

**INVESTIGATION OF AWARENESS AND UNDERSTANDING OF SCIENCE  
TEACHER CANDIDATES ABOUT TEACHING SCIENCE SUBJECTS THROUGH  
OUT-OF-SCHOOL ACTIVITIES**

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**Abstract:** The aim of this study is to determine the understanding and awareness of science teacher candidates about teaching some subjects from secondary school science courses (compositions and separation of compositions, recycling and decomposition of waste materials, electric circuits, bulb brightness and the fuse in serial and parallel connections; energy conversions) through practicing extracurricular activities with real life applications in out-of-class environments (Oil Factory and Trakya University Faculty of Education Chemistry Laboratory, Municipality of Edirne Hazardous Waste Storage Area, Municipality of Edirne Waste Sorting and Disposal Facilities, Edirne Creative Minds Science Workshop, Lalapaşa District Wind Power Plant). For this purpose, 11 teacher candidates selected from 3rd year students in Trakya University, Faculty of Education, Science Teacher Education Department were provided with the opportunity to observe and participate by guiding the students in the practices of teaching several subjects that are taking part in Republic of Turkey Ministry of National Education 2013's curriculum for 7th grades in real practice areas as out-of-class environment. Before and after the practices, teacher candidates were asked to fill out the forms with open-ended questions in order to determine their awareness and understanding for out-of-school learning environments. Through the analysis utilizing the content analysis methodology of obtained data it was determined that candidates have made significant improvements in their understanding and awareness of the need of out-of-school activities for science teaching and they have initiated to schedule prospective out-of-school science events for their future science classes.

**Keywords:** Out-of-school science events, science teacher candidates, understanding, awareness

### **1. Introduction**

Advances in science and technology are effective in terms of determining the future of

the countries. It was realized that this would only be achieved by giving the particular importance to science education. So that, there have been major changes in the curriculums. The vision of the science course curriculum was determined as: "To educate all students as scientifically literate individuals". It is suggested to utilize out-of-school learning environments in the training of individuals who are fit for vision (Şeyhioğlu, 2012). One of the aims of teaching in these environments with activities is that students could produce new, different and creative solutions by making in-situ analysis (Ramey-Gassert, 1997). In science education, it is thought that students should be educated like a scientist. Methods for delivering information by using the scientific process have been suggested. The philosophy of the program is the constructivist approach. In the constructivist approach, learners are constantly interacting with their environment and learn what they want to learn at the time they determine and in the way they want, also to the extent they want. In this regard, the constructivist approach supports out-of-school learning. As a matter of fact, formal education in school falls apart from the real dynamics and natural flow of life (Kıyıcı and Atabek Yiğit, 2010). In this sense, the experience of real life gains importance. The student must go outside of school in order to have this experience and observe. In Science, learning environments cannot be limited to chalkboard and books, but actual learning continues outside of the class walls (Ertaş et al., 2011). Environment is the most equipped laboratory and these areas contain the opportunity to learn science by making it easier to learn. The importance of out-of-school learning is increasing day by day. With the development in technology, informal learning as well as giving the most accurate and scientific information to learners become more important. In some countries such as Sweden, Norway, and the United Kingdom; extracurricular learning is used as an integrated training method with the curriculum which has been introduced especially in the last fifteen to twenty years (MEB, 2013). Also increasing number of scientific studies conducted in this area indicates the rising importance of out-of-school learning. When the studies on non-academic learning environments are examined, it is seen that the researches are generally about teachers, prospective teachers, parents' perspectives on this concept, teacher and parent's opinions about changes in students, opinions of teacher candidates on trips to non-school environments; interest, attitude and the academic success of students. By examining the overall results obtained from the studies, it is seen that out-of-school education increases the academic achievement and develops a positive attitude and interest in the course. However, teacher is the most fundamental basic element of success in education. Having awareness and sufficient knowledge about out-of-school learning in

science teaching has become highly important on behalf of teachers.

Our teachers prefer not to include the non-school science activities that formed the basis of our research into their teaching process. This reveals the necessity for a research of teachers' perceptions towards out-of-school science activities during their education. With our study, we aim to examine science teachers' attitudes towards teaching, awareness and understanding for out-of-school activities. Determining teacher candidates' perceptions of out-of-school science events will provide valuable information to us in designing teaching environments and ensuring that teachers are actively and effectively involved in this process. These studies will be contributed to the literature to be investigated experimentally.

Learning occurs in the mind. For an effective learning, it is a must for the student to associate what they have learned with their daily life and to internalize it by experiencing, observing, researching and questioning somewhere else than at school. Each individual's interest in learning, the desire to learn, the speed of learning and the method of learning are different. For this reason, out-of-school learning environments are influential in reaching information and achieving learning.

Learning is divided into Formal and Informal Learning

Formal learning: Reaching planned goals in a certain time, in a planned and programmed way. On the other hand, informal learning is learning outside of the school, which continues for a lifetime; while playing games, shopping on the mall, visiting a museum or zoo etc.... Learning in a variety of environments, from time to time, spontaneously, whenever the individual wants and as much as he or she wants. (Payne, 1985). In non-academic learning environments, persistence is increasing because the individuals learn by wondering, researching, seeing, observing and experimenting by himself/herself. Learning does not happen simply by a teacher teaching something to students in school. If learning was accepted only in the formal form; all learning that happened outside the school should have been ignored (Yavuz, 2012). Until individuals reach to the age for starting a school, they learn new, different and various phenomenon; events, concepts etc. from places outside of school, from people around them, from television, from places they visit (excursions, shops, market places, shopping centers, museums, factories, parks). Everywhere that is out of school, event, and entity are being informal learning environments. Recently, the science festivals that are included in the community services of the universities and the science fairs that secondary schools and high schools have prepared with the support of TÜBİTAK are also out-of-school learning environments. Moreover, learning from friends, from internet, from a mentor or by

watching television, reading books, magazines and newspapers happens in the out-of-school environment.

## **2. Purpose**

The purpose of this study is to determine the overall effects on the science teacher candidates, their attitudes towards science teaching, the development of their awareness and understanding in the context of out-of-school science activities. The research questions to be answered in parallel with these aims are:

1. Is there a meaningful improvement on attitudes of science teachers' who were participated in the study towards science teaching?
2. Is there a progress in the awareness and understanding of science teachers' candidates about science activities outside of school?

## **3. Sampling of the Study**

11 students composed of 3rd grade prospective teachers in 2016-2017 education years, Trakya University Faculty of Education Science Teacher Education were determined by appropriate sampling method.

## **4. Method**

Within the context of non-school science activities, in order to evaluate the effects on science teachers' attitudes towards science teaching, development of awareness and understanding; the data are collected qualitatively by using single group pre-test post-test design from research patterns. Sample of the work is determined as 11 students from prospective teachers who are students in 2016-2017 education years, Trakya University, Faculty of Education, Science Teacher Education by appropriate sampling method. The prospective teachers constituting our sample were participated in extracurricular science activities conducted by researchers in identified modules from the 7th grade Science curriculum. Attitudes, awareness and perceptions of the teacher candidates in respect to out-of-school science events were evaluated by a prepared Out-of-school Science Activities Teacher Candidate Assessment Form which consists of open-ended questions. Qualitative data were analyzed and evaluated by content analysis method. The frequencies of the codes and codes were calculated in the evaluations.

## **5. Application**

Learning outcomes of the 7th grade modules from the 2013 science curriculum of the 11 selected prospective teachers were investigated in terms of their suitability for the out-of-

school learning environments. Out-of-school learning outcomes have been aimed and appropriate environments for these aims have been elected. The following are out-of-school learning environments that are appropriate to the identified issues and outcomes. These:

- Oil Factory and Trakya University Faculty of Education Chemistry Laboratory, where we could give an insight about the separation of mixtures
- Hazardous Waste Storage Area and Solid Waste Disposal and Decomposition Plants of Edirne Municipality where we could give an insight about recycling and disposal of wastes.
- Edirne Creative Minds Science Workshop, where we could give an insight about electric circuits, bulb brightness and the fuse in serial and parallel connections
- Lalapaşa District Wind Energy Power Plant, where we could give an insight about energy conversion.
- Ali Kuscü Planetarium in İpsala, where we could give an insight about space and beyond

The necessary preparations were made by going to the above-mentioned out-of-school learning environments in accordance with the learning outcomes at certain intervals before the trip. The events to be held there have been examined. The relationship between material and the activities to be done are established. Teacher candidates were informed about the purpose of the excursion and the place to visit. A form of interview with open-ended questions was given to teacher candidates and they were asked to write a report before each visit by means of the learning outcomes. In addition, the necessary legal permissions have been taken and travel, transportation and nutrition needs were set. During the trip, teacher candidates were guided and necessary navigation was made. Activities were carried out together with the attendants so that the active participation of students was achieved. Teacher candidates have had some free time to look around according to their interest and to perform individual learning. Teacher candidates were available to conduct research, inquire, learn, practice and communicate. After the trip, teacher candidates talked about the excursion, they hold a conversation about the cases and phenomenon that attract their attention, and they shared their experience by telling each other what they have learned. After each trip, the interview form with open-ended questions prepared in accordance with the achievements was distributed to the teacher candidates and a report was requested. In this way, opinions about the awareness, understanding and applications of the teacher candidates about the non-school learning environments have been revealed.

## 6. Analysis of Data

Before starting out-of-school activities, "Out-of-School Science Activities Teacher Candidate Assessment Form", which has open-ended questions, was distributed to prospective teachers. The data obtained from the answers given by the teacher candidates were coded and categorized. A descriptive analysis of the data which is obtained from the open-ended questions was made. The data obtained from answers given by the teacher candidates are placed in the appropriate categories and the frequencies of the answers in these categories are calculated.

## 7. Results

The data in this section were evaluated by considering "the feelings and thoughts of the teacher candidates about the out-of-school activities before the practice" and "the feelings and thoughts of the teacher candidates about the out-of-school activities after the practice" and converting them into statements of attitude, awareness and understanding.

In order to reveal the teacher candidates' awareness towards out-of-school practices, the following questions have been asked before and after the practice.

**Question:** What do you think about out-of-school practice / activity?

The answers given by prospective teachers are evaluated and awareness about the subject is shown on the table.

**Table 1.**

**Awareness about non-school practice / activity locations**

Most commonly used words	Before practice (f)	After practice (f)	Frequency difference
Museum	7	7	0
Science festivals	4	5	1
Zoo	3	5	2
Field trips	3	5	2
Schoolyard	1	1	0
Factories	1	3	2
Power plants	0	3	3
Recycling plants	0	3	3
<b>Total</b>	<b>19</b>	<b>30</b>	

As they can be seen in the table, places such as power plants and solid waste sorting

facilities that teacher candidates did not mention before the work were mentioned after the work. In the pre-practice period, some environments that were not been thought before were mentioned after the application. It has been observed that there are an increasing number of places where they could think about in terms of non-school learning. Their horizons have been expanded with this study in regard to non-school application areas.

**Question:** Which institutions or organizations could be collaborated with for out-of-school activities?

The answers given by prospective teachers are evaluated and awareness about the subject is shown on the table.

**Table 2.**

**The table of awareness about the institutions that can be cooperated for out-of-school activities**

<b>Most commonly used words</b>	<b>Before practice (f)</b>	<b>After practice (f)</b>	<b>Frequency difference</b>
Municipality	4	5	1
Industrial establishments	4	5	1
Universities	3	4	1
Museum	3	5	2
Ministry of Education	2	4	2
Culture and tourism directorates	2	1	-1
<b>Total</b>	<b>18</b>	<b>24</b>	

As it could be seen, teacher candidates have stated the institutions that can cooperated for out-of-school events before and after the practice. When the frequencies in the table are evaluated, it is seen that after the study more teacher candidates expressed these institutions. This shows that the number of institutions to collaborate in non-school activities has increase.

**Question:** What is the most important thing in terms of teaching science lessons in out-of-school activities?

The answers given by prospective teachers are evaluated and awareness about the subject is shown on the table.

Table 3.

Table about awareness of importance in terms of teaching science lessons with out-of-school activities

Most commonly used words	Before practice (f)	After practice (f)	Frequency difference
The permanence of the information	8	9	1
Easier to understand the lesson	3	3	0
Didactic	2	3	1
Entertaining	2	5	3
Ingratiates the course	2	2	0
Increase of attendance	2	2	0
Provides consolidation	2	5	3
<b>Total</b>	<b>21</b>	<b>29</b>	

As it could be evaluated from the table, teacher candidates have stated that learning with out-of-school activities effect the students positively in terms of learning science topics. Teacher candidates expressed the most important points as the permanence of the information.

**Question:** How does teaching science topics in the non-school settings affect students' attitude toward science?

The answers given by prospective teachers are evaluated and awareness about the subject is shown on the table.

Table 4.

Table of attitude about how teaching science topics in non-school settings affect students

Most commonly used words	Before practice (f)	After practice (f)	Frequency difference
Develops a positive attitude toward the course	5	7	2
Entertaining	4	4	0
Interesting	4	5	1
Ingratiates the course	4	5	1
Arouses curiosity	3	5	0
Increases motivation	1	3	1
<b>Total</b>	<b>21</b>	<b>29</b>	

Teacher candidates have indicated that teaching science topics in non-school settings



promotes positive effect for students towards science. They also expressed that it occasions to like the lesson, increases the motivation and arouses interest.

**Question:** How does teaching science topics affect the academic success of students in an out-of-school setting?

The answers given by prospective teachers are evaluated and awareness about the subject is shown on the table.

**Table 5.**

**Table of attitude on the impact of teaching science topics in the non-school settings regarding academic achievement of students**

<b>Most commonly used words</b>	<b>Before practice (f)</b>	<b>After practice (f)</b>	<b>Frequency difference</b>
Learning by practicing and living	4	7	3
Increases success	5	4	-1
Increases persistence	4	4	0
It helps to identify professions and is effective in guidance	1	3	2
Provides socialization	1	3	2
Provides consciousness	1	2	1
<b>Total</b>	<b>16</b>	<b>23</b>	

Teacher candidates have stated that teaching science subjects in non-school settings enhances the academic success of students. After practicing, they also stated that it provides learning by living. They stated that even the students who were silent in the classroom and in the school environment, communicated with their teachers and friends so it has provided socialization.

### **8. Conclusions and Comments**

Teacher candidates' perceptions of out-of-school learning; their awareness, their competencies in this learning environment, their thoughts, the problems that may be encountered, the solutions they proposed were evaluated before and after the trip by semi-structured interviews. According to the study results; teacher candidates point out that out-of-

school learning environments are important in terms of science teaching. They think that these environments will increase the academic success of the students, contribute to their communication skills and socialization. It will be effective in developing a positive attitude towards the sciences. Because of having interesting features, they think that these places provide learning by amusing, doing and living. They stated that when they start teaching as a result of their practice, they want to do science activities with their students. Also with these activities, they believe that their communication with their students will be strong and they will succeed in realizing that science is in their lives.

Teacher candidates indicated that teaching in out-of-school settings is more related to daily life. Another answer is that it makes sense to teach by out-of-school activities to associate science topics with everyday life. Different studies are supported by this study. Eshach (2007) noted that extracurricular learning environments are effective in making students more curious by increasing their interest and motivation. In the study conducted by Ramey-Gassert (1997), it is stated that informal learning environments are characterized by increased motivation, curiosity and fun.

Teacher candidates stated that the advantage of teaching in non-school learning environments is permanent learning. Bozdoğan and his colleagues (2015) also pointed out the information that learning is more permanent by doing and living.

In a similar study by Sarıođlan and K¼c¼k¼z¼r (2017), 100 teacher candidates who study in Science Teacher Education between 2nd and the 4th grade have been interviewed. Apart from our study; houses, courses, study centers and social media are mentioned as extracurricular learning environments.

Out-of-school learning environments are not sufficient in our country. The following suggestions could be put forward:

- The number of science art centers, aquariums, nature education, science museums, planetarium etc. should be increased.
- Teacher candidates should gain awareness, knowledge and experience in out-of-school education.
- Theoretical and practical training should be given to teacher candidates in this subject.
- Teachers should receive in-service training on out-of-school education.
- Applied activity studies can be done together with the Ministry of National Education to enable stakeholders (teachers, students, prospective teachers, teaching staff) to enable them benefit from these studies.

When the results are evaluated as a whole, it can be said that science teacher candidates are conscious that out-of-school learning positively affects attitudes towards lectures and academic success. It is necessary to resist the lack of practice for teachers and students should be training in the related subject during their undergraduate education.

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