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# TÜBİTAK 4004 Nature Education and Science Schools "Mathematics is in my Nature!" Evaluation of the Project*

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***Abstract*:** In this study, "There is Mathematics in My Nature!" which was conducted within the scope of TUBITAK 4004 Nature Education and Science Schools' the project has been evaluated. In the project, it is aimed to carry out nature-themed activities, workshops and laboratory studies, to include knowledge and skills to be gained through new and different learning approaches, to raise awareness about mathematics in students by making them realize the relationship between different disciplines and mathematics, and to contribute to the development of students' individual creativity. In addition, it is among our aims to provide a positive change in the perspectives towards science, to provide students with a critical-artistic-inquiring perspective, to contribute to the bodily-kinesthetic development of the students, and to discover the mathematics hidden in nature and other branches of science. In addition, in this project it is aimed that the participants are actively involved in individual and group work, that their sense of curiosity is activated and that they learn by doing and experiencing. The target group of the project is 7th and 8th grade students studying in public schools in the 2020-2021 academic year. In the project, "Mathematics Attitude Scale", "Mathematics Anxiety Scale", "Affiliation to Nature Scale" and "Activity Studies Evaluation Scale" were applied to the students. In addition, in the light of the findings, it has been seen that students' learning mathematical elements intertwined with nature, by doing and experiencing, contributes to their internalization of the knowledge of mathematics and making mathematics a part of their lives. In the light of the project findings, it was observed that the participants' anxiety towards mathematics decreased, their commitment to nature and their attitudes towards mathematics changed positively. In line with the results obtained from the research, it is thought that the integration of the existing education system into the activities that the students will perform in nature by doing and living will make positive contributions to education.

***Keywords:*** Nature, TUBİTAK 4004 nature education, Awareness, Math education, Attitude.

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## Introduction

Students of our age perceive that mathematics consists only of problems and four operations. Students cannot make a connection between the subjects of the mathematics they learn and real life. This situation causes students not to learn mathematics. Freudenthal (1971) argues that in history, mathematics emerged from real life problems that people faced, that they mathematized real life through these problems, and then they reached formal mathematics. Mathematics is an interdisciplinary course that takes place in every part of daily life. In this context, Baki (2008), while stating the aims of the current mathematics curriculum, argues that the curriculum to be prepared should enable the training of individuals who value mathematics, learn to talk and to think about mathematics, are successfull and are problem solvers. Baki (2008) also states that mathematics is an appropriate lesson for the interdisciplinary teaching approach.

As famous mathematician Lobachevski's statement: "There is no branch of mathematics, however abstract, which may not some day be applied to phenomena of the real world" shows that mathematics is intertwined with daily life. Lobachevsky's pointing out that every branch of science will find an application area in the field of mathematics reveals the necessity of addressing the interdisciplinary relationship. In addition, the famous scientist Galileo said, "The language of the great book of nature is mathematics", this statement provides the development of ideas that magnificent results will come from the intersection of mathematics with nature. It is recommended by Beames et al. (2012) that teachers use the natural environments in their immediate surroundings for educational purposes. Therefore, this suggestion was taken into consideration while preparing the project activities.

Learning by doing is a learning system based on experience and discovery, which foresees being intertwined with all the possibilities of life. The inclusion of more sense organs in the educational process in learning experiences positively affects learning and ensures that the learned information is permanent (Arslan, 2007). In addition, as students will be a part of the process with learning by doing-experience, the outputs are learned deeply. Schank (1995) stated that another way of simplifying the learning of individuals is learning by doing and that there is a need to see, feel and do in all education-teaching processes as in daily life. One of the most important features of the project activities carried out within the scope of TÜBİTAK, 4004 coded projects is that, as Schank (1995) states, the activities are chosen from life as much as possible and they provide a learning environment for the participants by learning by doing.

In Turkey, project support has been provided by national and international institutions in the field of education for about 25 years. There are educational institutions among the institutions applying for the mentioned project supports. Necessary budgetary support is given to the successful projects among the applied projects. The Scientific and Technological Research Council of Turkey (TÜBİTAK) is among the important institutions that call for projects and grants in this context. TÜBİTAK (2021) aims to bring and disseminate knowledge with the society and to gain knowledge in an understandable structure through interactive applications. This article has been prepared according to the results obtained from the Project which is named "Mathematics Is In My Nature!".

Any learning environment outside the school can be expressed as an informal learning environment. Informal learning environments are defined by Falk and Dierking (2000) as places, such as zoos, museums, aquariums, historical places, and botanical gardens that enable young people and students to experience, learn and explore. In addition, science centers, children's universities and projects supported by TÜBİTAK can be listed as environments that support out-of-school learning environments. Learning provided in informal learning environments occurs in short time intervals without the need for attendance, depending on the individual control, intrinsic motivation, curiosity and preference of individuals (Falk & Dierking, 1997; Gutwill & Allen,

2012; Griffin & Symington, 1997; Rennie & McClafferty, 1996). Informal learning environments are of great importance in students' learning and modeling of mathematics. In this respect, informal learning environments effectively facilitate the process of students to discover real life.

In the literature, studies with real-life-based learning activities have been found, but studies specific to mathematics in informal learning environments are limited (Çağlar vd., 2018;Yıldız & Göl, 2014). In the literature, it has been seen that informal learning environments are frequently used in the field of social and science (Okur-Berberoğlu & Uygun, 2013; Saraç, 2017). This limitation highlights the necessity and importance of nature-based mathematics education. It is expected that the realization of the project named "Mathematics is in My Nature!" and the transformation of the project outputs into academic studies will contribute to the literature in this sense. It is thought that the results obtained from the project will give an idea about the elimination of these limitations and how the out-of-class school environments can be used more effectively. In this regard, it is expected to contribute to the literature and the field of mathematics education.

**The Aim of the Project**

The aim of the project is to enable students to discover and internalize the mathematics hidden in nature and other sciences, with the knowledge and skills to be gained through nature-themed activities, workshops and laboratory studies, new and different learning approaches. In the project, Interdisciplinary activities, individual-group studies and activitieswith interactive applications with which students will explore that mathematics is not just a discipline consisting of numbers, symbols and shapes; and its reflections in art, nature and daily life, as well as the beauty and aesthetics in its inner discipline are included.

With this project; In accordance with the Mathematics Lesson Curriculum (MEB, 2018) put into effect by the Board of Education and Discipline, it is aimed that secondary school students studying in Niğde should be able to develop their mathematical literacy skills and use them effectively, to understand and use mathematical concepts in daily life, to realize the relationship between mathematics, and art and aesthetics, to develop their skills and knowledge and to manage their own learning processes consciously.While doing this, it is aimed that students should get to know the place of mathematics in nature and other branches of science by discovering it, activating their sense of curiosity and learning by doing-experience; It is also aimed to present the skills that cannot be gained at the desired level in the classroom environment in the mathematics course, to combine mathematics with art and aesthetics, to bring them to students through different disciplines with a nature-based approach, to provide students with a more permanent, fun and rich mathematical experience thanks to the reflections, and to bring mathematics to nature with interactive applications.

In this study, an evaluation of TÜBİTAK, 4004 project coded "Mathematics is in My Nature!" is aimed. It is thought that the results of the project evaluation will contribute to the mathematics education literature and will guide the academicians and mathematics teachers working in this field.

## Method

The research was carried out by using one-group pre-test and post-test design, which is one of the weak experimental designs, and is one of the quantitative research methods. According to Karasar (2002), it can say that the application is effective when the pre-test and post-test averages of the study group differ significantly. While selecting the project scales, attention was paid to the age of the student and their suitability for the subject. In order to determine the effect

of the activities implemented in the project on the students, three measurement tools were used as pre-test and post-test; a measurement tool was also applied at the end of the project.

In the project activities of TÜBİTAK 4004 named "Mathematics is in My Nature!" learning environments suitable for each student's learning style were included with innovative learning approaches. Rich learning experiences such as art, design, experiment-observation, games, individual-group work, and skills such as research-examination-evaluation, guess-observe-explain etc. are presented to the students.

With the project activities prepared with an interdisciplinary perspective, students' learning experiences in enriched education environments, their level of mathematics knowledge; their awareness of discovering mathematics hidden in nature and other sciences and their perspectives on learning by doing-living are aimed to positively change. For this purpose, culture, art and sports activities were included in the content of the activities prepared based on project-based learning. Some activities carried out during the project are presented in Table 1.

Table 1
*Samples from the activities*

| Method | Name of the activity and its content |
|---|---|
| Animation and simulation | In the "My Stories Come to Life" activity, students were given theoretical information on digital stories and simulations, and sample applications were shown. Afterwards, digital storytelling and simulation applications were made using Web 2.0 tools including interactive applications. |
| Computational thinking | In the activity of "The Value of My Note: Mathematics", students were provided to establish a relationship between note values and fractions and to think computationally. |
| Scientific excursion and field work | "Calcite: from Nature to Life" was done. In the activity, Niğde calcite quarries were introduced as a field study and it was provided to explain how calcite was divided into small pieces mathematically, in safe areas in the calcite factory.Then, a mathematical modeling study suitable for this situation was presented by the instructor.<br>"How did they do it?" was done. In the activity, various features of the Gümüşler Monastery, which has a historical and cultural structure, were noted and a volume calculation study was made. |
| Digital game/narration | "My Stories Come to Life". In the activity, digital storytelling tools were introduced and students were given mathematical-themed digital story writing exercises. |
| Nature and wildlife observation | In the activity of "Making Geometric Patterned Floor Mosaic with Land Art" activity, various stones with geometric patterns were collected and patterns were created in places where natural life is available without harming the nature.<br>In the "Mathematician Spiders" activity, the symmetry in the structure of spiders and spider webs in nature was examined by using the method of observation and prediction.<br>In the "Flip and Twist Mathematics" activity, the causes of the bends in the rivers were discovered by using the sketches and making mathematical calculations. |
| Educational game | In the "MATfebe" activity, students were provided with the skills of visual interpretation, associating concepts through games by combining mathematical expressions with their imaginations, and skills in the field of Mathematics development by communicating and interacting. |

| | |
|---|---|
| Mobile apps | In the "Let's Look into Space" activity, students were made to observe the sky using mobile applications for space observation for night observation purposes. |
| Gamification | In the “MATfebe” activity, students were allowed to play games involving the relationship between illustrated alphabet and mathematics by using their body language. |
| Exhibition and show | At the end of the project, the project outputs of the students were exhibited both in a public place and online. |
| Sport and art | In the activity of “Following Mathematics with Orienteering”, sportive activities including the subject of integers in the mathematics curriculum were carried out. |
| STEAM | In the "Let's Build Bridge" activity, students were provided with the help of tongue sticks to build a Leonardo Da Vinci bridge.<br>In the "Art in My Kemer" activity, the aqueducts in the ancient city of Kemerhisar/Tyana, which the students visited during the day, were transformed into a three-dimensional artistic design with clay material. |
| Guess - observe - explain | “In the “The Secret in the Leaves” activity, the students made predictions by brainstorming about the sequences in the plants and trees around them.Then, the students made observations on the plants and leaves around them, accompanied by the instructor.Some scientific information about the arrangement of the leaves was given and this arrangement was explained by the students. |
| Discussion and workshop | A panel called “The Place of Mathematics in Our Lives” was organized for students, project team and volunteer participants via remote live connection. The content of the panel included the subject of mathematics in nature and daily life.08502022020 |
| Creative drama | In the activity called "Let's Meet", participants, trainers and the project team met and mingled with each other with a game and drama-based approach. The participants wrote their names on the balloons by forming a circle and tried to find the owner of the names on the balloon with games. |
| Other | In the activity "Science Diary”, the participants were asked to evaluate the day spent in the project during the project, with the aim of contributing to the development of individual creativity and entrepreneurship of the students.<br>In the “You Have The Microphone” activity, the thoughts and opinions of the participants, trainers and mentors about the project were taken. |

**Work(ing) Group**

While determining the students participating in the project, students’ answers from application form were examined and evaluated by the project team. As a result of the evaluation, 30 students were selected as participants, considering gender equality and class level while determining the participants.

The target audience of the project consists of 7th and 8th grade students studying at public secondary schools in Niğde. The number of participating students is 30, of which 15 are girls and 15 are boys. While selecting the students, their grade level, mathematics course grade and general success status were taken into consideration. The reason why the target audience was chosen from the 7th and 8th grades is the suitability of their readiness for the activities. While determining the number of participants, students’ participating in individual-group studies with the highest efficiency and pandemic conditions were also taken into account.

## Data Collection Tools

In the project, "Mathematics Attitude Scale" developed by Önal (2013), "Mathematic Anxiety Scale" developed by Bindak (2005), and "Nature Loyalty Scale" developed by Bektaş, Kural and Orçan (2017) were applied to the students at the beginning and end of the project. In addition, at the end of the project, the "Activity Evaluation Scale" developed by Koç (2018) was applied. In the process of preparing the project proposal, the scale owners were contacted and permission was obtained. Scales were applied to the participants through "Google forms" during the project process.

### *Survey*

With the "Mathematics Anxiety Scale", the change in the anxiety levels of the students towards mathematics, the students' attitudes towards mathematics with the "Math Attitude Scale", and the change in the level of loyalty to nature of the students with the "Nature Loyalty Scale" were measured. With the "Activity Evaluation Scale", students' opinions about the activities were taken. Before using the measurement tools, permission was obtained from the scale owners via e-mail.

In the Mathematics Anxiety Scale, which aims to measure the mathematics anxiety of primary school students, there are 4 items to determine the personal information of the students and a 5-point Likert type questionnaire consisting of 16 items obtained from these sentences. There are 22 items and four factors in the Mathematics Attitude Scale, which aims to determine secondary school students' attitudes towards mathematics. These factors are: necessity, concern, interest and work. The Nature Loyalty Scale is one-dimensional and contains 14 items. This scale is a valid and reliable scale that can be measured with two different sub-dimensions and adapted to Turkish culture. The Activity Evaluation Scale is a reliable and valid scale that measures the efficiency of activity studies applied in the learning environment according to teacher perceptions. This scale is grouped under a single factor and consists of 12 items.

Before conducting the research, permission was obtained from the relevant Provincial Directorate of National Education. Since the scales will be applied as a pretest and posttest, "Consent Forms" were signed by the parents of the students on the first day of the project. In the study, attention was paid to comply with all the rules in the "Turkish Higher Education Institutions Scientific Research and Publication Ethics Directive".

## Data Analysis

In the study, the measurement results were evaluated using qualitative and quantitative analysis methods. In addition, single sample independent t-test was used in the pre-test and posttest evaluation. In addition, the Activity Evaluation Scale was applied only at the end of the project and the data of the scale were evaluated with the help of the SPSS program.

During the evaluation process of the scales, it was observed that there was a deficiency in the number of students participating in the measurements. Therefore, the analyzes were carried out according to the number of students participating. Since all of the data sets obtained in the research were smaller than 50, whether the data collected from the study group showed a normal distribution or not was examined by the "Shapiro-Wilks" method. The Shapiro-Wilks method is used to find out whether the scores obtained from the data show a normal distribution (Büyüköztürk, 2011). The differences between the pre-test and post-test averages of the participants were determined by calculating p ($p>0.05$).The differences between the pre-test and posttest averages of the participants were evaluated with a single sample independent T-test for $p<0.05$ significance level.

## Results

The findings obtained from the study are presented in sub-headings according to the measurement tools used.

### Results Obtained from the Activity Evaluation Scale

The data analysis of the Activity Evaluation Scale applied at the end of the project to the students participating in the project is given in Table 2.

Table 2
Activity Evaluation Scale Analysis Results

| | Variables | f | (%) | Valid (%) | Cumulative (%) |
|---|---|---|---|---|---|
| The activities allowed my individual talents to emerge. | Rarely | 4 | 13.33 | 13.33 | 13.33 |
| | Sometimes | 2 | 6.67 | 6.67 | 20.00 |
| | Generally | 12 | 40.00 | 40.00 | 60.00 |
| | Always | 12 | 40.00 | 40.00 | 100.00 |
| | Total | 30 | 100.00 | 100.00 | |
| Activities helped me socialize. | Rarely | 1 | 3.33 | 3.33 | 3.33 |
| | Sometimes | 1 | 3.33 | 3.33 | 6.67 |
| | Generally | 12 | 40.00 | 40.00 | 46.67 |
| | Always | 16 | 53.33 | 53.33 | 100.00 |
| | Total | 30 | 100.00 | 100.00 | |
| The activities helped me gain the habit of working independently. | Never | 3 | 10.00 | 10.00 | 10.00 |
| | Rarely | 3 | 10.00 | 10.00 | 20.00 |
| | Sometimes | 4 | 13.33 | 13.33 | 33.33 |
| | Generally | 12 | 40.00 | 40.00 | 73.33 |
| | Always | 8 | 26.67 | 26.67 | 100.00 |
| | Total | 30 | 100.00 | 100.00 | |
| The activities gave me a sense of achievement. | Sometimes | 1 | 3.33 | 3.33 | 3.33 |
| | Generally | 13 | 43.33 | 43.33 | 46.67 |
| | Always | 16 | 53.33 | 53.33 | 100.00 |
| | Total | 30 | 100.00 | 100.00 | |
| The activities were not disconnected from daily life. | Never | 2 | 6.67 | 6.67 | 6.67 |
| | Sometimes | 2 | 6.67 | 6.67 | 13.33 |
| | Generally | 7 | 23.33 | 23.33 | 36.67 |
| | Always | 19 | 63.33 | 63.33 | 100.00 |
| | Total | 30 | 100.00 | 100.00 | |
| The activities helped me to socialize with friends. | Rarely | 2 | 6.67 | 6.67 | 6.67 |
| | Sometimes | 1 | 3.33 | 3.33 | 10.00 |
| | Generally | 6 | 20.00 | 20.00 | 30.00 |
| | Always | 21 | 70.00 | 70.00 | 100.00 |
| | Total | 30 | 100.00 | 100.00 | |
| The activities contributed to my emotional development. | Never | 1 | 3.33 | 3.33 | 3.33 |
| | Rarely | 4 | 13.33 | 13.33 | 16.67 |
| | Sometimes | 6 | 20.00 | 20.00 | 36.67 |
| | Generally | 8 | 26.67 | 26.67 | 63.33 |
| | Always | 11 | 36.67 | 36.67 | 100.00 |
| | Total | 30 | 100.00 | 100.00 | |
| Activities led me to make research. | Rarely | 2 | 6.67 | 6.67 | 6.67 |
| | Sometimes | 4 | 13.33 | 13.33 | 20.00 |
| | Generally | 6 | 20.00 | 20.00 | 40.00 |
| | Always | 18 | 60.00 | 60.00 | 100.00 |
| | Total | 30 | 100.00 | 100.00 | |
| | Rarely | 1 | 3.33 | 3.33 | 3.33 |

| | | | | | |
|---|---|---|---|---|---|
| The activities allowed me to acquire positive behaviors. | Sometimes | 7 | 23.33 | 23,33 | 26.67 |
| | Generally | 6 | 20.00 | 20.00 | 46.67 |
| | Always | 16 | 53.33 | 53.33 | 100.00 |
| | Total | 30 | 100.00 | 100.00 | |
| The activities were prepared according to my level. | Rarely | 2 | 6.67 | 6.67 | 6.67 |
| | Sometimes | 1 | 3.33 | 3.33 | 10.00 |
| | Generally | 15 | 50.00 | 50.00 | 60.00 |
| | Always | 12 | 40.00 | 40.00 | 100.00 |
| | Total | 30 | 100.00 | 100.00 | |

- 13.33% (4) "rarely", 6.67%(2) "sometimes", 40.00%(12) "usually", 40.00%(12) "always" answered the question "The activities allowed my individual talents to emerge". When the obtained data are evaluated, it can be said that the activities are quite effective in revealing the abilities of the students, since the total of the students who answered "usually" and "always" is 80%. In this respect, it is thought that the preparation of project activities in a way that supports students' independent work contributes to the students.

- 10.00% (3) "never", 10.00%(3) "rarely", 13.33%(4) "sometimes", 40.00%(12) "usually", 26.67%(8) "always" answered the question "The activities helped me gain the habit of working independently". When the obtained data are evaluated, it is seen that the total of the students who answered "usually" and "always" is 66%. In this context, it is thought that the fact that the activities support individual-independent active work and activate the feelings of success and curiosity supports this situation.

- 3.33% (1) "occasionally", 43.33% (13) "generally", 53.33% (16) "always" answered the question "The events gave me a sense of achievement". In the light of the data, it is seen that the total of the students who answered "usually" and "always" is 96%. In this context, it can be said that project activities are very effective in helping students experience the sense of success.

- 6.67%(2) "never", 6.67%(2) "sometimes", 23.33%(7) "usually", 63.33%(19) "always" answered the question "The activities were not disconnected from daily life". When the obtained data are evaluated, it is seen that the total of the students who answered "usually" and "always" is 86%. In this context, it can be said that the activities are not disconnected from daily life. It can be said that this situation is related to the fact that the activities in the project have content that has connection with daily life.

- 6.67%(2) "rarely", 3.33% (1) "sometimes", 20.00% (6) "usually", 70.00% (21) "always" answered the question "The activities helped me to socialize with friends". When the obtained data are evaluated, it is seen that the total of the students who answered "usually" and "always" is 90%. In this context, it can be said that the activities help them to socialize with their friends. It is thought that project activities strengthen communication and sharing among students, as the project activities adopt a project-based approach and support group work.

- The answer to the question "The activities contributed to my emotional development" was 3.33% (1) "never", 13.33% (4) "rarely", 20.00% (6) "sometimes", 26.67% (8) "usually", 36.67% (11) "always". When the obtained data are evaluated, it is seen that the total of the students who answered "usually" and "always" is 63%. It can be thought that this situation is thanks to the inclusion of activities aimed at stimulating success and curiosity in students in accordance with the project objectives.

- 6.67%(2) "rarely", 13.33% (4) "sometimes", 20.00% (6) "usually", 60.00%(18) "always" answered the question "The activities led me to make research". When the obtained data are evaluated, it is seen that the total of the students who answered "usually" and "always" is 80%. In the light of the data, it is seen that the activities lead the students to research. It can be thought that this situation is caused by workshop and laboratory studies, the use of different and new learning approaches, activities that will contribute to the positive change of perspectives on science, and gaining a critical-artistic-inquiring perspective.

- 3.33%(1) "rarely", 23.33%(7) "sometimes", 20.00%(6) "usually", 53.33%(16) "always" answered the question "The activities allowed me to gain positive behaviors". When the obtaineddata are evaluated, it is seen that the total of the students who answered "usually" and "always" is 73%. According to the data, it can be said that the activities enable students to acquire positive behaviors. It can be thought that this situation is achieved through the activities prepared to gain the root values adopted in the 2023 Education Vision set up by Ministry of Education in Turkey.

- 6.67%(2) "rarely", 3.33%(1) "sometimes", 50.00%(15) "usually", 40.00%(12) "always" answered the question "The activities were prepared according to my level". When the obtaineddata are evaluated, it is seen that the total of the students who answered "usually" and "always" is 90%. This result shows that the students found the activities appropriate for their level. It can be said that this situation is achieved through activities prepared considering the student level.

**Results Obtained from the Nature Loyalty Scale**

The analysis of the data obtained from the Nature Loyalty Scale applied at the beginning and at end of the project to the students participating in the project is given in Table 3.

Table 3
t-Test Result of Nature Loyalty Scale Pre-Test Post-Test Average Scores

| | | M | n | SD | t | p |
|---|---|---|---|---|---|---|
| Nature Loyalty Scale | Pre-Test | 3.780 | 29 | 0.626 | -2.314 | 0.028 |
| | Post-test | 4.220 | 29 | 0.718 | | |

When the scores of the students were evaluated with the t-Test in the application of the Nature Loyalty Scale applied before and after the project, a value of $p=0.028<0.05$ was obtained and it was determined that there was a statistically significant difference. In line with these data, it is thought that the experiences gained thanks to the realization of the project activities with nature, the connection of the students with nature or the emotional bond they have with nature become stronger. In addition, it can be said that there is an increase in the tendency of students to protect nature and the environment.

**Results Obtained from the Mathematics Anxiety Scale**

The Mathematics Anxiety Scale was applied at the beginning and end of the project to the students participating in the project, and the analysis of the data is given in Table 4.

Table 4
t-Test Result of Mathematics Anxiety Scale Pre-Test Post-Test Mean Scores

| | M | n | SD | t | p |
|---|---|---|---|---|---|
| Pre-Test | 2.362 | 29 | 0.745 | 2.992 | 0.006 |

| | | | | |
|---|---|---|---|---|
| Mathematics Anxiety Scale | Post-Test | 1.819 | 29 | 0.575 |

When the scores of the students in the Mathematics Anxiety Scale application before and after the project were evaluated with the t-Test, a value of $p=0.006<0.05$ was obtained and a statistically significant difference was determined. It can be said that there is a decrease in the anxiety levels of the students thanks to the fact that the project activities support learning by doing, experiencing and discovering, as well as the use of different and new learning approaches, as well as having fun and learning. It is thought that the application was successful in influencing students' math anxiety.

**Results Obtained from the Mathematics Attitude Scale**

The Mathematics Attitude Scale was applied at the beginning and end of the project to the students participating in the project, and the analysis of the data is presented in Table 5.

Table 5
t-Test Result of Mathematics Attitude Scale Pre-test Post-test Mean Scores

| | | M | n | SD | t | p |
|---|---|---|---|---|---|---|
| Mathematics Attitude Scale | Pre-Test | 3.680 | 28 | 0.636 | -6.303 | 0.000 |
| | Post-Test | 4.509 | 28 | 0.325 | | |

When the scores of the students in the Mathematics Attitude Scale application before and after the project were evaluated with the t-Test, a value of $p=0.000<0.05$ was obtained and a statistically significant difference was determined. Project activities had a very high impact on mathematics attitude. From this point of view, it can be stated that there has been a positive change in students' attitudes towards mathematics during the project. It is thought that the level of attitude towards the mathematics lesson has increased due to the fact that students learn by doing with the knowledge and skills they have acquired through workshop, nature and laboratory activities, internalize them and learn by having fun in practice-oriented activities.

## Conclusion and Discussion

In this study, it was aimed to evaluate the effect of the project named “Mathematics is in My Nature!” supported within the scope of TÜBİTAK 4004 program on the participants. The main purpose of the project was to enable students to discover other branches of science and mathematics hidden in nature, with the skills and knowledge to be gained through nature-themed activities, laboratories and workshops, new and different learning approaches.

Both as a result of the analysis of the data obtained from the scales applied to the students in the project and as a result of the analysis of the "Math Anxiety" scores applied to the participants before and after the project, a statistically significant decrease was found in the participants' math anxiety levels. By using different and new learning approaches in the project, it can be thought that the awareness of students about mathematics and their participation in nature-themed activities, laboratories and workshops, where students can reveal their individual creativity, support the reduction of their anxiety about mathematics. In the literature, studies supporting the obtained result were found. In the study of Buluş-Kırıkkaya et al. (2011) stated that the students both had fun and learned in the activities carried out in out-of-school environments, and they were happy with this situation. In addition, Hırça (2013) stated that students find summer science camps fun, useful, interesting and different and that students learn while having fun in these camps.

During the project, activities were implemented that contributed to the students' internalization of the knowledge of mathematics and making mathematics a part of their lives, thanks to the fact that they learned mathematical elements by doing-living together with nature. Thus, it was expected that the participants would develop a positive attitude towards mathematics. A statistically significant increase was found in the participants' “Math Attitude” scores, in favor of the attitude scale applied at the end of the project, in their mathematics attitude levels. It can be thought that the reason for this is that students learn and internalize the knowledge and skills they have acquired through workshop, nature and laboratory activities, and do not have difficulty in practical activities. In addition, in the results of the "Activity Evaluation", it is thought that the students' perspectives on science have changed positively, considering that the activities reveal the individual abilities of the students, help them gain the habit of independent study, and direct them to research. Findings from the study; In many studies on science camps in the literature, it coincides with the findings that the proficiency levels of the participants increased, their attitudes and opinions changed positively and they gained versatile information about education (Güler, 2009; Keleş et al., 2010; Karataş & Aslan, 2012; Metin & Leblebicioğlu, 2011; Mittelstaedt et al., 1999, Sezer Evcan et al., 2020). According to Akay (2013), science schools/camps support participants to develop positive attitudes towards science. In their study, Tekbıyık et al. (2013) found that the attitudes towards science of primary school students who participated in the summer science camp increased significantly at the end of the camp, and that there was a change in the participants' perspectives on scientific knowledge, environment and science. Lakin (2006) stated that out-of-school education activities are effective on the social and personal development of the participants and have a positive effect on beliefs, values and attitudes. In their study conducted to evaluate the science camps, Birinci-Konur et al. (2011) emphasized that the science camp affected the students' attitudes towards science and technology lesson positively and that the scientific activities and the environment in the camp played an important role in achieving this result. In the study carried out by Gibson and Chase (2002), students who attended and those who did not attend in the science camps that lasted 2 weeks were compared and it was stated that a high level of interest towards scientific career and a positive attitude towards science were developed in the individuals who participated in the camp.

With the different learning approaches applied in the project, it is aimed to explore the mathematics hidden in other sciences and nature with a critical-artistic-inquiring perspective with nature-based activities that contribute to the bodily-kinesthetic development of the students. There was a statistically significant increase in the participants' levels of “Nature Loyalty”, in favor of the “Nature Loyalty Scale” applied at the end of the project, in the "Nature Loyalty" scores applied to the participants before and after the project. In the literature, it is noteworthy that people who interact with nature have a high level of commitment to nature (Braun & Dierkes, 2017; Ernst & Theimer, 2011). Oğurlu et al. (2013) emphasized that field and nature studies are important in terms of facilitating the transformation of information into behavior and making it more permanent.

During the project, 50 activities in different disciplines were applied to the students. At the end of the project, students were asked to evaluate the activities using the Activity Evaluation Scale. In the light of the data obtained, the activities reveal the individual abilities of the students, help them to socialize and socialize with their friends, help them gain the habit of working independently, contribute to their emotional development, gain positive behaviors and experience a sense of achievement. In addition, it was concluded that the activities were prepared in accordance with the students' levels, prompted them to do research and were intertwined with daily life. When the literature about the articles evaluating the results of the projects carried out within the scope of TÜBİTAK, 4004, Nature Education and Science Schools is examined, it is seen that the effects of the projects carried out with different age groups on students are generally positive. (Akay, 2013; Avcı et al., 2015; Çavuş et al., 2013; Güler, 2009; Sezen Vekli, 2013; Taner, 2018).

In the light of the findings, it was seen that thanks to the fact that they learned mathematical elements by doing and living together with nature, the project, named "Mathematics is in My Nature" carried out in line with the set targets of TÜBİTAK 4004 Nature Education and Science Schools Support Program, contributed to the students' internalization of the knowledge of mathematics and to make mathematics a part of their lives. With the activities carried out within the scope of the project, it was observed that the students' anxiety towards mathematics decreased, their attachment to nature and their attitudes towards mathematics science changed positively.

**Suggestions**

In line with the results obtained from the research, it is thought that the activities that students will perform in nature learning by doing can be integrated into the existing education system. It is thought that the fact that project-based learning activities including the mathematics hidden in daily life organized by the Ministry of National Education, integrated into the mathematics lessons in schools will positively affect the mathematics achievement of the students. In-service trainings can be organized for mathematics teachers and school administrators to promote integration of the project-based learning approach in mathematics lessons. In this way, it can be ensured that school administrators and mathematics teachers are aware of new approaches to project-based learning and that they can create activities based on interdisciplinary cooperation. By organizing project preparation and information seminars in schools, awareness can be created among school administrations and teachers about project preparation. In addition, in order to raise an active generation that learns to work interdisciplinary and adapts to nature and the environment, it is thought that it would be beneficial to increase the implementation such projects and number of projects within the scope of TÜBİTAK 4004 Nature Education and Science Schools Support Program.

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