Id: 1053326

Participatory Educational Research (PER)
Vol.9(4), pp. 422-444, July 2022
Available online at http://www.perjournal.com
ISSN: 2148-6123
http://dx.doi.org/10.17275/per.22.98.9.4

Reflections from an Out-Of-School Learning Course: The Development of Pre-Service Science Teachers

Ümmü Gülsüm Durukan*
Department of Mathematics and Science Education, Giresun University, Giresun, Turkey
ORCID: 0000-0002-9279-2812

Ayşegül Aslan
Department of Mathematics and Science Education, Trabzon University, Trabzon, Turkey
ORCID: 0000-0003-2363-0091

Aykut Emre Bozdoğan
Department of Mathematics and Science Education, Gaziosmanpaşa University, Tokat, Turkey, ORCID: 0000-0002-5781-9960

Article history
Received:
04.01.2022

Received in revised form:
05.03.2022

Accepted:
14.03.2022

Key words:
Pre-service science teacher, out-of-school learning, self-efficacy, experience.

The aim of the study is to examine the development of pre-service science teachers within the course about the out-of-school learning. In this study, the effects of the implementations in the course on the perceptions of the pre-service science teachers about the relevant subject and their self-efficacy in organizing teaching activities in these environments were evaluated. The study was carried out employing an action research design. The study group consisted of 36 pre-service science teachers in The Department of Science Education at the Faculty of Education at a state university in Turkey during the 2019-2020 academic year. Data collection tools were "The Form of Pre-service Science Teachers' Opinion on OSL", "Self-Efficacy Belief Scale for Planning and Organizing Educational Trips to Out of School Settings" developed by Bozdoğan (2016), "Informal Learning Environments Scale" developed by Adiyaman (2019), and "Experience Determination Form" adapted by Aslan (2015). The data collection tools were used as a pre-test on the first week of the course and as a post-test on the fifteenth week of the same course. The qualitative data elicited from the open-ended questions and the "Experience Determination Form" were subjected to the content analysis method. The quantitative data obtained from the "Self-Efficacy Belief Scale for Organizing Educational Trips to Out-of-School Environments" and "Informal Learning Environments Scale" were analysed using the SPSS 25.0 package program. The dependent t-test was used to compare the scores of the pre-tests and post-tests. The results showed that the applications made within the course significantly affect the opinions of pre-service science teachers about out-of-school learning and their self-efficacy in organizing educational activities in out-of-school learning environments.

* Correspondency: ummugulsum.durukan@giresun.edu.tr

Introduction

According to the changing and developing understanding of education, it is seen that it is not sufficient to carry out the teaching-learning activities of the course contents in the curriculum only in the classroom environment. It is emphasized that the importance of out-of-school learning (OSL) activities has increased significantly in science lessons that are intertwined with daily life (Karademir, 2013). OSL activities, which are accepted as complementary to formal education today, define as education used depending on the curriculum of the fields and institutions outside the school structure and within the scope of the time spent at the school (Ertaş, Şen & Parmaksızoğlu, 2011). Sport centers, zoos, botanical parks, aquariums, national parks and areas, forested lands, museums, libraries, open-air laboratories, camps, factories also many other social areas that we cannot count are described as out-of-school learning environments (OSLEs) (Bozdoğan, 2015; Hannu, 1993). Teaching activities carried out in OSLEs support and enrich the educational activities at school (Okur-Berberoğlu & Uygun, 2013; Bozdoğan, 2015; Gerber, Marek & Cavallo, 2001). When the studies are examined, the positive contributions of the educational activities carried out in OSLEs on students can be listed, as shown in Figure 1.

In the science lessons, one of the OSL activities that have many positive contributions for individuals, as in Figure 1; it is stated that it can be used to associate the lesson with daily life, to make the lesson fun, and to provide permanent learning (Batman, 2020; Bozdoğan & Kavcı, 2016). While such positive contributions of out-of-school learning activities are emphasized in the literature; it is obvious that teachers should include such activities in the teaching process. For these teaching, activities to reach their goals, the planning, implementation, and evaluation stages require precision (Bolat & Köroğlu, 2020; Bozdoğan, 2016; Ertaş, Şen & Parmaksızoğlu, 2011). In the studies in the literature, it has been emphasized that well-planned and well-related OSL activities that are closely associated with the school curriculum will yield positive results (Bowker & Tearle, 2007). Teachers play an important role in successfully executing teaching activities in OSLEs. Therefore, teachers' willingness, responsibilities, and sensitivity in the process of organizing the trip should be at the maximum level, and at the same time, they should strive for a successful trip (Bozdoğan, 2016; Kete & Horasan, 2013).

Figure 1. The positive contributions of educational activities carried out in OSLEs

A significant part of the studies accumulated within the related literature of Turkey on OSLEs aims to organize teaching activities in these environments and to evaluate the variables for students participating in these activities (for example, Bozdoğan, 2007; Tortop & Özek, 2013). In the related literature, there are studies conducted with students, science teacher candidates, and teachers for OSLEs. In the study conducted by Balkan-Kıyıcı and Atabek-Yiğit (2010), it was concluded that the teacher candidates realized meaningful and permanent learning after the

technical visit to the power plant within the scope of the "wind energy" topic in the "Energy and Environment" lesson. Mertoğlu (2019) also stated that as a result of the OSL activities, pre-service teachers realized new and permanent learning in many subjects related to science, especially in physics. In their study, Ocak and Korkmaz (2018) examined the views of teachers about OSLEs. According to the teachers in this study, OSLEs allow students to learn by doing-experiencing and permanent learning, concretizing abstract information, and contributing positively to students' development. In their studies, Bostan-Sarıoğlan and Küçüközer (2017) and Kubat (2018) sought the opinions of pre-service science teachers about out-of-school learning environments, the activities to be organized in these environments, and the contribution of these activities to the teaching process. In the statements of the pre-service science teachers; it was mentioned in these studies that they listed only a few out-of-school learning environments and talked about the advantages and disadvantages of the use of out-of-school learning in the teaching process. Similarly, the study conducted by Batman (2020) that examines physics teachers' views about OSLEs and the positive contribution of activities in these environments were found and commented that these activities would effectively facilitate and make learning permanent. In Aslan and Demircioğlu's (2019) study, chemistry teachers stated that OSLEs are suitable for teaching chemistry. These environments enable students to learn by doing and experiencing, to recognize the connection between subject and daily life, and to encourage lifelong learning.

The Ministry of National Education published "Out of School Learning Environments Guidebook" based on provinces in 2019. It stated that OSL activities should be implemented at all levels, from pre-school to high school, starting from the 2019-2020 academic year. Considering this situation, a teacher is expected to have the competencies to prepare, plan and organize learning activities in OSLEs. On the other hand, the studies in the literature show that teachers have a positive view of the organization of teaching activities in out-of-school learning environments, but mostly they do not prefer to use these environments during teaching activities (Carrier, 2009; Çiçek & Saraç, 2017; Tatar & Bağrıyanık, 2012). As the reasons for this situation, many studies in the literature mention the difficulties experienced by teachers. Çiçek and Saraç (2017), Güler (2009) and Füz (2018) stated in their studies that teachers do not have enough information about the field trips. As a result, it is believed that pre-service science teachers should be assisted in gaining knowledge, awareness, and a positive perspective on OSLEs. Bozdoğan (2016), on the other hand, stated in his study that pre-service teachers do not have the self-efficacy belief of organizing trips outside of school for educational purposes, and they are worried. On the contrary, teachers emphasized that it is challenging to plan OSL activities (Carrier, Tugurian & Thomson, 2013). However, Thomas (2010) said that teachers are insufficient in guiding before and during the trip. In addition, it has been determined that teachers see the intensity of bureaucratic procedures, responsibility, time, and cost as problems (Bozdoğan, 2008; Çiçek & Saraç, 2017; Dillon et al., 2006; Kisiel, 2005; Tatar & Bağrıyanık, 2012).

Based on these studies, it is thought that there is a need for studies on OSLEs on teacher education. In fact, the related studies show that preservice teachers should gain experience in the use of OSLEs in teaching activities. Furthermore, experiencing the design of teaching activities for OSLEs will increase their self-confidence and encourage them to carry out teaching activities in these environments. The lack of results emphasizing the changes experienced by pre-service science teachers in the teaching process related to out-of-school learning in the studies mentioned above is the reason for this study. In addition to this thought, as Bostan-Sarıoğlan and Küçüközer (2017) stated in their study, pre-service teachers should examine the sample applications related to out-of-school learning environments. It is believed

that determining the experiences of pre-service teachers after a learning process designed with the content of out-of-school learning environments will shed light on researchers in terms of teacher education. Accordingly, the study is to investigate the impact of implementations developed within the framework of the course on the views of pre-service science teachers about OSL and their self-efficacy to organize teaching activities in these environments. The research question is: "How effective are the implementations produced within the context of the course on pre-service science teachers' opinions about out-of-school learning and their self-efficacy to arrange teaching activities in these environments on their self-efficacy to organize teaching activities in these environments?" is already filled out. Answers to the sub-problems listed below were sought within the context of this problem situation.

RQ1. What is the effect of the implementations within the framework of the course on the opinions of pre-service science teachers about out-of-school learning?

RQ2. What is the effect of the implementations within the framework of the course on the self-efficacy of pre-service science teachers to organize teaching activities in out-of-school learning environments?

Method

This study was carried out within the framework of action research. According to Yıldırım and Şimşek (2013, p.333), action research is the process of collecting and analysing data in a planned manner to understand the problems found in the practice or the problem in the middle, prepared by a practitioner working in organizations himself or with a researcher, and to solve these problems. In action research, the problem is defined, solutions are sought, solutions are applied, evaluations are made, solutions are developed, and the best solution is sought (Büyüköztürk, Kılıç-Çakmak, Akgün, Karadeniz, & Demirel, 2011, p.18). Opportunities for action research participants to develop analytical thinking skills about their own practices, to ensure that they are open to new ideas and changes in education, to develop their decision-making and awareness skills, to make them look critically at teaching, to determine which methods are more appropriate, to gain knowledge and skills in research methods and practices (Pine, 2009). For this reason, in this study, a teaching process was designed (Figure-2) and the effectiveness of this designed process was tested so that pre-service science teachers could gain experience in out-of-school learning and teaching activities organized in these environments.

Study Group

The study group was consisted of 38 pre-service science teachers (PSTs) in their last year of the department of science education in the education faculty of a state university and taking the course related to out of school learning. Two PSTs, however, were excluded from the study group due to difficulties in participating in the implementation process. The remaining 36 PSTs (30 females, 6 males, and aged 21-23) were determined as the study group.

Data Collection Tools

The following data collection tools were used, within the scope of the study.

1) The Form of Pre-service Science Teachers' Opinion on OSL (PST-OOSL): This form contains four open-ended questions to evaluate PSTs' awareness of OSL and the applied teaching process. Related studies in the literature were reviewed while preparing the questions

in this form. In addition, at the beginning of this form, there are demographic questions about PSTs' age, and gender. The open-ended questions in the PST-OOSL are presented:

A. What is out-of-school learning? Please explain.

B. Have you ever taken a trip to an environment that can be used as an out-of-school learning environment? If your answer is yes, please briefly explain the content of this trip(s).

C. Give examples about out-of-school learning environments that can be utilized during educational activities.

D. Do you think you can benefit from out-of-school learning environments during educational activities? Please explain the reasons.

2) Experience Determination Form (EDF): This form, developed by Wishart and Triggs (2010) and adapted by Aslan (2015), has 17 positive (interactive, teamwork, social, etc.) and 11 negative (confusing, unnecessary, difficult, etc.) words which are thought to reflect participant experiences about the activities and environment. PSTs were asked to circle the 5 words that best reflected their experiences and then explain in detail why they chose these words under the table. With this, it was ensured that the opinions of all PSTs on OSL were taken in a short time. In addition, it was used in the study to reveal the experiences of PSTs.

3) The Informal Learning Environments Scale (ILES): The five-point Likert-type scale developed by Adıyaman (2019) has a single factor and 10 items (for example; "With my trips to museums, I better understand the world I live in by seeing, hearing and touching" and "Through my visits (zoos, water parks, botanical gardens, national parks, nature centers, etc.), I learn about many species of living things that I have never seen before"). The Cronbach Alpha reliability coefficient of the scale was found to be 0.96. After confirmatory factor analysis (χ^2/sd=2.601, RMSEA=0.071, SRMR=0.0409, GFI=0.960, AGFI=0.915, CFI=0.969, NFI=0.951), it was decided that the scale was applicable. It was used to reveal the PSTs' perspectives on OSL before and after the relevant application.

4) Self-Efficacy Belief Scale for Planning and Organizing Educational Trips to Out of School Settings (SEBS-POET-OSL): The five-point Likert-type scale developed by Bozdoğan (2016), consisting of five factors and 30 items. The scale's Cronbach Alpha reliability coefficient was found to be 0.93. It was used in the study to reveal PSTs' self-efficacy beliefs before and after the application.

Implementation Process

The study was conducted with 36 senior PSTs who enrolled in the course during the spring term of the 2019-2020 academic year, face-to-face for the first four weeks, and distance education for the following 10 weeks. The implementation process took 14 weeks in total, and the content of the study and the course are explained in Figure 2.

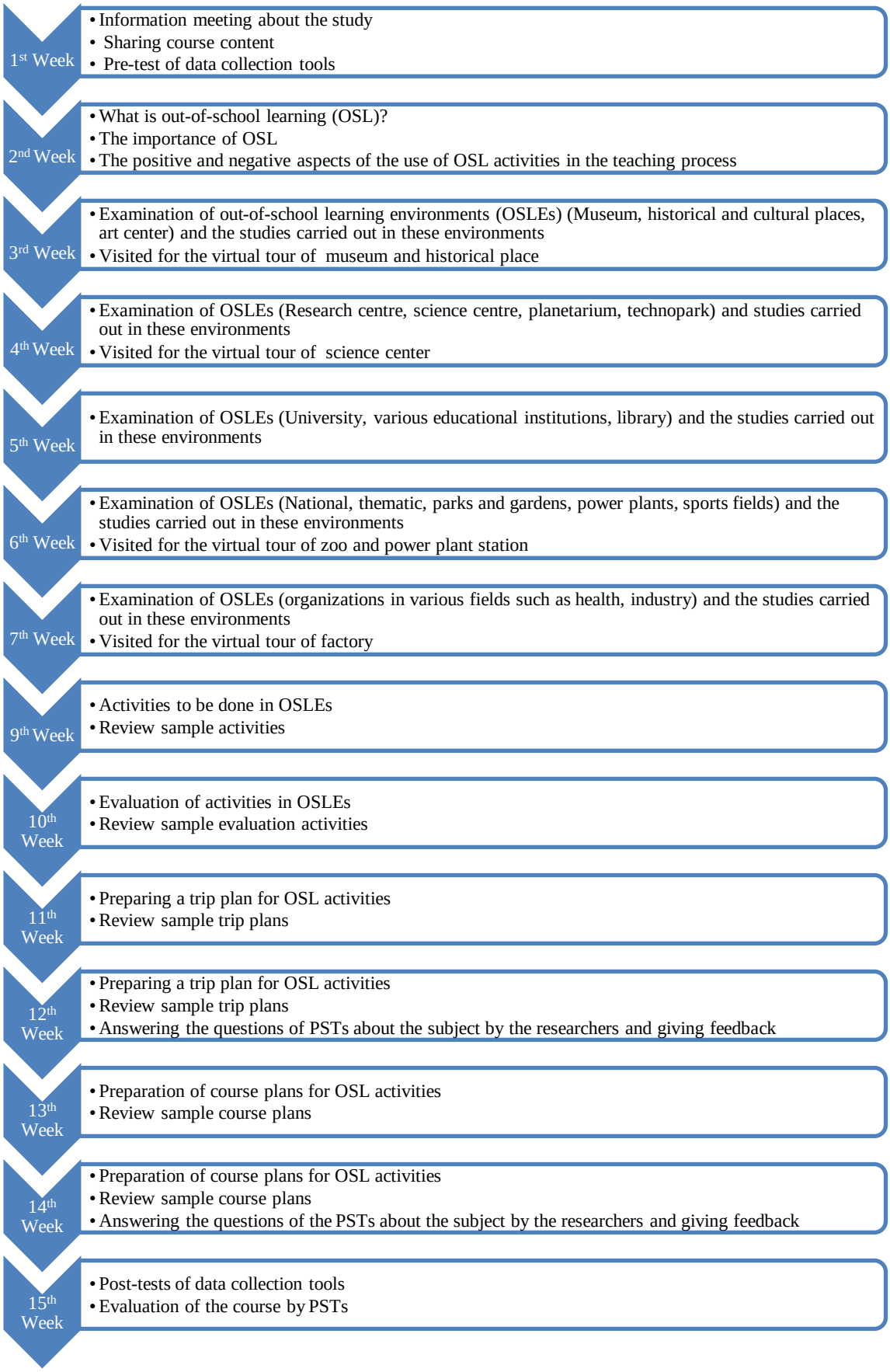

Figure 2. The course contents

In the course, the OSL concept and OSLEs were introduced in the first seven weeks, and the studies carried out in these environments were examined. In seven weeks following the eighth week, which is the midterm week, the learning activities to be carried out in OSLEs and the methods for evaluating these activities are explained. In addition, the processes of preparing trip and course plans for OSLEs were discussed, and the examples of trip and course plans prepared for OSL activities were examined. Besides, because of the pandemic, the virtual tours for OSLEs were used in the course for becoming an example for pre-service science teachers and in these virtual tours, what kind of activities can be planned was discussed. Finally, the researchers provided feedback on the trip and course plans prepared by the PSTs (Figure 2).

Data Analysis

The data from the scales were analysed using statistical analysis methods, whereas the data from other data collection tools were analysed by descriptive analysis. The descriptive analysis, on the other hand, was used to analyse the data from the PST-OOSL and the EDF. The answers given to the PST-OOSL's questions were coded and gathered under common themes. Two researchers first made the analysis, and the analysis was finalized after being checked by another researcher. The percentage of agreement between researchers was calculated with Miles and Huberman (1994)'s the percentage of agreement formula (Percent of agreement = [Agreement/Disagreement+Agreement]*100) to determine the study's reliability. This value was determined as 0.92. In the analysis of the data from the EDF, a table of frequency and percentage values was created for each word selected by the PSTs. At the same time, examples of different PSTs' expressions explaining the reasons for choosing these words are presented.

The data from the SEBS-POET-OSL and the ILES were analysed using the SPSS 25.0 package program. The data were first subjected to normality and variance homogeneity tests. Within the framework of the results of these tests, the dependent t-test was then used to compare the scores of the pre-test and post-test.

To increase the validity of the analysis, examples from the PSTs' statements were used to present the findings. The PSTs were given the codes PST1, PST2, PST3, ..., PST36 while presenting these statements. During this coding, pre-test/post-test applications were also taken into account as a data source. The letters' pr' for the pre-test and 'po' for the post-test were added in front of the codes (for example, prPST1: pre-test/pre-service science teacher 1 and poPST1: post-test/pre-service science teacher 1).

Results

The results of the study are presented under this title within the framework of the data collection tools.

Results from The Form of Pre-service Science Teachers' Opinion on OSL

The PSTs' answers to the questions in the PST-OOSL in the pre and post-tests were analysed based on questions and summarized in appropriate tables. The definitions of the PSTs regarding the concept of OSL, which is the first question of the PST-OOSL, are presented in Table 1.

Table 1. The PSTs' definitions of OSL

Themes	Codes	Pre-test	Post-Test
The environments which are outside of school	The learning environment we create outside of school	15	19
	Anywhere outside of school	15	
Content of learning activities	Unplanned and unscheduled learning environment outside of school	3	
	Planned and programmed learning environment outside of school		17
Visited places	The places we travel	3	

It is seen in Table 1 that the PSTs explained OSL under three themes and four codes in the pre-test. The PSTs generally defined OSL as "the learning environment we create outside of school" and "any place outside of school". Sample expressions from the PSTs' explanations are presented below.

"Providing more effective and more permanent education by doing out-of-school learning in places where it is possible to see the places mentioned in the curriculum (prPST29- The learning environment we create outside of school)"

"A more unplanned and unscheduled teaching environment outside the school (prPST3- Unplanned and unscheduled learning environment outside of school)"

"Organizing trips to places such as museums and factories outside of school (prPST8- The places we travel)"

"Any imaginable environment outside the school roof (prPST12- Anywhere outside of school)"

It is seen that PSTs defined the concept of OSL under two themes and two codes in the post-test (Table 1). While the majority of the PSTs define OSL as learning environments that we create outside of school, the rest of the pre-service science teachers described it as a planned and programmed learning environment outside the school. An example of this definition can be given as the expression *"Ensuring that students learn by living, experiencing or observing within the framework of a plan and program in out-of-school environments to support permanent and more effective learning (poPST2)"*.

The second question in the PST-OOSL; "Have you ever taken a trip to an environment that can be used as an out-of-school learning environment? If your answer is yes, please briefly explain the content of this trip(s)" were asked to the PSTs. The PSTs who answered 'Yes' and visited OSLEs were presented in Table 2.

Table 2. OSLEs visited by PSTs

OSLEs		f	
		For instructive purposes	For individual purposes
Museums	Museum		16
Science and research centers	Planetarium		4
	Science Center		2
Historical And Cultural Places	Historical Place		7
Libraries	Library	1	
Industrial Establishments	Factory		2
	Recycling Facility		1
National and Thematic Park and Gardens	Zoo		10
	National Park		2
	Camp		1
Various Institutions and Organizations	Cinema		2
Various Educational Organizations	Public Education Center	1	
	Schoolyard	1	

Table 2 shows that the PSTs frequently had trips to museums (f=16), zoos (f=10), historical places (f=7) and planetariums (f=4) for individual purposes. Three PSTs visited these environments for instructive purposes. According to the twelve PSTs in the study group (PST8, PST13, PST20, PST22, PST23, PST25, PST26, PST28, PST30, PST33, PST35, PST36), they had never been in an OSLE in their trips before. The examples provided by the PSTs to the OSLEs that can be used during the educational activities in the PST-OOSL are summarized in Table 3.

Table 3. Examples provided by PSTs to OSLEs

Themes	OSLEs	Pre-test	Post-Test
Museums	Museum	25	33
Science and research centers	Science Center	9	21
	Planetarium	9	18
Art centers	Art Center		10
	Science Exhibits	1	
Technoparks	Technopark		10
Historical And Cultural Places	Historical And Cultural Place	2	10
Libraries	Library		10
Natural Protected Area and Ruins	Natural Protected Area and Ruin		13
Industrial Establishments	Industrial Establishment	3	17
	Factory	4	18
	Mill		1
Universities	University		5
National and Thematic Park and Gardens	Zoo	15	15
	Botanical Park/Garden	3	12
	Aquarium	1	8
	National Park		9
	Theme Park (Skateboard Park, Funfair)		3
	Nature	1	
Various Institutions and Organizations	Non-Governmental Organizations (AFAD)		2
Healthcare Organizations	Hospital		3
HEPP and Power Plants	Power Plant	1	12
Sports Areas	Stadium		1
Various Educational Organizations	Public Education Centers	4	

	Courses	2
	Schoolyard	2
	Seminar	1
Others	Home	3
	Social Clubs	4
	Street	1

It has been determined that the examples provided by the PSTs to the OSLEs that can be benefited during the educational activities are categorized into sixteen themes. In the pre-test, the PSTs frequently expressed the museum (f=25), zoo (f=15), a planetarium (f=9), and science center (f=9) as an OSLE. The examples provided by the PSTs to the OSLEs that can be used during their educational activities are frequently museum (f=33), science center (f=21), factory (f=18), a planetarium (f=18), industrial/industrial establishment. (f=17), zoo (f=15), natural protected area and ruins (f=13), botanical garden (f=12), power plants (f=12), art center (f=10), historical and cultural places (f=10), library (f=10) and technopark (f=10) in post-test. The last question in the PST-OOSL; "Do you think you can benefit from out-of-school learning environments during educational activities? Explain the reasons" were asked. The PSTs' reasons for using OSLEs are summarized in Table 4.

Table 4. PSTs' reasons for using OSLEs

Themes	Codes	Pre-test	Post-Test
Contributing to learning/learning process	Allows learning by doing	14	19
	Provides permanence of knowledge	11	22
	Relates learning to daily life	9	14
	Active learning is provided	1	5
	Provides an interactive learning environment	1	---
	Supports formal education	---	6
Supporting subject-concept teaching	Provides a better understanding of topics	7	16
	Embodies the abstract concepts	2	13
	Reinforces the topic	2	2
	Learn a variety of information	2	
	Offers rich content		3
Supporting affective features	Have fun/learn with pleasure	4	12
	Grabs students' attention	2	6
	Motivates the student	2	5
	Encourages learning/Increases desire to learn		2
Contributing to outcomes of learning process	Supports them to be science literate		3
	They can learn many gains in the same process.		2
	Establishes interdisciplinary relationships		1
	Increases academic achievement		1
Accessing information and supporting this process	Gets first-hand knowledge		1
	Supports the student to construct their knowledge		1
Developing skills in different fields	Develops science process skills		2
	Improves observation ability		1
	Improves social skills		1
	Contributes to creative thinking		1
	Gains critical thinking skills		1

The PSTs' reasons for using OSLEs during their educational activities categorized under the six themes. In the pre-test, the codes under the themes of contributing to learning/learning process, supporting subject-concept teaching, and supporting affective features were mentioned by PSTs. Learning by doing (f=14), because it ensures the permanence of knowledge (f=11), because it helps students relate what they know to daily life (f=9) and what is taught in these

environments in pre-test. It was found that they preferred it (f=7) because it provided a better understanding of the subjects (Table 4). The examples of PSTs' explanations are presented below.

"We can definitely benefit from these. For example, students can be taken to the planetarium whilst teaching astronomical terms. Thus, it is ensured that many abstract concepts are concretized (prPST10- Embodies the abstract concepts)"

"Yeah. ... For example, I can take advantage of the classification of living things by organizing trips to the zoo or botanical parks with the students to reinforce the subject (prPST12-Allows learning by doing)"

In the post-test, the codes are categorized under the six themes. Because the PSTs ensure the permanence of knowledge during the execution of teaching activities (f=22), provide learning by doing (f=19), enable students to understand the subjects better (f=16), associate what they learn with daily life (f=14), provide concretization of the subjects. (f=13) and because they learned with fun/taste (f=12) that they wanted to use it (Table 4) in post-test. The examples of PSTs' explanations are presented below.

"Yeah. In fact, out-of-school learning environments support the subject we teach at school. For example, while I was teaching the Solar system and beyond unit, I would have made the subject more attractive by integrating it with a planetarium trip during the exploration phase of the lesson (poPST1- Grabs students' attention- Supports formal education)"

"Yes, I think I will benefit from it as I believe it will help students learn science subjects permanently. For example, in grade 5, I might take my students to the zoo to classify living things. ... I will encourage students to become science literate by introducing them to objects. ... (poPST19- Provides permanence of knowledge- Encourages learning/Increases desire to learn)"

"I think I can benefit. For example, I think that I will provide more permanent and easy-to-learn learning by taking students to a soap factory or factories where chemicals such as bleach and detergent are produced, getting ideas about the cleaning materials that students use in daily life, making concrete observations and examining them. ... I try to ensure that the student develops his/her observation ability, grows as a social individual, strengthens his/her communication skills, and learns from his/her own experiences (poPST26-Relates learning to daily life - Have fun/learn with pleasure)".

Results from the Experience Determination Form

The words chosen by the PSTs in the EDF are presented in Table 5.

Table 5. Words chosen by the PSTs in the EDF

Words	Pre-test	Post-test
Entertaining	26	34
Instructive	22	29
Social	19	22
Interactive	18	22
Experience	16	18
Motivating	15	26
Enjoyable	14	23
Beneficial	10	13
Creative	9	27
Different	8	11
Various	8	7
Interesting	6	4
Teamwork	5	4
Explanatory	2	15
Easy	2	
Amazing	1	
Tough		8
Complicated		4

In the pre-test, the PSTs who responded to the EDF were often entertaining (f=26), instructive (f=22), social (f=19), interactive (f=18), experience (f=16), motivating (f=15), enjoyable (f=14) and beneficial (f=10), expressing their expectations for OSL activities. Sample expressions of the PSTs ' expectations about the course are presented below.

"I will learn that the excursions are diverse (e.g., museums, science centers). I think that we will discuss the stages of the trips interactively in the classroom. I believe that all of these activities we do will be important experiences for our future life (entertaining, instructive, experience, diverse, interactive, prPST10)"

"Because it is an out-of-school activity, it is an experience that includes teamwork through interaction with our friends. At the same time, students will be motivated, and their success will increase with the trips (teamwork, motivating, experience, useful, interactive, prPST15)"

In the post-test, the PSTs were often entertaining (f=34), instructive (f=29), creative (f=27), motivating (f=26), enjoyable (f=23), social (f=22), interactive. (f=22), experience (f=18), explanatory (f=15), beneficial (f=13) and different (f=11) words as the words that best express their experiences. Sample statements from the PSTs' experiences with the course are presented below.

"While preparing my travel plans, I discovered places I did not know and had fun. While describing an outcome in an out-of-school learning environment, students can be even more motivated by interacting there one-on-one, and we can witness many creative ideas at that time. Going to an environment that students have never seen before will make that environment more interesting and will motivate the student's sense of curiosity more (entertaining, interesting, creative, motivating, interactive, poPST1)"

"It is different because apart from the usual classroom lessons, it makes education fun by making it fun. It is social because it enables learning and discovering, communicating with

people, and exchanging views during the trip. It's fun because it's always more fun to learn by doing and experiencing new places and information. It is instructive because it allows us to gain permanent knowledge by seeing and interpreting the subject acquisitions, we see at school without realizing it outside of school. Experience because the information learned by doing takes place in permanent memory and records the information without being aware. It enables us to gain experiences that will be used in life in the future (different, social, entertaining, instructive, experience, poPST29)"

Results from the Informal Learning Environments Scale

The pre and post-tests' scores of the PSTs from ILES were analysed with the dependent t-test. The results from this analysis are presented in Table 6.

Table 6. Dependent t-test analysis results of the data from the ILES

Tests	N	X	sd	df	t	p
Pre-test	36	41,94	6,27	35	-4,054	,000
Post-test	36	46,06	4,13			

It was determined that there was a statistically significant increase in favour of the post-test in the PSTs' perceived from the ILES scale scores [$t_{(35)}$=-4,054, p<.01]. When the pre-test (X=41.94) and post-test (X=46.06) mean scores taken from the scale were compared, an increase was observed between the averages in favour of the post-test.

Results from the Self-Efficacy Belief Scale for Planning and Organizing Educational Trips to Out of School Settings

The total self-efficacy belief scores of the PSTs from SEBS-POET-OSL were analysed with the dependent t-test. In Table 7, the results of this analysis are presented.

Table 7. Dependent t-test analysis results of the data obtained from the SEBS-POET-OSL

Tests	N	X	sd	df	t	p
Pre-test	36	91,89	9,04	35	-3,268	,002
Post-test	36	97,22	5,03			

It was determined that there was a statistically significant difference in favour of the post-test in the self-efficacy belief scores of the PSTs in organizing educational trips outside of school [$t_{(35)}$=-3,268, p<.01]. Furthermore, when the pre-test (X=91.89) and post-test (X=97.22) mean scores of self-efficacy belief scores were compared, an increase was observed between the averages in favour of the post-test's scores.

Discussion and Conclusion

The results obtained from this study show that the practices, reviews and feedbacks within the content of the course effectively raise the PSTs' awareness about OSL and their self-efficacy in organizing educational activities in OSLEs. According to SEBS-POET-OSL results, it can be interpreted as the content of the course and the activities carried out increase the self-efficacy beliefs of PSTs to plan and organize educational trips to the OSLEs. It can be said that

the implementations made within the scope of the course are at a sufficient level for the development of PSTs' self-efficacy. The literature indicates that teachers' insufficient knowledge and experience in organizing out-of-school learning activities are among the reasons for their low self-efficacy towards these activities (Sontay & Karamustafaoğlu, 2017; Şişman, 2009; Tal & Morag, 2009; Thomas, 2010). However, as stated in the results, it is essential to experience the theoretical knowledge through the implementation process. Durel (2018) organized trips to different out-of-school learning environments (factory, recycling facility, university, planetarium, power plant) with 7th-grade students, science teachers, and pre-service science teachers in his study. After these trips, it was seen that the increase in the academic achievement of the students was higher, and when the data obtained from the pre-service science teachers were evaluated, an increase in the desire to participate and to make such studies and an improvement in taking responsibility. It has been determined that there are developments in the teachers' thoughts about the areas of OSL activities and the institutions to cooperate. In this study, it was seen that all the PSTs answered positively the benefits from out-of-school learning environments during educational activities in the pre- and post-tests. The pre-service teachers stated that OSL activities would provide the opportunity to learn by doing, the permanence of the information will be ensured, the subjects will be concretized, the students will understand the subject better; they will be able to associate the information they have learned with daily life and will support formal education. In the studies conducted in the literature (e.g., Balkan-Kıyıcı & Atabek-Yiğit, 2010; Çiçek & Saraç, 2017; Göksu & Somen, 2018; Kubat, 2018), a significant portion of the pre-service teachers stated that learning by doing-experiencing the advantages of OSLEs, first-hand. They emphasized the benefits of experience, observation, and discovery. The results obtained in this study are also consistent with the results of studies in the literature (see Figure 1). Bell, Lewenstein, Shouse, and Feder (2009) stated that OSL activities increase students' motivation, use, and remember new information, develop scientific process skills, participate in learning processes, develop social skills, create a scientific identity, and enable analysis, synthesis, and analysis in science education. They stated that they take an active role in acquiring high-level skills such as assessment. In this case, it was stated that the inclusion of entrepreneurship and life skills in addition to the science and engineering practices included in the new science curriculum (MoNE, 2018) would make significant contributions to the learning by the experience of the students (Ural-Keleş, 2018); however, the understanding required for these contributions can be made. It has been concluded that the design of the environments is important. Timur, Timur, Yalçınkaya-Önder and Küçük (2020) examined the attitudes of 170 students aged 7-14, who attended out-of-school STEM workshops in a province in Turkey, towards STEM education, according to various demographic characteristics. The results showed that out-of-school STEM workshops improved students' attitudes towards STEM. In addition, it was concluded that students' lack of knowledge about STEM education and reaching a concrete result for children who learn by doing affects their attitudes positively. In this context, it is thought that the experience of pre-service science teachers in planning and implementing OSL activities will contribute positively to STEM practices.

Results obtained from the EDF; showed that the PSTs found the course content entertaining, instructive, creative, motivating, and enjoyable (Table 5). While the frequency values of the given words have increased in general, the change in the frequency values of the words creative, motivating, enjoyable, explanatory, and tough has been noteworthy. In this context, it can be stated that while PSTs plan educational activities in OSLEs, they also benefit from the positive effects of activities in OSLEs. Wishart and Triggs (2010) found that more than 30 words "interesting" and "entertaining" were chosen as a result of the online experience determination form applied to the students. Aslan (2015), on the other hand, determined that 57% of positive

words and 7% of negative words were chosen among the words in the experience determination form. It was seen that the negative words were not mainly chosen. The words entertaining, enjoyable, instructive, and interesting are at the beginning of the words frequently chosen by the students.

In the examples given by the PSTs regarding OSLEs, environments such as streets and houses were mentioned. This situation was also detected in the study of Bostan-Sarıoğlan and Küçüközer (2017), and it was determined that pre-service teachers commonly see areas such as home, friend environment, private teaching school, study center as an OSLE. At this point, it can be said that PSTs do not have sufficient experience as a student in OSL activities before the course. The findings in Table 1 also support this result. In the post-test, the PSTs stated that they could frequently use universities, zoos, science centers, factories, and power plants; rarely use aquariums, hospitals and theme parks as OSLEs. At this point, it can be said that at the end of the course, pre-service science teachers get to know the out-of-school learning environments better and analyse their characteristics. In support of this situation, according to ILES findings, the PSTs' perceptions improved as a result of the course content and activities. It was determined in the study of Bozdoğan (2008) that pre-service teachers stated that visits to science centers would be beneficial both in terms of their professional development and that the teaching activities to be organized in science centers could increase students' interest in science and academic success, provide students with science literacy and affect their career choices. Similarly, Mertoğlu (2019) stated in his study that pre-service teachers like science centers the most among OSLEs. Kubat (2018), on the contrary, discovered that when pre-service science teachers are asked about OSLEs, science centers and science museums come to mind first, followed by zoos and planetariums. The use of museums for science teaching was also suggested by science teachers in Cebeci's (2019) study; it was stated that they expressed their opinion that studies should be carried out to disseminate museums, highlight their educational function and transform museum environments into interactive learning environments. Finally, this study revealed that although students generally prefer to use the internet to conduct research, public libraries' usage rates are very low (Balcı, Uyar & Büyükikiz, 2012) libraries are also defined as an OSLE by the PSTs. It was observed that the lesson plans prepared by the PSTs for an exemplary power plant trip mostly covered the eighth-grade subjects. It is essential to raise awareness in pre-service teachers and students about renewable energy sources. In his study, Izgi-Onbasili (2020) investigated the effect of energy resources activities on the attitudes and opinions of primary school teacher candidates towards renewable energy resources in the context of OSLEs. Within the scope of the study, OSL activities were held at the Solar Park House, Turkey's first nuclear power plant, and the Akkuyu Nuclear Power Plant Information Center in Mersin. As a result, it was determined that there was a significant difference in the scores of the primary school teacher candidates on the pre and post-tests for renewable energy sources, favouring the post-test scores.

Based on the innovative practices included in the 2023 Education Vision, to use OSLEs in the teaching process and eliminating the problems expressed in the literature regarding this process, 'Out-of-school Learning Environments Guide' were prepared by the Provincial Directorates of National Education of MoNE. In these guides, the OSLEs in their provinces were associated with the units, subjects, and acquisitions of the relevant courses at each grade. For being effectively used the guides, the teachers must have knowledge and experience about OSL. For this reason, it is crucial to teach undergraduate courses (such as teaching principles and methods, or courses related to field education) that include OSLEs as openly as possible to gain knowledge and experience. In addition, it is seen that a course on out-of-school learning has been added to the undergraduate contents of science education department updated in 2018. At

this point, it can be suggested to carry out studies on preparing enriched content for the course and to support the teaching process with mobile (Turan-Güntepe, Durukan & Dönmez-Usta, 2021) and technological (such as video assisted (Aslan, Batman, Durukan & Güler, 2021) applications. As was done in this study, the planned OSLE visits could not be realized due to the fact that the application of the course coincided with the pandemic process, and instead of these visits, activities in the course were emphasized in virtual tours of these environments. Planning the course content in a way that supports not only one-to-one visits to the environment, but also the use of virtual tours of these environments, is considered important in terms of preparing pre-service science teachers for such situations that may occur in the future.

Acknowledgement

This research was conducted as part of the EĞT-BAP-A-270220-51 project, which was funded by the Giresun University Scientific Research Projects Unit. The study was approved by the Giresun University Scientific Research and Publication Ethics Committee in a decision dated 02.06.2020 and numbered 44079388-050.01.04-E.23458. Furthermore, some of the findings of this study were presented as an oral presentation at the 14th National Science and Mathematics Education Congress, which will be held at Burdur Mehmet Akif Ersoy University on May 19-21, 2021.

References

Adıyaman, A. (2019). *Öğretmen adaylarının algın öğrenme ortamlarına ilişkin görüşlerinin belirlenmesi [Determination of pre-service teachers' views on the informal learning environments]* (Unpublished master's thesis). Bartın University, Bartın.

Anderson, D., & Piscitelli, B. (2002). Parental recollections of childhood museum visits. *Museum National, 10*(4), 26-27.

Aslan, A. (2015). *Etkileşimli sınıf dışı kimya ortamı tasarımı ve etkililiğinin belirlenmesi [Design of interactive out-of-class chemistry environment and evaluation of its effectiveness]* (Unpublished dissertation). Karadeniz Technical University, Trabzon.

Aslan, A., & Demircioğlu, G. (2019, November). *Kimya öğretmenlerinin sınıf dışı öğrenme ortamlarına yönelik görüşlerinin belirlenmesi [Determination of chemistry teachers' perceptions of out-of-school learning environments]*. In 1st International Informal Learning Congress (pp. 28-37), 1-3 November 2019, Nevşehir.

Aslan, A., Batman, D., Durukan, Ü.G. & Güler, M. (2021). An alternative learning during pandemic: Video-assisted out-of-school learning activities. In Ş. Danişman & M. Güler (Eds.), *Educational Implications in The Covid-19 Era* (p. 63-88). Ankara: Vizetek.

Bakioğlu, B., & Karamustafaoğlu, O. (2020). Okul dışı öğrenme ortamlarının öğretim sürecinde kullanımına yönelik öğrenci görüşleri [Pupil views on the use of out-of-school learning environments in teaching process]. *Journal of Research in Informal Environments, 5*(1), 80-94.

Balcı, A., Uyar, Y. & Büyükikiz, K. K. (2012). İlköğretim 6. sınıf öğrencilerinin okuma alışkanlıkları, kütüphane kullanma sıklıkları ve okumaya yönelik tutumlarının incelenmesi [The examination of reading habits, frequency to use library and attitudes towards reading of 6th grade primary school students]. *Turkish Studies - International Periodical for the Languages, Literature and History of Turkish or Turkic, 7*(4), 965-985.

Balkan-Kıyıcı, F. & Atabek-Yiğit, E. (2010). Science education beyond the classroom: A field trip to wind power plant. *International Online Journal of Science Education, 28*(12), 1373-1388.

Batman, D. (2020). Fizik öğretmenlerinin okul dışı öğrenme ortamlarına yönelik görüşlerinin incelenmesi [Investigation of physics teachers' views about the out-of-school learning environments]. *Journal of Research in Informal Environments, 5*(1), 59-79.

Behrendt, M. (2014). *It is an experience, not a lesson: The nature of high school students' experiences at a biological field station* (Unpublished dissertation). Ohio University, USA.

Bell, P., Lewenstein, B., Shouse, A. W., & Feder, M. A. (2009). *Learning science in informal environments: People, places, and pursuits.* Washington DC: National Academies Press.

Bolat, Y., & Köroğlu, M. (2020). Out-of-school learning and scale of regulating out-of-school learning: Validity and reliability study. *International Journal of Education Technology and Scientific Researches, 5*(13), 1630-1663. http://dx.doi.org/10.35826/ijetsar.258

Bostan-Sarıoğlan, A. & Küçüközer, H. (2017). Fen bilgisi öğretmen adaylarının okul dışı öğrenme ortamları ile ilgili görüşlerinin araştırılması [Investigation of preservice science teachers' opinions regarded to outdoor school learning environments]. *Journal of Research in Informal Environments, 2*(1), 1-15.

Bowker, R., & Tearle, P. (2007). Gardening as a learning environment: A study of 'children's perceptions and understanding of school gardens as part of an international project. *Learning Environments Research, 10*(2), 83-100. https://doi.org/10.1007/s10984-007-9025-0

Bozdoğan, A. E. & Yalçın, N. (2006). Bilim merkezlerinin ilköğretim öğrencilerinin fene karşı ilgi düzeylerinin değişmesine ve akademik başarısına etkisi: Enerji parkı [The effects of science centers on the change of "Science Interest" levels of primary education students and on their academic success: Energy park]. *Ege Journal of Education, 7*(2), 95-114.

Bozdoğan, A. E. (2007). *Bilim ve teknoloji müzelerinin fen öğretimindeki yeri ve önemi [Role and importance of science and technology in education]* (Unpublished dissertation). Gazi University, Ankara.

Bozdoğan, A. E. (2008). Fen bilgisi öğretmen adaylarının bilim merkezlerini fen öğretimi açısından değerlendirilmesi: Feza Gürsey Bilim Merkezi Örneği [The assessment of the science centers of the pre-service science teachers in terms of science education: The case of Feza Gürsey Science Center]. *Journal of Uludag University Faculty of Education, 21*(1), 19-41.

Bozdogan, A. E. (2015). Determination of biology department students' past field trip experiences and examination of their self-efficacy beliefs in planning and organising educational field trips. *Wulfenia Journal, 22*(7), 31-44.

Bozdoğan, A. E. & Kavcı, A. (2016). Sınıf dışı öğretim etkinliklerinin ortaokul öğrencilerinin fen bilimleri dersindeki akademik başarılarına etkisi [The effects of out of class teaching activities to secondary school students' academic achievement in science course]. *Gazi Journal of Educational Science, 2*(1), 13-30.

Bozdoğan, A.E. (2016). Okul dışı çevrelere eğitim amaçlı gezi düzenleyebilme öz- yeterlik inancı ölçeğinin geliştirilmesi [Development of self-efficacy belief scale for planning and organizing educational trips to out of school settings]. *Journal of Theoretical Educational Science, 9*(1), 111-129.

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2011). *Bilimsel araştırma yöntemleri [Scientific research methods*]. Ankara: Pegem Akademi.

Carrier, S. J. (2009). The effects of outdoor science lessons with elementary school students on pre-service teachers' self-efficacy. *Journal of Elementary Science Education, 21*(2), 35-48. https://doi.org/10.1007/BF03173683

Carrier, S. J., Tugurian, L. P., & Thomson, M. M. (2013). Elementary science indoors and out: Teachers, time, and testing. *Research in Science Education, 43*(5), 2059-2083. https://doi.org/10.1007/s11165-012-9347-5

Cebeci, D. (2019). *Fen bilimleri öğretmenlerinin eğitimde müze kullanımıyla ilgili görüşlerinin incelenmesi [Investigation of science teachers's views related to the use of museums in science education]* (Unpublished master's thesis). Ege University, İzmir.

Clarke-Vivier, S., & Lee, J. C. (2018). Because life doesn't just happen in a classroom: Elementary and middle school teacher perspectives on the benefits of, and obstacles to, out-of-school learning. *Issues in Teacher Education, 27*(3), 55-72.

Çavuş, R., Umdu-Topsakal, Ü. & Öztuna-Kaplan, A. (2013). İnformal öğrenme ortamlarının çevre bilinci kazandırmasına ilişkin öğretmen görüşleri: Kocaeli bilgievleri örneği [Teachers views on awareness of environmental acquiring in ınformal learning environments: The sample of Kocaeli Science Houses]. *Pegem Journal of Education and Instruction, 3*(1), 15-26.

Çiçek, Ö., & Saraç, E. (2017). Fen bilimleri öğretmenlerinin okul dışı öğrenme ortamlarındaki yaşantıları ile ilgili görüşleri [Science teachers' opinions about experience in out of school learning environments]. *Ahi Evran University Journal of Kırşehir Education Faculty, 18*(3), 504-522.

DeWitt, J. & Storksdieck, M. (2008). A short review of school field trips: Key findings from the past and implications for the future. *Visitor Studies, 11*(2), 181-197. https://doi.org/10.1080/10645570802355562

Dillon J., Rickinson, M., Teamey, K., Morris, M., Choi, M. Y., Sanders, D., & Benefield, P. (2006). The value of outdoor learning: Evidence from research in the UK and elsewhere. *School Science Review, 87*(320), 107-111.

Durel, E. (2018). *Okul dışı fen etkinliklerinin fen bilimleri öğretmen ve öğretmen adayları ile öğrenciler üzerine etkileri [Out of school science activities effects on science teacher- teacher candidates and students]* (Unpublished master's thesis). Trakya University, Edirne.

Ertaş, H., Şen, A. İ. & Parmaksızoğlu, A. (2011). Okul dışı bilimsel etkinliklerin 9. sınıf öğrencilerinin enerji konusunu günlük hayatla ilişkilendirme düzeyine etkisi [The effects of out-of school scientific activities on 9th grade students' relating the unit of energy to daily life]. *Necatibey Faculty of Education Electronic Journal of Science and Mathematics Education, 5*(2), 178-198.

Falk, J. H., & Dierking, L. D. (1997). School field trips: Assessing their long-term impact. *Curator: The Museum Journal, 40*(3), 211-218. https://doi.org/10.1111/j.215-6952.1997.tb01304.x

Fűz, N. (2018). Out-of-school learning in Hungarian primary education: Practice and barriers. *Journal of Experiential Education, 41*(3), 277-294. https://doi.org/10.1177/1053825918758342

Gerber, B.L., Marek, E.A., & Cavallo, A.M.L. (2001). Development of an informal learning opportunities assay. *International Journal of Science Education, 23*(6), 569-583. https://doi.org/10.1080/09500690116959

Goksu, M. M., & Somen, T. (2018). Opinions of social studies prospective teachers on out-of-school learning. *European Journal of Educational Research, 7*(4), 745-752. https://doi.org/10.12973/eu-jer.7.4.745

Güler, A. (2011). Planlı bir müze gezisinin ilköğretim öğrencilerinin tutumuna etkisi [Impact of a planned museum tour on the primary school 'students' attitudes]. *Elementary Education Online, 10*(1), 169-179.

Güler, T. (2009). Ekoloji temelli bir çevre eğitiminin öğretmenlerin çevre eğitimine karşı görüşlerine etkileri [Ekoloji temelli bir çevre eğitiminin öğretmenlerin çevre eğitimine karşı görüşlerine etkileri]. *Education and Science, 34*(151), 30-43.

Hannu, S. (1993). *Science centre education. Motivation and learning in informal education.* (Unpublished doctoral dissertation). Helsinki University, Finland.

Izgi-Onbasili, U. (2020). Investigation of the effects of out-of-school learning environments on the attitudes and opinions of prospective classroom teachers about renewable energy sources. *Journal of Education in Science, Environment and Health, 6*(1), 35-52. https://doi.org/10.21891/jeseh.670049

James, J. K. &Williams, T. (2017). School-based experiential outdoor education: A neglected necessity. *Journal of Experiential Education, 40*(1), 58-71. https://doi.org/10.1177/1053825916676190

Karademir, E. (2013). *Öğretmen ve öğretmen adaylarının fen ve teknoloji dersi kapsamında "okul dışı öğrenme etkinliklerini" gerçekleştirme amaçlarının planlanmış davranış teorisi yoluyla belirlenmesi [Determination of objectives realization at outdoor science education activities of teachers and pre-service teachers by the theory of planned behavior within the scope of science and technology lesson]* (Unpublished doctoral dissertation). Hacettepe University, Ankara.

Karpinnen, J. A. (2012). Outdoor adventure education in a formal education curriculum in Finland: Action research application. *Journal of Adventure Education and Outdoor Learning, 12*(1), 41-62.

Kete, R. & Horasan, Y. (2013, May). Öğretmen adaylarının uygulamalı (doğa merkezli) biyoloji derslerinde verimlilikleri [Efficiency of pre-service teachers in applied (nature-centered) biology courses]. In Proceedings Book of the VI. National Graduate Education Symposium II (pp. 85-90), Sakarya.

Kılıç, H. E., & Şen, A. İ. (2014). UF/EMI eleştirel düşünme eğilimi ölçeğini türkçeye uyarlama çalışması [Turkish adaptation study of UF/EMI critical thinking disposition instrument]. *Education and Science, 39*(176), 1-12. http://dx.doi.org/10.15390/EB.2014.3632

Kirkby, M. A. (1989). Nature as refuge in children's environments. *Children's Environment Quarterly, 6*(1), 7–12.

Kisiel, J. (2005). Understanding elementary teacher motivations for science field trips. *Science Education, 89*(6), 936-955. https://doi.org/10.1002/sce.20085

Kubat, U. (2019). Okul dışı öğrenme ortamları hakkında fen bilgisi öğretmen adaylarının görüşleri [Opinions of pre-service science teachers about outdoor education]. *Mehmet Akif Ersoy University Journal of Education Faculty, 48,* 111-135. https://doi.org/10.21764/maeuefd.429575

Lakin, L. (2006). Science beyond the classroom. Science beyond the classroom. *Journal of Biological Education, 40*(2), 88-90. https://doi.org/10.1080/00219266.2006.9656021

Lindemann-Matthies, P., & Knecht, S. (2011). Swiss elementary school 'teachers' attitudes toward forest education. *Journal of Environmental Education, 42*(3), 152-167. https://doi.org/10.1080/00958964.2010.523737

Mertoğlu, H. (2019). Fen bilgisi öğretmen adaylarının farklı öğrenme ortamlarında gerçekleştirdikleri okul dışı etkinliklere ilişkin görüşleri [Opinions of scıence pre-

service teachers on out-of-school activities conducted in different learning environments]. *Journal of Research in Informal Environments, 4*(1), 37-60.

Metin, M. (2020). *Fen bilimleri dersi kapsamında planetaryuma düzenlenen bir gezinin 7. sınıf öğrencilerinin akademik başarı, ilgi ve motivasyonlarına etkisi [The effect of a trip organized in planetarium on science course on academic success, interest and motivation of 7th year students]* (Unpublished master's thesis). Gaziosmanpaşa University, Tokat.

Metin-Goksu, M., & Somen, T. (2018). Opinions of social studies prospective teachers on out-of-school learning. *European Journal of Educational Research, 7*(4), 745-752. https://doi.org/10.12973/eu-jer.7.4.745

Miglietta, A. M., Belmonte, G., & Boero, F. (2008). A summative evaluation of science learning: A case study of the Marine Biology Museum "Pietro Parenzan" (South East Italy). *Visitor Studies, 11*(2), 213- 219. https://doi.org/10.1080/10645570802355984

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded Sourcebook.* (2nd ed). Thousand Oaks, CA: Sage.

Miller, T. J. (2008). *The Alaska factor: Outdoor education program design in Alaska.* (Unpublished master's thesis). University of Alaska, USA.

MoNE (2018). Fen bilimleri dersi öğretim programı (İlkokul ve ortaokul 3.,4.,5.,6.,7. ve 8. sınıflar için) [Science curriculum: Elementary and middle schools 3,4,5,6,7 and 8th grades]. Ankara, Turkey: Board of Education. 22 December 2021 retrieved from https://mufredat.meb.gov.tr/ProgramDetay.aspx?PID=325

Ocak, İ., & Korkmaz, Ç. (2018). Fen bilimleri ve okul öncesi öğretmenlerinin okul dışı öğrenme ortamları hakkındaki görüşlerinin incelenmesi [An examination of the views of science and pre-school teachers on nonformal learning environments]. *International Journal of Field Education, 4*(1), 18-38.

Okur-Berberoğlu, E., Güder, Y., Sezer, B. & Yalçın-Özdilek, Ş. (2013). Sınıf dışı hidrobiyoloji etkinliğinin öğrencilerin duyuşsal bakış açıları üzerine etkisi, Örnek olay incelemesi: Çanakkale bilim kampı [An outdoor hydrobiology activity's effect on students' affective perspective, case study: Çanakkale, science camp]. *Kastamonu Education Journal, 21*(3), 1177-1198.

Okur-Berberoğlu, E. & Uygun S. (2013). Sınıf dışı eğitimin dünyadaki ve Türkiye'deki gelişiminin incelenmesi [Examining of outdoor education development in the world and in Turkey]. *Mersin University Journal of the Faculty of Education, 9*(2), 32-42.

Pine, G. J. (2009). *Teacher action research: Building knowledge democracies*. Thousand Oaks, CA: Sage.

Randler, C., Baumgartner, S., Eisele, H., & Kienzle, W. (2007). Learning at workstations in the zoo: A controlled evaluation of cognitive and affective outcomes. *Visitor Studies, 10*(2), 205-216. https://doi.org/10.1080/10645570701585343

Rennie, L. J. (2014). Learning science outside of school. In N. G. Lederman & S. K. Abell (Eds.), *Handbook of research on science education* (Vol. II, pp. 120–144). New York, NY: Routledge.

Richmond, D., Sibthorp, J., Gookin, J., Annarella, S., & Ferri, S. (2018). Complementing classroom learning through outdoor adventure education: Out-of-school-time experiences that make a difference. *Journal of Adventure Education and Outdoor Learning, 18*(1), 36-52. https://doi.org/10.1080/14729679.2017.1324313

Şentürk, E., & Özdemir, Ö. F. (2014). The effect of science centres on students' attitudes towards science. *International Journal of Science Education, 4*(1), 1-24. https://doi.org/10.1080/21548455.2012.726754

Şişman, M. (2009). Öğretmen yeterlilikleri: Modern bir söylem ve retorik [Teacher's competencies: A modern discourse and the rhetoric]. *Inonu University Journal of the Faculty of Education, 10*(3), 63-82.

Sontay, G., & Karamustafaoğlu, O. (2017). Fen bilimleri öğretmenlerinin gezi düzenlemeye ilişkin öz-yeterlilik inançlarının incelenmesi [Investigation of science teachers' self-efficacy beliefs related to trip arrangement]. *Hacettepe University Journal of Education, 32*(4), 863-879. https://doi.org/10.16986/HUJE.2017027586

Sturm, H. & Bogner, F. X. (2010). Learning at workstations in two different environments: A museum and a classroom. *Studies in Educational Evaluation, 36*(1-2), 14-19. https://doi.org/10.1016/j.stueduc.2010.09.002

Tal, T., & Morag, O. (2009). Reflective practice as a means for preparing to teach outdoors in an ecological garden. *Journal of Science Teacher Education, 20*, 245-262. https://doi.org/10.1007/s10972-009-9131-1

Tatar, N., & Bağrıyanık, K. E. (2012). Fen ve teknoloji dersi öğretmenlerinin okul dışı eğitime yönelik görüşleri [Opinions of science and technology teachers about outdoor education]. *Elementary Education Online, 11*(4), 883-896.

Thomas, G. (2010). Facilitator, teacher, or leader? Managing conflicting roles in outdoor education. *Journal of Experiential Education, 32*(3), 239--254. https://doi.org/10.1177/105382590903200305

Timur, S., Timur, B., Yalçınkaya-Önder, E. & Küçük, D. (2020). Attitudes of the Students Attending Out-of-School STEM Workshops towards STEM Education. *Journal of Theoretical Educational Science, 13*(2), 334-351. https://doi.org/10.30831/akukeg.582388

Tortop, H. S., & Özek, N. (2013). Proje tabanlı öğrenmede anlamlı alan gezisi; Güneş enerjisi ve kullanım alanları konusu [The meaningful field trip in project based learning; The solar energy and its usage areas topic]. *Hacettepe University Journal of Education, 44*, 300-307.

Turan-Güntepe, E., Durukan, Ü.G. & Dönmez-Usta, N. (2021, October). *Öğretmen adaylarının okul dışı öğrenme faaliyetleri kapsamında mobil öğrenmeyi benimseme durumlarının incelenmesi: Actionbound örneği.* 4th International Computer and Instructional Technologies Symposium, Rize. Abstract retrieved from http://icits2021.erdogan.edu.tr/index.php/tr/kitapciklar/

Türkmen, H. (2010). İnformal (sınıf-dışı) fen bilgisi eğitimine tarihsel bakış ve eğitimimize entegrasyonu [Historical overview of informal science education and its integration to our education system]. *Cukurova University Faculty of Education Journal, 3*(39), 46-49.

Türkmen, H. (2018). İnformal öğrenme ortamının fosiller konusunun öğrenilmesine etkisi: Tabiat Tarihi Müzesi örneği [The effect of informal learning environment on the learning of fossils: Case of the Natural History Museum]. *Afyon Kocatepe University Journal of Social Science, 20*(3), 165-175. https://doi.org/10.32709/akusosbil.417266

Ural-Keleş, P. (2018). 2017 Fen bilimleri dersi öğretim programı hakkında beşinci sınıf fen bilimleri öğretmenlerinin görüşleri [Opinions of fifth grade science teachers about the 2017 science curriculum]. *Journal of Qualitative Research in Education, 6*(3), 121-142. https://doi.org/10.14689/issn.2148-2624.1.6c3s6m

Vaughan, A. (2020). Conceptualizing scholarship on adolescent out-of-school writing toward more equitable teaching and learning: A literature review. *The Journal of Adolescent & Adult Literacy, 63*(5), 529-537. https://doi.org/10.1002/jaal.1009

Wishart, J. & Triggs, P. (2010). MuseumScouts: Exploring how schools, museums and interactive technologies can work together to support learning. *Computers & Education, 54*(3), 669-678. https://doi.org/10.1016/j.compedu.2009.08.034

Wulf, R., Mayhew, L., & Finkelstein, D. (2010, July). *Impact of informal science education on 'children's attitudes about science.* In C. Singh, M. Sabella, & S. Rebello (Eds.), Physics Education Research Conference Proceedings, (Vol. 1289, pp. 337-340), Portland, Oregon, AIP Conference Proceedings. https://doi.org/10.1063/1.3515238

Yardımcı, E. (2009). *Yaz bilim kampında yapılan etkinlik temelli doğa eğitiminin ilköğretim 4 ve 5. sınıftaki çocukların doğa algılarına etkisi [The effect of activity based nature education at a summer science camp on 4th and 5th graders conceptions of the nature]* (Unpublished master's thesis). Abant İzzet Baysal University, Bolu.

Yavuz, M. (2012). *Fen eğitiminde hayvanat bahçelerinin kullanımının akademik başarı ve kaygıya etkisi ve öğretmen-öğrenci görüşleri [The effect of using zoos in science education on students' academic achievement and anxiety towards science and teachers'-students' conceptions]* (Unpublished master's thesis). Sakarya Üniversitesi, Sakarya.

Yıldırım, A. & Şimşek, H. (2013). *Sosyal bilimlerde nitel araştırma yöntemleri [Qualitative research methods in the social sciences (9th ed)]*. Ankara: Seçkin.

Yıldırım, H.İ. (2020). The effect of using out-of-school learning environments in science teaching on motivation for learning science. *Participatory Educational Research, 7*(1), 143-161. https://doi.org/10.17275/per.20.9.7.1