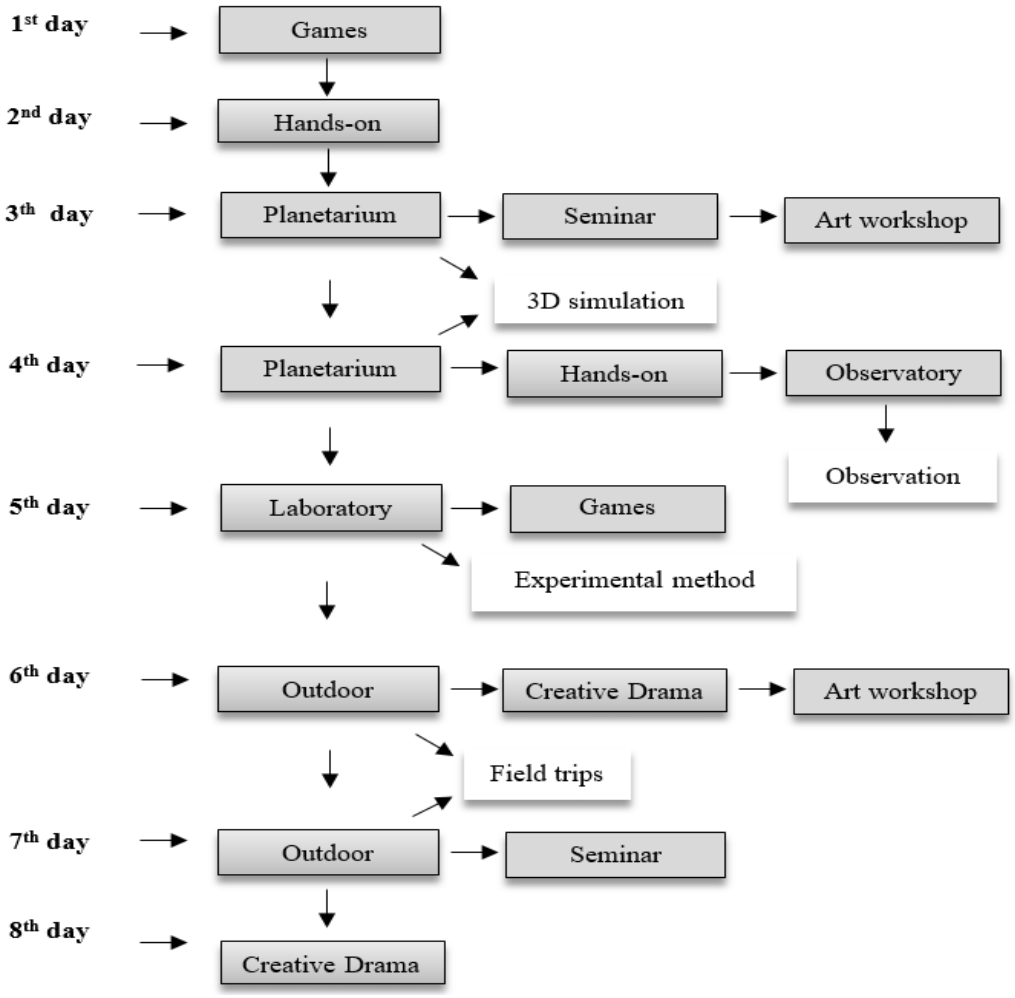


**Figure 1.** Implementation Design of MSS II Project

In the project, a different "theme" was processed every day and activity topics were created in accordance with that theme. The distrubitions of the themes according to the project camp days as follows:

Day 1 - Little Scientists Meet

Day 2 - Astronomy with models

Day 3 - Discovery of the Universe in the Planetarium

Day 4 - Journey from the Observatory to the Sky

Day 5 - Little Scientists are in the Laboratory

Day 6 - Environmental Pollution and Recycling

Day 7 - I learn about Science in nature

Day 8 - Let's get to know Einstein

Planetarium is a structure that allows the virtual image of the sky and sky clouds to be projected onto a dome-shaped screen with the help of a special projection machine. It creates the appearance of the sky in the virtual environment, allowing you to go back and forth in time. Planetariums are learning environments that enable

students to learn in a fun way, especially in science education (Ertaş and Şen, 2011). Planetariums are attracting interest in students with specially designed attention-grabbing environments, positively influencing students' attitudes toward astronomy thus science (Baxter and Preece, 2000). Planetariums can also be used to teach topics apart from astronomy and space science topics. Planetariums provide much more efficient, comfortable, and easy learning opportunities for teaching subjects that are difficult for students to learn in the normal classroom environment (Bishop, 2003).

Observatories are places where studies and research on the sky are carried out, usually in high and low cloudy places. In optical observatories, sky observations are made by placing telescopes under a dome-like structure with a cover that can be opened. Therefore, observatories are one of the educational places where students can draw their interest and curiosity. With the education provided to students in these places, astronomy can be understood and the concepts which are difficult to perceive can be explained.

Outdoor education is mentioned with such concepts as “learning out of doors”, “outdoor learning”, “education out of doors”, “education in nature”, “authentic learning in landscapes” and “the outdoors: a learning environment” for further understandings (Higgins and Nicol, 2002). Field trips, trekking, camping, and adventure activities which are performed at outdoor education, improve childeren’ sensitivity towards the nature, and their social relations (Palmberg and Kuru, 2000). Outdoor education provides teachers with a vehicle for bringing real meaning to what were abstract concepts (Hammerman D., Hammerman M., and Hammerman E., 2001).

Hands on means learning by doing. Through hands-on workshops, students create their own models through specific materials, using hands-on skills. This process allows both the mental and physical skills of the student to develop. This process allows both the mental and physical skills of the students to develop. Through hands-on modeling, students will gain a better understanding of the subject and gain a positive perspective on the subject (Holstermann, Grube, and Bögeholz, 2010; Stocklmayer, 2010).

Creative drama is a method which is participant-oriented and appropriate for group interaction for teaching a subject through the experiences of the participants (Özdemir, Akfırat, and Adıgüzel, 2009). The creative drama method has an important role in science teaching in that many abstract subjects, especially in science lessons, can be made concrete and understandable. Through creative drama, the child actively participates in teaching using his/her body. The impersonation that a person does in practice helps him develop both his communication skills and creativity.

Laboratory experiments involve the process of students’ solving a specific problem by collecting data, analyzing them, observing and obtaining results. In this process, students develop their academic achievement, research skills and scientific process skills (Hofstein, Navon, Kipnis, and Naaman, 2005; Koray, Köksal, Özdemir, and Presley, 2007). In laboratory implementations, the students either get the informaiton by themselves or test the information that they learn. Thus, students learn concrete things and acquire their own experiences in the process of information access.

Field trips are excursions that are planned and programmed for a specific purpose outside the school and based on the first-hand experience of the students The students associate the curriculum learned at school with the outside of the school through out-of-school trips. By observing the information in its natural environment and using the experiences he/she has gained, the student becomes aware of the real world (Bozdoğan, 2012; Kola-Olusanya, 2005). Field trips also allow students to develop positive attitudes towards science (Falk and Adelman, 2003; Jarvis and Pell, 2002).

**The Purpose of Research**

The purpose of this study is to examine the impact of the MSS II project on the attitudes towards science and the motivation levels for science learning in secondary school students. For this reason, an answer for the question stated below was sought in the research:

" What is the effect of MSS II Project on the secondary school students' attitude and motivation levels for science learning?"

Based on the research problem, the following sub-problems were searched:

**Sub-problems**

1.How does the level of attitudes of the students who participated in the MSS II project toward the science change before and after the project?

2.How does the motivation level of students participating in the MSS II project for learning science change before and after the project?

**METHOD**

The method of this study was the quantative research. Also, the research design of this research was the weak experimental design. In the study, the weak experimental design was chosen since the effect of the MSS II Project Model on students' motivation and attitudes towards science learning was examined. With this aim, this study was used as a one-group pre-test and post-test design because it was conducted with students participating in the MSS II project. Since the experimental study was carried out only with students participating in the MSS II project which lasted only eight days, no control group was included in the experimental study. While the dependent variables of the study are the motivation towards science and the attitude towards learning science, the independent variable is the curriculum applied in the Mobile Science II Project. In the one-group pre-test and post-test design, the effect of the experimental process is tested in a single group study. Measurements of the dependent variables of the subjects are obtained by using the same subjects and the same measurement tools as the pretest before the application and as the posttest after the application (Büyüköztürk, Kılıç Çakmak, Agün, Karadeniz & Demirel, 2012).

**Sample**

Criteria sampling method that is one of the purposive sampling methods was used in the research. The sample of the research consists of a total of 50 students selected from the 7th grade students who applied voluntarily to the MSS II project which was carried out in Samsun province in Turkey and which was supported by the Scientific and Technological Research Council of Turkey (TÜBİTAK) for the second time, considering the criteria determined by the researcher. However, four students were not included to the data analysis of the study since they couldn't attend the camp regularly due to their health problems. For this reason, the study was carried out with a total of 46 people and data analysis was carried out. In the criteria sampling method, criteria can be created by the researcher or a pre-prepared criteria list can be used (Yıldırım & Şimşek, 2011). In this research, when selecting the sample, the following criterias which were prepared by researchers were taken into account:

- To be a 7th grade student,
- To ensure that the number of girls and boys is the same among the determined students,
- To the distance of the schools where the students are educated to the city and country town centres
- That priority is given to students whose socio-economic income level is low have been noted.

When determining the sample, the above criteria were taken into account and the sample was carefully selected from students who live in rural areas with difficult access and low economic level.

**The Implementation of MSS II Project**

The main focus of the project is the implementation realization of science teaching in different teaching environments based on science and nature practices. For this purpose, different instructional areas and different teaching practices were included in the project. In the MSS II project, which lasts eight days, a different theme has been processed every day. The Project has eight different themes including "Little Scientist Meet" on the first day, "Learning Astronomy with Models" on the second day, "Discovery of the Universe in the Platenarium" on the third day, "The Journey from the Observatory to the Sky" on the fourth day, "Little Scientists are in the Labratory" on the fifth day, "Enviromental Pollution and Recyling" on the sixth day, "Learning Science in Nature" on the seventh day and finally "Let's Get to Know Einstein" on the eighth day. Activities to be performed during the day were created by associating with the theme that was set. Activity applications include planetarium, observatory, hands-on, art workshop, seminars, laboratory, outdoor and creative drama applications. The eight themes that the project contains, learning environments, methods and activities are shown in Table 1.

**Table 1.** The Themes, Learning Environments and Methods Covered in the Project Design

| *Days* | *Theme* | *Learning Environment* | *Method* | *Activity* |
|---|---|---|---|---|
| *1th* | *Little Scientists Meet* | *Drama Classroom* | *Games* | *Introduction and warm-up games*<br>*Scientist game* |
| *2th* | *Learning astronomy with models* | *Workshop classroom* | *Hands on learning* | *How do the seasons occur?*<br>*Eclipse of the Sun and Lunar Eclipse*<br>*Constellations* |
| *3th* | *Discovery of the Universe in planetarium* | *Lecture room, Planetarium, Outdoor, Art studio* | *Seminar, 3d simulation, Hands on model, Art workshop* | *Biology and Astronomy Seminar*<br>*The Big Bang Seminar*<br>*Finding direction in the sky*<br>*Constellations*<br>*Latitude and longitudes*<br>*Scaling the Solar System in outdoor*<br>*The Universe with Marbling Art* |
| *4th* | *The Journey from the Observatory to the Sky* | *Planetaryum Observatory* | *3d simulation, Observation, Hands on learning* | *The movie 'The Oasis in the Universe' in Planetarium*<br>*What can be done in an Observatory?*<br>*Observing the Sun in Observatory*<br>*Using Sunspotter*<br>*Making galilescope*<br>*Observing the Sky in Observatory* |
| *5th* | *Little Scientist are in the Labratory* | *Laboratory* | *Experiment, Games Art workshop* | *Using microscope*<br>*Examination of animal organs*<br>*Determination of blood groups*<br>*A simple electrical circuit game*<br>*Photography Workshop* |
| *6th* | *Environmental pollution and recycle* | *Glass factory, Recycle centre, Drama Classroom, Art studio* | *Field trip, Creative drama, Art wokshop* | *Glass factory trip*<br>*The trip of Recyling Centre*<br>*'Our World is getting polluted' drama* |
| *7th* | *Learning Science in nature* | *The Delta of Bafra Kızılırmak* | *Field trip, Seminar* | *Bird Observation*<br>*Delta Trip*<br>*Biology and Life Seminar* |
| *8th* | *Let's Get to Know Einstein* | *Drama Classroom* | *Creative drama* | *'Identify of scientists' drama* |

**The Data Collecting Instruments**

As a means of collecting data in order to determine students' attitudes towards science in the research; "Attitude Scale Towards Science" developed by Şener and Taş (2016) was used. Reliability and validity studies were conducted by applying Attitude Scale Towards Science to 469 students in total including 5th, 6th, 7th and 8th grade students. While the variance explained by the factor analysis was 53,56%, Cronbach Alpha Reliability coefficient was calculated as 0.87 and a 5-factor Likert-type scale consisting of 21 items was developed.

"Questionnaire for Motivation towards Science Learning" developed by Dede and Yaman (2008) was used as the second data collection tool to determine the motivation of students to learn science in the research. Questionnaire for Motivation toward Science Learning was applied to 421 elemantary school second-grade students and an exploratory factor analysis was conducted to determine the validity of the scale. As a result of the factor analysis, a scale consisting of 23 items with five factors explaining 47% of the total variance and whose coefficient of reliability (Cronbach Alpha) is 0.80 was developed.

**Data Analyses**

Statistical analyzes of data from attitude and motivation scales in the study were performed using Statistical Package for the Social Sciences (SPSS) 18.00. The Kolmogorov-Smirnov test which is one of the normality tests was used to test whether the data analysis shows normal distrubition before the data analysis of scores of the scales was conducted. P value of the scores obtained from the tests of "Attitude Scale towards Science" and "Questionnaire for Motivation toward Science Learning" which was calculeted in the Kolmogorov-Smirnov test was found to $p > 0.05$ which indicates that scores at this level of significance did not show any significant deviation from the normal distribution (Büyüköztürk, 2013). For this reason, data analysis was performed by using t-test for related samples and unrelated samples from parametric tests.

**FINDINGS**

**Students' Attitudes**

Table 2 shows the arithmetic average and standard deviation values of pre-test and post-test scores that students participated the Mobile Science School II project obtained from attitude scale towards science.

**Table 2.** Descriptive Data Related To ASTS Pre-Test and Post-Test Scores

| | N | Mean | Std. Deviation |
|---|---|---|---|
| **Pre-test** | 46 | 64.80 | 4.139 |
| **Post-test** | 46 | 72.50 | 4.048 |

A favorable diference for the post-test is found between the pre-implemenatation pre-test attitude scores toward science of students participating in the project [$X_{Pre}$=64.80] and their post-implementation post-test attitude scores [$X_{Post}$=72.50]. Subsequently, a dependent simple T-test was applied to examine whether the Science pre-test post-test scores differed significantly (Table 3).

**Table 3.** Dependent Simple T-Test Results of ASTS Pre-Test and Post-Test

| | N | Mean | Std. Deviation | df | t | p |
|---|---|---|---|---|---|---|
| Post test – Pre test | 46 | 7.69 | 5.695 | 45 | 9.164 | 0.00* |

*p< 0.05

When Table 3 is examined, the ASTS pre-test and post-test scores of the students show a significant difference [t (45) = 9.164; p <.05]. According to these results, it can be said that the applied science education project has an important effect on the attitudes of students towards science.

**Students' Motivations**

The change in motivation levels of students participating in the Mobile Science School II project before and after the project was examined using the related samples t-test and given in Table 4.

**Table 4.** Descriptive Data Related to Motivation Toward Science Learning Pre-Test and Post-Test Scores

| | N | Mean | Std. Deviation |
|---|---|---|---|
| **Pre-test** | 46 | 85.76 | 7.989 |
| **Post-test** | 46 | 91.43 | 5.931 |

In the Table 4 when the motivation level of the students is examined, it is seen that the post-test scores [$X_{Post}$ = 91.43] are higer than pre-test scores [$X_{Pre}$ = 85.76]. Afterwards, a dependent simple T-test was applied to examine whether the motivation pre-test and post-test scores for learning science differed significantly (Table 5).

**Table 5.** Dependent Simple T-Test Results of Motivation Toward Science Learning Pre-Test and Post-Test

| | N | Mean | Std. Deviation | df | t | p |
|---|---|---|---|---|---|---|
| **Post test – Pre test** | 46 | 5.67 | 5.48 | 45 | 7.026 | 0.00* |

*p< 0.05

Relevant samples t-test analysis results show that there is a significant difference between motivation pre-test and post-test scores of the students participating in the project [t (46) = 7.026; p <0.05]. When the arithmetic mean of the students 'motivation towards science scales scores' is taken into account, this difference seems to be in favor of the post- test score. According to these results, it can be said that the project carried out has a positive influence on the motivation of students to learn science.

**CONCLUSION and DISCUSSION**

The Mobile Science School II project in the field of science education has created instructional environments that will enable students to look at the universe and nature with different perspectives and to recognize the scientific phenomena and events that occur around them.

The science school project lasted for eight days included different teaching environments and different teaching methods. Attention was drawn to the fact that activities in the project can be carried out with the materials that they can easily find, in particular enabling students to gain practical experience. Motivation and attitude are two important variables affecting the learning process of students in science teaching. In order to ensure active participation of students in the classroom and to improve academic achievement, students' attitudes and

motivation towards learning science must be valued (Yenice, Saydam & Telli, 2012) In this study, the motivation and attitudes of the students, which are two important variables in learning have been improved positively with the MSS II Project model.

In the science school project, attention has been paid to the fact that topics are popular in science education and that they are part of students' daily life, especially in the subjects of Sun, stars, planets, animal organs, recycling, environmental pollution. Thus, an effective science school program that would lead students to develop their attitudes and motivations toward science positively in the eight-day period was able to be established.

As a result of the project, it was revealed that the MSS II project had a positive effect on students' attitudes towards science and their motivation for learning science. The science school project includes various implementations such as planetarium, observatory, laboratory studies, outdoor education, art workshops, field trips, hands-on learning, seminars and creative drama. There are many studies in the literature showing that all these implementaitons have positive effects on the affective areas such as attitude and motivation of the students. Students' attitudes toward science are evolved positively through the use of laboratories in science education (Freedman, 1997). The science learned through experiment arouses the natural instincts of the students and makes them insistent on learning science (Kaptan, 1999). Güzel (2001) found that the usage of drama in the 6$^{th}$ grade science class at secondary school made it easier for students to remember what they learned and that it affected their attitude toward science lessons positively. These results show that the different teaching methods and techniques applied in the MSS II project have positive effects on students' attitudes and motivations.

Camp and out-of-school natural field practices contribute to the increase in the affective tendencies of students (Crompton and Sellar, 1981). There are studies that show that science schools / camps have a positive effect on students' attitudes toward science and contribute to the continuity of science education (Gibson and Chase, 2002; Stake and Mares, 2005). Sontay, Tutar and Karamustafaoglu (2016) have shown that planetarium trips are convenient for science learning as a result of planetarium tour studies conducted by 8$^{th}$ grade students and that such outside of school learning environments are fun and effective. Planetarium influences students' attitudes toward astronomy thus science positively by stimulating interest in students with specially designed and remarkable environments (Baxter and Preece, 2000). Akay (2013) has implemented practical laboratory and workshop activities for 6$^{th}$ and 7$^{th}$ grade girls with the project "Learning By Doing Summer Science School" supported by TÜBİTAK. As a result of the project, it has been revealed that the students' perspectives against science have improved in the positive direction. Gibson and Chase's (2002) study comparing students who participated in two-week science camps conducted at Hampshire College Amherst with those who did not participate showed that the students who participated in the camp had developed positive attitudes toward science and had a high interest in scientific achievement. Konur, Şeyihoğlu, Sezen, and Tekbıyık (2011) stated

that the science camp has a positive effect on students' attitudes towards science and technology lessons, and scientific activities and scientific environment in the camp have an important role in achieving this result.

In this study, students' motivation and attitudes towards science learning were improved positively with MSS II project. The Mobile Science School II project symbolizes an exemplary science school model that can be influential on the affective areas of students in the field of science teaching both in terms of teaching environments and teaching methods. With the Mobile Science School II and similar project work carried out, students can increase their desire by avoiding the prejudices about learning science. It may also be possible to think that science is a part of daily life, and that the understanding of science means understanding nature and the universe.

**SUGGESTIONS**

The MSS II project, one of nature education projects carried out in the field of science education, has led students to develop a positive attitude towards science and motivation to gain a different perspective on nature. Based on this project model, some suggestions have been made by the researchers for future studies. These suggestions are:

- The number of projects that will be realized in this area needs to be increased because the science school projects have positive effects on students' view of science.
- In the science school projects; it can be used to measure not only the affective areas such as attitudes and motivation of the students but also the cognitive areas of the students.
- Experimental studies with control groups can be conducted to test the addition of the results of the project.
- In the science school projects; the learning process can be diversified by including practical activities from other fields such as mathematics and social sciences besides science.
- Persistence tests or oral interviews may be applied to test whether the change in the learning products produced at the end of the project is effective in the long term.

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