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Abstract

This study aimed to reveal the experiences of science education graduate students about education in out-of-school learning environments before and after they took a course on this topic. The study group consisted of four students who were attending the science education graduate program at a state university in Turkey and who were taking the "science education in out-of-school learning environments" course. In the study, the students answered seven semi-structured, open-ended questions that were prepared by the researcher at the beginning of the semester. Then, they took the 16-weeks course and answered the same questions at the end of the semester. The interviews were recorded using a voice recorder. Data obtained was analyzed using the descriptive analysis method. The findings of the study showed that at the beginning of the semester the graduate students did not have any scientific knowledge about out-of-school learning environments and that their answers to questions did not go beyond presumptions. On the other hand, the students' level of knowledge about out-of-school environments was observed to increase after the intervention.

Keywords: Out-Of-School Learning Environments, Graduate Students, Interview, Experiences

Introduction

Nowadays, with the development of technology and increasing expectations from school administrators, the aims of schools have expanded and developed to go beyond the building's walls. At the same time, the need for out-of-school learning environments has grown. For example, in Scandinavian countries, out-of-school learning environments are considered to be an important—perhaps even central—factor in children's physical, emotional, and intellectual development (Humberstone & Stan, 2011). Out-of-school learning environments are defined as class or field trips where students have one-to-one interactions with the environment to establish an experiential connection with the subject in question (Krepell & Duval, 1981, as cited in Behrendt & Franklin, 2014). Out-of-school learning environments include a well-planned and well-organized program designed by the teacher and the experiences of students following this program. In experiential activities, students search for things, touch, listen, watch, move, and climb (Behrendt & Franklin, 2014). In this regard, in out-of-school learning environments, students are provided with the opportunity to directly see and experience what they cannot see and experience in the classroom. The student, who

connects what is learned in the classroom with the information learned in out-of-school environments acquires the knowledge of how and where to use this information in daily life (Lei, 2010). Despite all these positive effects, teachers often prefer using only school computers and taking virtual trips to save money and time. However, students who only interact with digital media in the classroom cannot experience a multidimensional activity in which all their senses are fully involved (National Research Council (NRC), 2009).

The purpose of this study was to reveal the experiences of science education graduate students about education in out-of-school learning environments before and after they took the "science education in out-of-school learning environments" course. The following research questions guided this study:

1. How do graduate students develop knowledge about the benefits of out-of-school learning environments in science education?
2. What changes, if anything, in their understanding of science education after taking the course in out-of-school learning environments?

Literature Review

In countries such as England, Sweden, and Norway, education provided in out-of-school learning environments is integrated into classroom education (Öztürk Aynal, 2013). Despite all the positive features of field trips, Michie (1998) identified seven barriers to successfully planning them. These barriers are transportation, teacher training and experience, a lack of time for school programs' and teachers' preparation, lack of school manager support for field trips, the inflexibility of the curriculum, poor student behaviors and attitudes, and a lack of destination options. Here, issues such as teacher education and experience, lack of preparation time, and the lack of school manager support for field trips are seen as serious obstacles. Studies have revealed that teachers do not have any idea about making plans for out-of-school learning environments; they perceive out-of-school learning environments only as fun and interesting places; and they do not understand their roles in this process (Kisiel, 2003; Michie, 1998; Tal et al., 2005). Studies have also shown that teachers do not have adequate knowledge about and self-efficacy for out-of-school learning environments; therefore they are anxious about teaching in out-of-school learning environments, and they lack competence in guiding students in these environments (Bozdoğan, 2012; Griffin &Symington, 1997; Kisiel, 2005; Orion & Hofstein, 1994). Research has shown that teachers who want to teach in out-of-school settings need to know well what to do in those learning environments in order to perform the necessary tasks effectively and efficiently. Thus, prospective teachers should receive professional training for using out-of-school learning environments in lessons, and the quality of this training is important.

The courses that prospective teachers take during their university years about using out-of-school learning environments in lessons can make them successful in this regard (Bozdoğan, 2017; Carrier, 2009; Chin, 2004). Carrier (2009) revealed that prospective teachers felt successful when they participated in out-of-school learning activities; their teaching activities increased with this participation, and it helped them to become aware of their out-of-school learning potential in science lessons. Izgi Onbaşı (2020) investigated the effects of out-of-school learning environments on the attitudes and opinions of prospective teachers about renewable energy sources and found that out-of-school learning environments positively affected prospective teachers' attitudes towards renewable energy sources. These studies have provided evidence that out-of-school learning environments have positive effects on

prospective teachers. The review of the literature has indicated that the majority of studies on the use of out-of-school learning environments in education have been carried out with primary-and secondary-school students. Studies with teachers, prospective teachers, or graduate students are limited. It is thought that the present study will contribute to the literature in this regard.

The Science Teaching Undergraduate Program in Turkey was updated in 2018, and the "out-of-school learning environments in science education" course was placed in the teaching program in the field of education category in the eighth semester. Before this date, courses related to out-of-school learning environments were taught in the elective courses category in some faculties. Similarly, in graduate programs, the "out of school learning environments in science education" course is taught in some faculties. For this reason, it is predicted that some prospective teachers may not have enough information about this subject, since they may not have taken this course. Within this context, this study was carried out to reveal the opinions of science education graduate students who had not previously had any education about out-of-school learning environments, both before and after they took the "science education in out-of-school learning environments" course.

Method

Research Design and Participants

This study used a case study research design (Stake, 1995; Yin, 2018). The case study research design is one of the qualitative research methods. It is a research method used to understand, identify, and describe the causes and consequences of the situation when the researcher does not have control over variables (Yin, 2018). The study group involved four graduate students who were taking the "science education in out-of-school learning environments" course in the science education program at a state university in Turkey. Two of the participants were female and two were male. All of the students were graduates of science education undergraduate programs and had not previously taken any courses about out-of-school learning environments. In this study, the convenience sampling method was employed. The participants in the study were attending the science education master's program during the research process.

Data Collection

The data of this research were collected using the interview method, which is one of the qualitative research methods, through face-to-face and semi-structured interviews with graduate students participating in the research. Semi-structured interviews allow researchers to set the boundaries of the topics they are researching and ask questions on the topic. Moreover, the semi-structured interview method has the flexibility that allows researchers to add new questions during the interview (DiCicco-Bloom& Crabtree, 2006).

I conducted the semi-structured interviews face-to-face, both at the beginning of the semester before students took the course and at the end of the semester after they took the course. The sample questions in the final form for the graduate students were as follows:

- "What do out-of-school environments mean to you? Please explain."
- "What kind of contributions do you think out-of-school learning environments make to students?"

- "Do out-of-school learning environments have disadvantages? Please explain."
- "What do you think are the preparations before going to out-of-school learning environments?"
- "Considering the science course, what out-of-school learning environments would you prefer for certain subjects and concepts? Why?"
- "Do you see yourself as competent at teaching in out-of-school learning environments? Please explain."
- "What are your expectations from the 'science education in out-of-school learning environments' course?" (pre-course) or "Did the 'science education in out-of-school learning environments' course meet your expectations?" (post-course)

Before the interviews, the researcher prepared an easily accessible interview environment where the participants would feel comfortable. The researcher told the participants that the interviews would be kept confidential, their personal data would not be used, and the interviews would be recorded. Moreover, the researcher informed the participants about the purpose of the research. Each interview took about 30 to 50 minutes.

The course included a midterm exam and a final exam. Methods such as presentation, discussion, interview, group discussion, and role-playing were used within the scope of this course. The course outlines were planned for 16 weeks (see Table 1).

Implementation Stages of the Study

At the beginning of the semester, I held a semi-structured interview with the four students in the course. I recorded the interviews with a voice recorder. Then, the 16-week long course started. The syllabus of this course is presented in Table 1.

Table 1

Syllabus for the "Science Education in Out-of-School Learning Environments" Course

Week	Content
1	Ensuring that students understand out-of-school learning is not an individual activity, but rather that it can be implemented in all areas of life and practiced in any learning environment that can support formal learning
2	Associating science and technology curriculum with out-of-school science learning environments; cases to consider in out-of-school learning activities
3	Museums (museum concept and types of museums; teaching science through technology museums)
4	Using zoos for educational purposes
5	Using botanical gardens for educational purposes
6	Industrial institutions and organizations
7	Planetariums, and the purpose and importance of planetariums
8	Midterm exam
9	National parks and using national parks in science education

10	What is environmental education? The relationship between existing environmental content in science education curriculum and nature education
11	"TUBITAK Nature Education" within the scope of science and technology projects
12	Health institutions and organizations
13	Choosing a science subject and preparing an out of school learning environment lesson plan
14	Examining out-of-school learning environment lesson plans
15	A sample trip
16	Final exam

Lessons were conducted as three 45-minute sessions per week, including two hours of theoretical teaching and one hour of examination of scientific papers written in this field. The last lesson was carried out by the students in an out-of-school learning environment. To collect data, I re-administered the semi-structured interviews with the participants after the last lesson, and I asked them the same questions that I asked at the beginning of the semester.

Data Analysis

I used the descriptive analysis method when I analyzed the data. Descriptive analysis is a useful method to reflect the views of the persons interviewed or observed by giving frequent quotations (Yıldırım & Şimşek, 2011). I asked the questions to postgraduate students, and I collected the data. I examined the postgraduate students' answers to the questions. I created themes based on research questions. I coded the data according to the themes revealed by the research questions. At the same time, I asked another science expert to encode the data. I checked the consistency of the comparisons made by me and the comparisons made by the science expert. I determined the numbers of consensus and disagreement by making comparisons, and I calculated the reliability of the study using Miles and Huberman's (1994) formula: reliability = consensus / (consensus + disagreement) * 100. According to Miles and Huberman (1994), the consensus among coders is expected to be at least 80%. The research was found to be reliable, as 90.3% consensus was reached among the coders in the study. Finally, I organized and tabulated the responses and themes. In order to protect the privacy of students, I coded them as S1, S2 etc.

Findings

As a result of several cycles of coding, the following themes have emerged to address research questions:

1. Theme: Graduate Students' Knowledge About Out-of-School Learning Environments

In this section, I asked graduate students about the main theme of the course and about their expectations. I asked, "What do out of school learning environments mean to you? Please explain." I analyzed the responses, which are shown in Table 2.

Table 2

Responses to the Question "What do out of school learning environments mean to you? Please explain."

Participant	Beginning of the semester	End of the semester
S1	Home education	Lessons and activities conducted out of school that result in learning outcomes
S2	Excursions	Not only places for sightseeing but also places for learning
S3	Excursions	Practices for obtaining the same learning outcomes out of school
S4	Peer-learning, implicit learning, latent learning	Out-of-classroom lessons conducted under a program

In interviews with graduate students before at the beginning of the semester, they defined out-of-school learning environments as going on an excursion, home education, and everything that is learned out-of-school.

> S1: "I don't know it as a topic, but perhaps it may be home education."
>
> S2: "It can be a kind of 'excursion.' I think it is a kind of excursion teaching. The first thing coming to my mind is 'excursions': exploring different places."
>
> S3: "It means going out of school. It may be excursions, observations."
>
> S4: "I think even children hanging out with their peers may be considered doing out-of-school learning. ... Implicit learning, latent learning activities are also out-of-school learning. I think these are all out-of-school-learning as long as there is nothing that we do willingly and on purpose."

In the interview held at the end of the semester, all the students stated that planned and scheduled training conducted outside the school was out-of-school learning environments.

> S1: "It is a planned, scheduled application that we associate with learning outcomes. Like an activity; activities outside the school walls."
>
> S2: "When I thought about out-of-school learning environments, the first thing that came to my mind was 'excursions.' But now I understand that they are more diverse environments, not only environments for sightseeing. I have learned that these are various environments, such as museums, planetariums, or national parks."
>
> S3: "Out-of-school learning environments mean imparting learning outcomes to students in places such as science centers and parks, which are outside the school."
>
> S4: "Out-of-school learning environments, of course, I will not compare it to the former, are kind of lessons that students take daily under a plan that is closely linked with the nature that they see, know, and are accustomed to."

2. Theme: Educational Use of Out-of-School Learning Environments by Graduate Students

In this section, I asked graduate students about the educational use of out-of-school learning environments. My first question was, "What do you think out-of-school learning environments contribute to students?" Responses are presented in Table 3.

Table 3

Responses the Question "What kind of contributions do you think out-of-school learning environments make to students?"

Participant	Beginning of the semester	End of the semester
S1	Continuing education is useful as it goes on at home, too.	Learning with real materials by experiencing and doing
S2	It is useful for students who like sightseeing.	Memorable; learning by experiencing and doing
S3	It is not boring.	It embodies abstract things. More memorable; in line with life
S4	Memorable, supportive of implicit learning	It embodies abstract things. Collaborative learning; enabling students to realize themselves

At the beginning of the semester, the graduate students' thoughts on the contributions of out-of-school environments ranged from continuing home education in support of learning to facilitating the comprehension of students who love excursions. Still other responses showed graduate students thought out-of-school environments could be interesting due to active student participation, could be memorable, and could implicitly support of the love of one's homeland and nation.

> S1: "I mean it is similar to what I imagine it to be; for example, it is home education or it is carried out in the school garden or outside school instead of doing it in the classroom. It is when the student attends the lesson in open environments, or a forest, or when the family contributes to the lesson. That's, I think individuals will be more successful when they progress both at school and outside school."
>
> S2: "This is what I think. After all, everyone has a different level of intelligence; you know that, the classification of intelligence. I think it will be more effective for students who love excursions."
>
> S3: "I think it will definitely contribute to students. … That's, I think students will not get bored because they will be active."
>
> S4: "That's, on the one hand, let's imagine a student who reads Çanakkale (Gallipoli) from books, and on the other hand, let's imagine taking students to Çanakkale and having them see the spirit of Çanakkale on-site; those conserved places. All these will definitely sustain the permanence of knowledge. These students learn the unity of the homeland and the nation even if there are no exams or school. It might not just be related to the lesson. "

At the end of the semester, the students stated that the lesson would be understood better due to active participation, permanence, embodying abstract ideas, and students' self-realization.

> S1: "They will be able to see and touch real materials or things related to the learning outcomes in a subject. I think it will be memorable. In my opinion, it will be learning by doing because it will be conducted outside."
>
> S2: "I do not think that a normal lesson between four walls will be very memorable. No matter how much you teach using a smart board, going and seeing something is different. Therefore, we make the students more active in terms of visuals, and student learning becomes better by experiencing and doing. I think it is effective for these reasons."
>
> S3: "It means moving from an abstract environment to a concrete environment. Things that children learn by touching and feeling, otherwise abstract things in their minds, which helps them to retain knowledge more quickly; it is an environment close to life."
>
> S4: "I believe that out-of-school learning is a transition from abstract to concrete. There is also a harmony between disciplines; for example, when we take them to national parks, I think they learn the social environment, how social harmony is realized, or how the order of environment should be, or how to behave as a group, or how collaborative learning is realized. I think it will be beneficial in these areas and will serve the purpose of education. … Our sole aim is not to teach our subject; nor is it to impart the learning outcomes. On the contrary, it aims to increase the personal traits and to have students find out about themselves."

Another question I asked was, "Do out-of-school learning environments have disadvantages? Please explain." Responses are presented in Table 4.

Table 4

Responses to the question, "Do out-of-school learning environments have disadvantages? Please explain."

Participant	Beginning of the semester	End of the semester
S1	They have no disadvantages	Economy, seasonal problems, bureaucracy
S2	Waste of time	Bureaucracy, number of students
S3	Safety	Bureaucracy, number of students, safety
S4	Economy and permission	Number of students, safety

As seen in Table 4, in the interview at the beginning of the semester, while one student said that these out-of-school learning environments had no negative aspects, other students mentioned some disadvantages, such as that they could be a waste of time, safety, and financial resources.

S1: “I think all out-of-school learning environments are useful.”

S2: “If we go somewhere far, we may lose some time.”

S3: “Some precautions should be taken.”

S4: “Of course, they have financial aspects; so if we take the example of Çanakkale, it has some costs. Besides, families may not give permission.”

In the interview at the end of the semester, the students mentioned the negative aspects of out-of-school learning environments as follows: a high number of students, bureaucratic barriers, and security.

S1: “It may cause some financial problems. We need to take permission, so we may have difficulties with these matters. Also, if we go to an open place such as national parks in winter months, we may have problems due to cold weather.”

S2: “Taking permission makes up the difficult part. … Also, the number of students can be a problem. There are few students in villages and districts, but there are a lot of students in city centers. This can pose a problem.”

S3: “When the number of students is high, imparting learning outcomes to every student outside the school may not be successful. There may be dangerous environments. Also, taking official permission can be difficult for teachers. For the student, there are situations when parents do not give permission for school trips. Then, the child may be affected negatively.”

S4: “For example, we may have some problems in controlling the students. ... Some precautions need to be taken. For example, when we take them to a museum, students will touch things in the museum, of course. Precautions for such things need to be taken. ... Apart from this, if the class is crowded, then problems may arise.”

I also asked the graduate students, “What preparations do you think are needed before going to out-of-school learning environments?” Responses are presented in Table 5.

Table 5

Responses to the Question, “What preparations do you think are needed before going to out-of-school learning environments?”

Participant	Beginning of the semester	End of the semester
S1	I don’t know.	Permissions, security measures, plans, materials, brochures
S2	Safety	Permissions, bureaucratic procedures, plans, security, food and drink, brochures
S3	A program should be made.	Permissions, plans, eating and drinking
S4	Permissions and appropriateness for the level of students	Plans, permissions, student characteristics

As seen in Table 5, one participant did not know what preparations were needed before going to out-of-school learning environments; yet, other participants made some predictions, such as taking safety measures, making programs, taking permissions, and accounting for the suitability of the trip for the age of students going.

> S1: "I don't know."
>
> S2: "We may need security measures."
>
> S3: "So, if we want to achieve efficiency and if we want to get feedback, we need to plan it."
>
> S4: "I think it is necessary. If we take the Çanakkale example again, there are sculptures made of wax in Çanakkale to touch people's emotions. To make them look a little more realistic, the sculptures have blood-like colors on them, or similar things happen in the shows. They may negatively affect the psychology of children on the excursion. I think we should first go and see the environment and then take the students there accordingly. Or I think we should ask the educational institutions in that city whether the place is suitable for children of that age. The permission of the families should also be obtained. "

In the interview conducted at the end of the semester, the participants stated that it was necessary to take permission, make plans, and prepare necessary materials.

> S1: "I think we will first need to get permission from the authority of the place where we are planning to go. The teacher should first go and see the place. Security measures must be taken. The teacher needs to make a lesson plan about the activities to be performed. Security measures must be taken. The course plan and course materials related to the learning outcomes and activities should be prepared. We need to prepare a brochure and distribute it beforehand."
>
> S2: "We should get permission. We should prepare a lesson plan. We should go to the place beforehand and check whether it is suitable for students or not. How about the food and drinks? Are they suitable in terms of safety? The guide should be warned about giving level-appropriate information to students. Also, a brochure should be prepared and given to students in advance."
>
> S3: "At the outset, we should obtain the necessary permission. The lesson plan should be prepared well in advance. The teacher should first go and examine the place."
>
> S4: "We need to make a plan for the place to be visited. Correspondences, permission, the scope of the subject; you need to determine all of them: What am I doing this for, what are the learning outcomes, what is the content, and how should I relate everything to education?"

The next question asked was, "Considering the science course, what out-of-school learning environments would you prefer for certain subjects and concepts? Why?"

Table 6

Responses to the Question, "Considering the science course, what out-of-school learning environments would you prefer for certain subjects and concepts? Why?"

Participant	Beginning of the semester	End of the semester
S1	Nature, science center	Science center, playground, zoo, recycling facility, hospital
S2	Zoo, mines	Playground, planetarium, observatory, national parks, zoo
S3	Out-of-school learning environments can be visited for any subject.	Planetarium, observatory, playground, science center, botanical garden, hospitals
S4	Out-of-school learning environments can be visited for any subject.	Hospital, playground, industrial institutions and organizations, national park, zoo, school garden

As seen in Table 6, in the interview conducted at the beginning of the semester, two participants stated that out-of-school environments could be visited for any subject. One participant mentioned zoos and mines particularly, while another stated that students could go on nature or science center excursions as out-of-school learning environments.

> S1: "It may not be possible to organize an excursion for all topics, but there may be subjects that we should be in touch with nature related to biology. For physics and chemistry, students can be taken to a science center-like place outside school."
>
> S2: "It may not be possible to plan an excursion for every lesson, but students can be taken to the zoo while teaching animals in a science lesson. It also applies to the chemistry course; the elements, and the like. In our country, we have an abundance of boron; we can go to see it. It may also be about the iron. We can go to a mine, too."
>
> S3: "Biology can be included, or chemistry, or physics. Instead of giving formulas for physics, some other things can be done to adapt it to a more visual life. If it can be organized, it may be suitable to go to out-of-school learning environments for every lesson.
>
> S4: "Science is a very wide field. ... Almost every subject can be studied outside."

During the interviews held at the end of the semester, students mentioned five different out-of-school learning environments that could match science subjects. They also stated that there would be no suitable out-of-school learning environment for each course and subject.

> S1: "For example, if there is a science center exhibiting simple machines in the town where I live, I will take my students there. Or I can take them to a playground. I can take them to the zoo about living things. I can take them to

an industrial plant about recycling. Also, I can take them to a dental hospital for oral and dental health."

S2: "For example, consider the force and motion unit in the physics course. For this unit, I would take the children to parks. For the Earth, sun, and moon, I would take them to planetariums, observatories; for the world of living things, I would take them to national parks or zoos."

S3: "For example, planetariums, observatories about the sun and the planets; parks and science centers can be visited about simple machines. I can take students to botanic gardens about plants, and health institutions and organizations about health-related topics."

S4: "From hospitals to parks, industrial plants, national parks, and zoos; each of these is an out-of-school learning environment. We have learned that even going to the garden is an out-of-school learning environment. For example, you can go to a hospital to find out about health materials."

Theme 3: Expectations of Graduate Students

In this section, I asked about the expectations of graduate students. Firstly, I asked, "Do you see yourself as competent at teaching in out-of-school learning environments? Please explain." Responses are presented in Table 7.

Table 7

Responses to the question, "Do you see yourself as competent at teaching in out-of-school learning environments? Please explain."

Participant	Beginning of the semester	End of the semester
S1	Yes	Yes
S2	Yes	Yes
S3	Yes	Yes
S4	Yes	I am uncertain about it.

As seen in Table 7, in the interview at the beginning of the semester, all the students stated they felt they were competent at teaching in out-of-school environments.

S1: "Yes, I feel competent."

S2: "I can teach in out-of-school learning environments."

S3: "I mean. I think I can possibly do it."

S4: "I think I can."

In the interviews held at the end of the semester, students responded more consciously. While three out of four students felt competent, one of them said he had some hesitations.

S1: "Yes. I know what I need to do in out-of-school learning environments from now on. I do not think I will have difficulties unless I experience

> problems in obtaining permissions and contacting authorities in my destination."
>
> S2: "Yes, after taking this out-of-school learning environment course, I have understood that I can do it. But, of course, previously I thought I could certainly do it because I had just been looking at the issue simply; however, after taking this lesson, I have seen how planned and scheduled it must be."
>
> S3: "I feel it now. My thoughts were different in the first lesson because I did not know it then, but now I know it better. In this lesson, we have learned the procedures that should be carried out before, during, and after the excursions systematically, and we have seen the application. My self-confidence has increased more."
>
> S4: "I cannot say that I can do this right away. The size of classrooms and the characteristics of students, all of them, are important. What environment you will take the students to is also important. ... I cannot say that I can take them to these places for sure because after taking this course, I have realized that I should do the job more professionally."

Another question I asked at the beginning of the semester was, "What are your expectations from the 'science education in out-of-school learning environments course'?" In the interview at the end of the semester, I instead asked, "Did the 'science education in out-of-school learning environments' course meet your expectations? "Responses are given in Table 8.

Table 8

Responses to the questions, "What are your expectations from the 'science education in out-of-school learning environments' course?" (pre-course) and "Were your expectations met?" (post-course)

Participant	Beginning of the semester	End of the semester
S1	To learn how and where education is conducted and what its contributions are	It met my expectation
S2	Self-development through various methods	It met my expectation
S3	The more I learn, the better it is.	It met my expectation
S4	Self-development	It met my expectation

As seen in Table 8, in the interview held at the beginning of the semester, the students stated that they expected to learn how and where education in out-of-school environments was conducted from this lesson. Also, they said they expected to improve themselves and find out about the contributions of the lesson.

> S1: "I think we will learn how and where the education outside the school is conducted, and what kind of contributions it makes to the student or the teacher."

> S2: "I am expecting to come to a better place by improving myself with different methods that I will learn from you."
>
> S3: "The more I learn, the better it is."
>
> S4: "If we want to educate our students or the teachers who will educate the students in the future, we definitely need to improve ourselves in this regard."

The answers that students gave at the end of the semester indicated that they obtained more than they expected from the course, and that they had not had accurate knowledge about out-of-school learning environments during the interview held at the beginning of the semester.

> S1: "In my initial interview, I said these things. I thought it was like every other place. I did not know that it was planned and programmed. I have improved myself in planning and programming these activities. At the same time, you have to get permission in advance; indeed, I had just been thinking of simpler permissions, such as parental consent and permission from the school principal. I saw that I had not been considering security measures in more detail. I had no idea about handing out brochures. Previously, I thought out-of-school learning environments as, 'Let's go, we will have fun.' According to my presumptions, the students did not have any worksheets or the like. In my previous practices, I used to function just as a guide, giving information about the place. Indeed, the reality is different from my considerations; there are activities and students have worksheets. They take notes; similar to the process in a lesson."
>
> S2: "This course has met my expectations. You have both taught and showed it to us. You gave examples both from the world and our country. Then, we conducted an activity. We learned it by doing and experiencing ourselves. I think this course is effective."
>
> S3: "This lesson has met my expectations a lot. We used to know out-of-school places like museums or similar places. We have learned that almost all places in our lives can be an out-of-school environment, like a playground. There is a big difference between our previous understanding and our current knowledge; lessons are not performed only between four walls, rather they are performed outside school, which contributes to more learning outcomes. Out-of-school environments consist of a lot of places. For example, we did not know the planetarium very much. There were many different places that we did not know. What we knew and the reality is different. My list of out-of-school learning environments includes museums, libraries, and similar official places, now. We know parks, but we did not think they could be used for educational purposes. We used to think parks more as a playground for children. We have learned that there are so many out-of-school environments. We have learned them."
>
> S4: "Initially, I knew out-of-school learning environments incorrectly. I even thought what my parents taught was out-of-school learning. I have discovered that these are incorrect. The process has really contributed to us. I have understood what science education is in the out-of-school learning environment and other fields. In this lesson, we have not only been a listener

> but also a practitioner. This lesson should be included in the undergraduate program. If we aim to seek answers to the question of how to take education forward, every teacher should take this lesson."

I also gave the graduate students midterm and final exams. In these exams, I asked them questions about how to use out-of-school learning environments in science education. The students mostly answered the exam questions correctly and got high scores.

Discussion and Conclusions

According to the findings obtained from the interviews held at the beginning of the semester, the graduate students did not have any scientific knowledge about out-of-school learning environments, and their answers to the questions did not go beyond presumptions. They even stated that they thought out-of-school learning environments meant going on school trips for entertainment purposes, information learned at home by chance or through friends, and even latent learning. According to Storksdieck (2001), teachers do not know how to shape students' experiences in out-of-school learning environments. In the interview conducted at the beginning of the semester, while one student stated that out-of-school learning environments had no negative aspects, other students mentioned that visiting these environments could be a waste of time or money, or pose security issues. Studies report that teachers are most concerned about taking responsibility for students and keeping them under control (Kisiel, 2007). In the interview conducted at the end of the semester, students mentioned the negative aspects of out-of-school learning environments as follows: a high number of students, bureaucratic obstacles, and security issues. Kisiel (2005, 2007) listed the following as conditions that teachers were anxious about when organizing school trips: teachers' perception of school trip organization pedagogy, previous experiences of teachers and students, conditions of the school, and taking responsibility for students and controlling them.

In the interview that I held at the beginning of the semester, while one student did not know what preparations were supposed to be made before going to out-of-school learning environments, other students made guesses, such as taking security measures, making a program, obtaining permission, and checking the appropriateness of the trip for the age of students. In the interview that I held at the end of the semester, all of the students mentioned the following preparations that should be made before going to an out-of-school environment: obtaining permission, making plans, and preparing necessary materials. According to the findings that I obtained from the interviews, the graduate students did not have knowledge about the preparations of necessary materials before going to out-of-school learning environments. While the students thought that they would not prepare any materials before going to out-of-school learning environments and that they could use what was available in out-of-school learning environments, they changed their minds by the end of the semester. Indeed, studies have shown that teachers have little educational or pedagogical knowledge about the field trip planning and preparation process (Michie, 1998; Tal &Morag, 2009). Moreover, in the interview that I conducted at the end of the semester, while two of the students said that they could go to out-of-school learning environments for any subject, one student stated that they could go to the zoo and mines, and another student stated that even though they may not go to out-of-school learning environments for every topic, they could go to natural places and science centers. During the interviews that I held at the end of the semester, students mentioned five different out-of-school learning environments that could match science subjects. They also stated that there would be no suitable out-of-school

learning environment for every course and subject. In the interview that I held at the end of the semester, the students matched learning outcomes and out-of-school learning environments more consciously. Accordingly, some researchers have emphasized that teachers should associate school trips with learning outcomes, make preparations before the trip and inform their students, guide students during the trip, and do different activities in the classroom after the trip (DeWitt & Osborne, 2007; Tal, 2004). For this reason, I conclude that teacher training institutions have important responsibilities with respect to educating future teachers in this area.

In the interview that I held at the beginning of the semester, all students said that they felt competent at teaching in out-of-school learning environments. In the interviews at the end of the semester, on the other hand, the students gave answers more consciously. While three out of four students felt competent in the interview at the end of the semester, one of them changed his answer to "I have hesitations." In the study, the students understood the seriousness of the topic after receiving education on how to use the out-of-school learning environments in education. They stated that they had not known the essence of the issue during the interview at the beginning of the semester and that they had responded in that way. These findings were similar to the findings in the literature. Bozdoğan (2012) compared the opinions of prospective science teachers about out-of-school learning environments before and after the interventions and concluded that almost all of the prospective teachers understood that the process of planning and organizing school trips was a serious job. Bozdoğan (2012) stated that providing applied support to prospective science teachers in the planning and implementation of school trips during their school years at university could contribute to their gaining positive experiences. The findings indicated that educating prospective teachers on how to plan out-of-school learning environments was a serious task and that they should feel competent in taking on the various obligations required of them. In the interview at the beginning of the semester, the students stated that they had some expectations from the "science education in out-of-school learning environments" course, such as learning how and where education was carried out in out-of-school learning environments and what the contributions of these environments were. They also said that they wanted to develop themselves. When I examined the answers of the students to this question at the end of the semester, I saw that they obtained more learning outcomes than they had expected from the course and that they had not had accurate information about out-of-school learning environments at the beginning of the semester. This finding of the study was consistent with the literature (Bozdoğan, 2017; Carrier, 2009; Tal & Morag, 2009). Bozdoğan (2017) found that giving lessons to prospective teachers about out-of-school learning environments helped them develop awareness of these environments as teaching environments. According to Tal and Morag (2009), if teachers or prospective teachers are provided with sample applications about how to use out-of-school learning environments in education, they can gain a lot of knowledge and experience. Also, after teachers learn how to use and organize out-of-school learning environments in education, they will be more inclined to plan field trips (Tal & Morag, 2009). Ferry (1993) stated that prospective teachers who were reluctant at the beginning were more willing to participate in informal experiential courses after they received training on field trip pedagogy. Accordingly, our study findings were found to be consistent with the literature.

I also used midterm and final exams to ask graduate students questions about how to use out-of-school learning environments in science education. The students mostly answered the exam questions correctly and got high scores. In the interviews at the end of the semester, they stated that they learned how to use out-of-school learning environments in science

education through this lesson. Graduate students' answers on the midterm and final exams supported the interviews that I held at the end of the semester. When I evaluated all these findings, I observed that before taking the course, the graduate students did not have any scientific knowledge about out-of-school learning environments and their answers to questions did not go beyond presumptions. I also saw that their knowledge level about out-of-school learning environments increased after the intervention. Given that graduate students in Turkey do not take courses on out-of-school learning environments during the education process, I think that the results of the present study will contribute to the literature in terms of revealing the experiences of prospective teachers on out-of-school learning environments.

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