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An Investigation into Changes in The Situation of Science Teachers Who Attend Out-of-School Learning Activities

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ABSTRACT This study aims to investigate the situation of science teachers regarding out-of-school learning activities and to investigate how their participation in out-of-school learning activities as an observer within the scope of science courses creates a change in the situation of teachers. A case study was used in this study. Twenty-one science teachers in the study group participated as observers in the activities carried out with the seventh-grade students for seven different out-of-school learning areas. Pre- and post-interview forms were given to the study group. The findings demonstrate that a significant number of science teachers did not receive training for such practices before participating in the activities. They were aware of the benefits and importance of out-of-school activities but did not feel sufficient in learning practices. Another result of this study is that there are positive developments in the situation of teachers by showing a significant reduction in anxiety about aspects such as determining out-of-school learning environments according to the subject and performing out-of-school activities. In addition, this study reveals that teachers ' observation experience makes them aware of different aspects of out-of-school learning.

Keywords Out-of-school learning, science teachers, the Case study, Learning activities

1. INTRODUCTION

Today, developments in science and technology and intense demands for discoveries and inventions amplify the importance of science education. At this point, teachers need to be equipped with skills to increase students ' interest in science and ensure their continuity. One of the important means of providing this interest is to conduct science education outside the classroom. The basic element of out-of-school learning is that people who are a part of nature try to learn and understand nature by feeling it with their senses. In addition, it supports establishing a relationship between lessons and real life. In this context, out-of-school learning environments and academic studies in science education clearly show interest in the subject (Affeldt, Tolppanen, Aksela, Eilks & Practice, 2017; Clarke-Vivier & Lee, 2018). Bolat & Köroğlu, 2020; Cagri, Gulgun, Yilmaz & Doganay, 2019; Larsen, Walsh, Almond & Myers, 2017; Demir & Celik, 2020; Firman, 2020; Norðdahl & Jóhannesson, 2020; Özyildirim & Durmaz, 2022).

It is accepted that out-of-school learning was first started at Broadoaks Schools in the USA based on "the use of nature itself in lessons as a laboratory." Out-of-school learning entered the California State program in 1912 and began to take part in the curriculum for the first time (Okur-Berberoğlu & Uygun, 2013). Currently, the use of out-of-school learning in science lessons is encouraged in the science curricula of many countries around the world (MONE, 2018; Matthews, 2017; Meric & Tezcan, 2005; Ergun & Avci, 2013; Fűz, 2018; Göksu, 2020).

As stated above, out-of-school learning practices benefit students and teachers. These activities provide students with a different learning experience, enabling teachers to discover, implement, and evaluate different teaching approaches (Demir & Çetin, 2022). Out-of-school learning is a multidimensional process that allows us to carry out structured learning activities outside the classroom and includes working in different environments such as science-technology-society-environment and the natural environment (Waite, 2020; Küçük & Yıldırım, 2020; Çetinkaya, 2021). In a comprehensive review by Malone (2008), which compiled studies on the benefits and effects of learning outside the classroom in many parts of the

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world (USA, England, Australia, Italy, Norway, Finland, Belarus, Canada, Sweden and Thailand), it was stated that "experience in any environment is important" as a slogan. This report presents evidence that school grounds, nature camps, art galleries, parks, and community venues can each contribute positively to the development of children and youth and that these experiences shape their identities. In addition, this report stated that children 's involvement in learning environments outside the classroom provides benefits in five different areas. These benefits include learning, social interaction, emotional well-being, and physical and reaction-behavioral changes (Evans & Achiam, 2021). Out-of-school science education can be an alternative pathway to 21st-century competencies among learners (Berg, Achiam, Poulsen, Sanderhoff & Tøttrup, 2021). In this process, students ' senses are made more open, their awareness of the relationship between humans and the environment increases, students gain environmental awareness, analytical thinking skills develop, students' success levels increase, scientific process skills are developed, and abstract concepts that positively affect their attitudes and motivations toward the course are provided. Thus, it is possible to learn from real sources of scientific information (Vaughan, 2020; Ciftci & Dikmenli, 2016; Aslan & Demircioğlu, 2018; Seyhan, 2020; Richmond, Sibthorp, Gookin, Annarella & Ferri, 2018). According to the studies conducted in this context, it is stated that educational field trips make it easier to cope with learning problems, provide students with plenty of opportunities to make observations and make learning interesting. In addition, these field trips for educational purposes play an important role in the socialization of students by providing the opportunity to make new friends and get to know each other and by improving student-teacher communication (Dillon, Rickinson & Teamey. 2016; Richmond, Sibthorp, Gookin, Annarella & Ferri, 2018; Waite, 2020). Teachers experience some difficulties in out-of-school practices, such as student control, planning the practices, and preparing post-trip assessment scales (Donitsa-Schmidt & Zuzovsky, 2020; Clarke-Vivier & Lee, 2018; Henriksson, 2018; Ocak & Korkmaz, 2018; Çiçek & Saraç, 2017; Kubat, 2017; Topaloğlu & Kıyıcı, 2015). However, it has also been revealed that these environments are effective in providing positive attitudes toward teaching, increasing professional satisfaction and motivation, and gaining educational experience after the activities of teachers who have had out-of-school learning experiences with their students (Çiçek, Ö., & Saraç, 2017; Donitsa-Schmidt & Zuzovsky, 2020; Tal & Morag, 2009; Laçin-Şimşek & Öztuna-Kaplan, 2022). Most studies investigating the views of teachers and students on out-of-school learning environments in science education have investigated the possible benefits of these environments (Mutlu & Celik, 2019; Evans & Achiam, 2021). These studies focus on teachers, teacher candidates, and head masters' perspectives on out-of-school learning and their effects on students (Mutlu & Çelik, 2019; Henriksson, 2018; Davidson, Passmore & Anderson, 2010; Sahin & Yazgan, 2013; Erentay, 2013; Erten & Tasci, 2016; Sarioglan & Küçüközer, 2017; Tungac, 2015; Çiçek, Ö., & Saraç, 2017; Alkan, 2023; Sontay & Karamustafaoğlu, 2017; Ayeni & Sadıku, 2020; Durukan, Aslan & Bozdoğan, 2022). In some studies, it is emphasized that teachers experience some concerns due to the difficulty in controlling the students during the planning and experiences of scientific field trips. They also agree that it is not always possible to provide vehicles to practice in the planned area; it requires responsibility to ensure the safety of the students in this process, and it is also not possible to complete the curriculum they have to carry out, and such practices are time-consuming. (Çiçek, Ö., & Saraç, 2017; Topaloğlu & Kıyıcı, 2015; Kubat, 2017; Onal & Cevik, 2022); Karbeyaz & Karamustafaoğlu, 2021; Clarke-Vivier & Lee, 2018). Therefore, teachers require learning experience to overcome these difficulties and concerns about planning and conducting an out-of-school activity (Clarke-Vivier & Lee, 2018). In this context, science teachers who participated in out-of-school learning practices acted as observers. The purpose of this study was to examine the changes in science teachers' views on out-of-school learning practices after being provided with the opportunity for a learning experience.

2. METHOD

2.1. Research Model

A case study, one of the qualitative research models, was used in this study to determine the situation of science teachers regarding out-of-school learning and to reveal how their participation in out-of-school learning activities as an observer within the scope of science courses affects the situation of teachers. A case study investigates factors related to a situation (environment, individuals, events, and processes). It focuses on how these factors affect the relevant situation and how they are affected by the situation (Yildirim & Simsek, 2021).

Research within this model framework was conducted in three stages. In the first stage, pre-interview forms were given to each science teacher who participated in the study voluntarily at different times, and they were asked to answer the questions in the form. In the second stage, activities were prepared for seven different out-of-school learning areas in line with the subjects and purposes shown in Table 1. The prepared activities were carried out with the 7th-grade students of one of the researchers, a science teacher, for seven weeks and once a week in out-of-school environments for which visit permissions were obtained in advance. Teachers in the study group participated in these practices as observers. The final interview form was submitted to the teachers in the last stage.

Table 1 Selected subjects and selected objective areas from the science curriculum determined for out-of-school learning (MONE, 2018)

Subjects	Objective	Out-of-school areas
-Structure and Properties of Matter -Separation of the Mixtures - Chemical Industry	- Observing some methods that can be used in the separation of mixtures at the application site in the industry -Attempting different methods used in the separation of mixtures	-Oil Factory -University Chemistry Laboratory
-Domestic Waste and Recycling	-To be able to distinguish recyclable and non-recyclable materials in household waste. -Evaluating recycling by observing on-site in terms of the effective use of resources -Examination of waste control practices in the immediate vicinity.	-Former unregulated landfill in the area we live in -Solid waste regular storage and disposal facilities in the region we live in
-Types of Electric Energy Usage	-Recognition and application of electrical circuits	-Creative Minds
-Connection Types of Bulbs	-To be able to conduct experiments on the conversion of electrical energy into heat and light energy and to give examples of technological applications. -To be able to observe and interpret the brightness differences in the circuit when the bulbs are connected in series and in parallel.	-Science Workshop
-Conversion of Electric Energy	- Recognition of electrical energy sources -Seeing and examining the conversion of motion energy into electrical energy and electrical energy into motion energy in practice. -Examination of how electrical energy is produced in power plants -Seeing and reviewing the applications of wind power plants and clean energy sources	- Wind Power Plant
- Solar System and Beyond -Celestial Bodies -Solar system -Space researches	-Observing and recognizing celestial bodies with the naked eye. -To be able to distinguish and recognize planets, stars, and galaxies in the solar system using simulations -Compares the planets in the solar system	Space observatory and planetarium

2.2. Study group

Sciences teachers, who were the study participants, were determined through convenient sampling, a purposive sampling method (Obilor, 2023). Purposeful sampling methods include determining the characteristics of the population of interest and selecting individuals with these characteristics (Creswell, 2009). Purposeful sampling allows for an in-depth study of situations that are thought to have rich information (Yildirim & Simsek, 2021). Inconvenient case sampling, the research is carried out quickly and practically because the researcher chooses a situation that is easy to reach for himself (Obilor, 2023). In line with the purpose of the study, 21 teachers who voluntarily agreed to participate in the study when they were informed about the purpose of this study and what kind of process would be followed formed the study group. Out of 37 science teachers who were working in a city in the northwest of Turkey, they were selected in a way that researchers could easily reach.

The demographic information of the teachers participating in the study is given in Tables 2 and 3. All the teachers are science teachers working in public schools. Nineteen teachers work in urban centers, and the other two in rural schools. All teachers have teaching experience in both rural and urban areas. Looking at the years of

Table 2 Seniority information science teachers participating in the study (n=21)

Gender	Number of teachers
Woman	14
Man	7
Seniority (year)	**Number of teachers**
0-5	0
6-10	10
11-20	6
21 and above	5
Total	21

Table 3 Out-of-school education activity organization status of teachers (n=21)

Participation status	Number of Teachers Participating in the Out-of-School Education Project
Never	13
1 times	3
3 times	4
4 times	1
Total	21

seniority, it can be seen that most teaching experiences have a seniority of 10 years or more. As can be seen from Table 3, most of the participating teachers had never organized any out-of-school activities before. In the remaining part, very few out-of-school activities occurred.

2.3. Data Collection Tool

In this study, a structured interview form developed by the researchers consisting of 10 pre-activity questions and six post-activity questions, was used to determine the status of science teachers regarding out-of-school learning. In the research, the number of questions asked after the activities was less than the number of questions before the activity because the questions that determine the demographic information and experiences of the participants were asked before the application and not after the application. The questions common to both the pre- and post-interview forms focused on the following subjects: their perception of their efficacy in out-of-school science teaching, their ability to identify out-of-school learning environments in science subjects, their awareness of the existing suggestions for out-of-school learning in the science curriculum, their awareness of the potential effects of out-of-school science teaching on students, their awareness of preparing assessment scales for out-of-school science teaching, and their understanding of the problems that may be encountered in out-of-school science teaching activities.

Interview forms were created by examining the relevant literature. In preparing the interview questions, attention was paid to principles such as the questions being easy to understand and not guiding the respondent (Roberts, 2020). To determine the extent to which the prepared interview forms serve the purpose, their suitability for the intended purpose, clarity, and applicability, the opinions of experts in the field were taken, and the form was given its final shape by making necessary changes in line with the feedback received.

2.4. Data Analysis

The data collected in this study were analyzed using content analysis. In the definition of data through content analysis, similar data are brought together and interpreted within the framework of certain concepts and themes (Yildirim & Simsek, 2021; Lichtman, 2023). The main purpose of this analysis is to identify the concepts and relationships that will help explain the collected data. The researcher names those that form a meaningful part among themselves, meaning they are coded (Neuman, 2012). The researchers analyzed all the data in this study and coded using short words for close expressions. Coding was based on teachers ' awareness and understanding of out-of-school learning activities. Subsequently, the related codes were gathered under the same theme. Finally, frequencies were determined according to the codes and themes created.

3. FINDINGS

When the answers to the questions in the interview forms were subjected to content analysis, the codes created from the data obtained from the pre-form were grouped under four themes, and the codes created from the data obtained from the final form were grouped under four themes (Yildirim & Simsek, 2021; Lichtman, 2023). For this reason, the findings were presented under two groups of themes: "Themes of Situations Detected Before the Process" and "Themes of Situations Detected Before and After the Process." The themes in these classifications are as follows:

Themes of the Situations Detected Before the Process

Theme 1: Their understanding of what out-of-school learning is: To determine the teachers ' understanding of what out-of-school learning is, in the pre-interview form, the question "What do you think is out-of-school learning?" was posed. The codes and frequency distributions created by analyzing the answers given by the teachers are presented in Table 4. Because a participant can talk about more than one effect in their response, the sum of the frequency values of the categories is more than the number of participants.

Table 4 Understanding of out-of-school learning

Codes	f
Learning outside school	9
Learning is possible everywhere	5
Learning through study, research, excursions and observations	5
Students learn from their own experiences	4
Learning in exhibitions, fairs, and festivities	3
Total	26

When the answers given by the teachers are evaluated, it is seen that they make different definitions for out-of-school learning. For example, Teacher 9 stated, "According to me, learning activities occurring in a different place than school is out-of-school learning." By emphasizing 13 trips and observations, the teacher said, "They are learning that occurs outside the school. It is the learning that the student realizes through trips and observations, examinations, and research." Teacher 8, emphasizing that students ' experiences are important, stated, "They are environments where students can learn by experiencing on their own." In addition, the definitions of learning (f=3) in exhibitions, fairs, and festival areas are also used by teachers.

Theme-2: Experiencing out-of-school science learning environments: To determine the teachers ' experience of out-of-school learning environments, in the pre-interview form, the question "Which out-of-school learning environments do you use in your lessons?" was asked, and the codes and frequency distributions created by analyzing the answers given by the teachers are presented in Table 5.

When we look at teachers' out-of-school science learning environments in lessons, the highest number

Table 5 Experiencing out-of-school science learning environments

Codes	f
Science Festivals (fair)	10
Museums	6
Industry Associations	5
Scşence Workshops	4
School Yards	3
Nature Trips	2
Total	30

corresponds to science fairs (f=10). For example, Teacher 4 stated, "I take my students to science fairs coded 4006((science festival support fund) supported by TUBİTAK (The Scientific And Technological Research Council Of Türkiye)", Teacher 6 stated, "We go to science festivals that are organized around us that are easily accessible." In addition, teachers stated that they could benefit from museums, industrial establishments, science workshops, and schoolyards. Teacher 12 said, "I prefer the ones close to the school for out-of-school learning. Since the science workshop is close to our school, I take my students there." Teacher 8 said, "Sometimes I teach my students in the schoolyard following the subjects. In addition, there is a bakery near the school, and I teach my students there on topics such as fermentation and microscopic living things." Moreover, it is noteworthy that the frequency of nature trips (f= 2), which has an important place in out-of-school environments, is lower than that of the others.

Theme-3: The situations of the institutions and organizations that cooperate for out-of-school learning: The codes and frequency distributions created when the answers given by the teachers to the question of which institutions or organizations cooperate within the scope of out-of-school learning activities are presented in Table 6. Because a participant stated more than one institution and organization name in his answer, the sum of the frequency values of the categories is more than the number of participants.

Table 6 Situations of collaborating institutions for out-of-school learning

Codes	f
Governorship	4
Prefecture	3
Headman's office	5
Municipality	7
University	8
Ministry of National Education	9
Tourism Directorate	4
Museum	4
Private Organizations	2
Other Out-of-School Settings	6
Total	52

Teachers cooperate with different institutions and organizations within out-of-school learning activities. The highest rates among these institutions or organizations are the directorate of national education (f=9), university (f=8), and municipality (f=7). Examples of statements from teachers on this subject are as follows: Teacher 1 stated that he cooperated with the municipality and said, "I want help from the municipality in providing vehicles to go to out-of-school learning environments." While saying that, the teacher stated that she/he communicates with six national education directorates as follows: "I prefer to communicate with the national education directorate for out-of-school learning environments. Teacher 15 said, "I cooperate with the appropriate faculties of universities by the subjects." He stated that he cooperated with the university. From these statements, it is noteworthy that teachers try communicating with different institutions and organizations.

In addition, the state governorship, district governorship, headman, tourism directorate, museums, and private institutions are the institutions they benefit from. According to these findings, it was seen that the teachers showed several distributions in terms of the institutions and organizations with which they cooperated.

Theme-4: Experiences in out-of-school science teaching: To reveal the teachers ' experience in out-of-school learning, in the pre-interview form, the question "How often do you perform out-of-school learning activities during the year? (Never [ ] Once a year [ ] 2-3 times a year [ ] 4-5 times a year [ ] More than five times a year [ ])" was asked. The codes and frequency distributions created when the answers given by the teachers were analyzed are presented in Table 7.

Table 7 Experiences in out-of-school science teaching

Codes Regarding the Number of Out-of-School Activities	f
Never	1
1 time	11
2-3 times	6
4-5 times	3
More than 5 times	0
Total	21

Eleven teachers stated that they usually conduct an out-of-school learning activity once a year. It is seen that six teachers perform out-of-school learning activities 2-3 times a year, and three teachers perform them 4–5 times a year. For example, Teacher 3 says, "I usually take my students to close places once a year or 2-3 times in some years." Teacher 6 stated, "We go 3-4 times depending on the situation, as it is easy to go to places within walking distance of the city and return."

Unfortunately, no teachers do more than five out-of-school learning activities. One teacher stated that he did not participate in any out-of-school learning activities. In addition, a striking point is that some teachers do not consider the places they go within walking distance within the scope of out-of-school activities. Lecturer 9 expresses

this view: "We try to organize extracurricular activities once a year by planning with my group friends, in addition to trips to nearby environments."

Themes of Situations Detected Before and After the Process

Theme 5: Perceptions of self-efficacy regarding out-of-school science teaching: In addition to determining the learning environments outside of school, the planning and organization of learning in these environments is of great importance. Therefore, before the activities, "Do you find yourself sufficient in field studies in out-of-school learning practices?" and after the activities, "Do you find yourself sufficient to do extracurricular activities with what you learned from this study you participated in?" questions were directed to the teachers. The codes and frequency distributions created when the answers given by the teachers were analyzed are presented in Table 8.

Table 8 Perceptions of self-efficacy regarding out-of-school science teaching

Codes	Before the Activities (f)	After the Activities (f)
Finding it sufficient	9	15
Finding it insufficient	10	6
Being indecisive	2	0
Total	21	21

Before the activities, nearly half of the teachers (f=10) stated they were insufficient in field studies in out-of-school learning practices. Teachers put forward a wide variety of reasons for feeling inadequate. Teacher 15 explains that the school environment in which he works affects his feelings of inadequacy: "I do not find myself sufficient. I may have difficulties ensuring student safety as controlling students in crowded classrooms becomes difficult. I think I will struggle to create a budget because I work in a disadvantaged school." Teacher 3 stated that they do not have enough information on this subject, causing them to feel inadequate: "I do not have enough information about learning through out-of-school activities." Teacher 16, who felt competent before the activities: "I find myself sufficient. I participate in extracurricular activities whenever my lessons and subjects are appropriate. I prefer places that are close to the school." He states that he performs extracurricular activities.

After the activities, while the number of competent teachers increased from 9 to 15, 6 teachers still had reservations about this issue. For example, Teacher 3 emphasizes the lack of knowledge on this subject: "I do not find myself sufficient. I don't have enough information about learning through extracurricular activities yet."

Teacher 12, one of the teachers who expressed a positive opinion by stating that their experience was beneficial, said: "I did not find myself sufficient. However, I think I have gained experience with this work."

Theme 6. Determining out-of-school learning environments in science subjects: To determine the teachers ' ability to determine out-of-school learning environments in science lesson subjects, before and after the activities, the question "Which subjects can be learned in the science lesson, in which out-of-school environments?" was posed. The codes and frequency distributions formed when the answers given by the teachers were analyzed are presented in Table 9. Because a participant stated more than one non-school environment in his answer, the sum of the frequency values of the categories is greater than the number of participants.

As seen in Table 9, the teachers gave similar answers before and after the activities, but there was an increase in frequency after the activities. While they did not think about benefiting from the biology departments of universities regarding living things before the activities, they stated that they could benefit from the biology departments of the universities after the activities. Teacher 15: "If an observatory is nearby, I want to take them there for the subject of space. But besides this, oil factories in our province are among the places we can go to within close distance." It is noteworthy that while emphasizing the activity he wants to perform by stating his opinion, he also states that he can benefit from his close environment. Teacher 6, on the other hand, states that zoos, nature trips,

Table 9 Determining out-of-school learning environments in science subjects

Codes Related to the Subjects	Codes Regarding Out of School Environments	Before the Activities (f)	After the Activities (f)	Frequency Difference
Space Topics	Observatory, planetariums	5	6	+1
Living Things Topics	Zoo	5	7	+2
	Botanic Garden	3	4	+1
	Nature trip	2	5	+3
	Biology departments of Universities	0	4	+4
Matter Topics	Industry associations	2	3	+1
Climate Topics	Meteorology stations	2	4	+2
Environment Topics	Nature trips	2	4	+2
	recycling facilities	3	5	+1
Total		24	42	

Table 10 Awareness of potential effects of out-of-school science teaching on students

Codes for Potential Impacts	Before the Activities (f)	After the Activities (f)	Frequency Difference
Provide permanent learning	14	15	+1
Increasing interest in the lesson	9	10	+1
Relating the lesson to daily life	5	5	0
Providing learning by doing	7	9	+2
Ensuring examination and observation of the environment	3	5	+2
Increasing academic success	12	19	+7
Good comprehension of topics	4	5	+1
Developing research and observation skills	5	5	0
Increasing desire to work like a scientist	2	4	+2
Total	61	77	

and botanical gardens, which are among the prominent places, are suitable for the living creatures unit as follows: "We can benefit from zoos, nature trips, and the botanical garden of the university for the living things unit."

After the activities, it was observed that the awareness of many teachers in determining out-of-school learning environments in science subjects increased. Zoos, botanical gardens, nature tours, and biology departments of universities for living creatures; industrial organizations for substance matters; meteorological stations for climate issues; nature trips and recycling facilities for environmental issues; and observatories and planetariums for space subjects are places where teachers ' awareness is raised. For example, Teacher 7 said, "Advances related to astronomy and space sciences can be learned in planetariums. Environmental problems can be observed through nature trips." Teacher 16 said, "Subjects related to living things can be studied in zoos, biology departments of universities, and planetary subjects in observatories." Teacher 3 said, "Actually, I think that nature trips will be the best places to teach the subject of environment." Teacher 14 stated, "We can benefit from oil factories and other industrial environments around us on the properties of matter."

Theme 7: Awareness of the potential effects of out-of-school science teaching on students: Teachers ' effects of out-of-school learning on students, academic achievement, scientific process skills, attitudes toward science, and environmental awareness were assessed both before and after the activities. The codes and codes for frequency values obtained from the answers are presented in Table 10.

To reveal the teachers' awareness of the potential effects of out-of-school learning on students, before the activities, the question "What do you think the effects of out-of-school learning activities used in science lessons can be on students?" and after the activities, the question "Based on your impressions of this study you participated in, how do you think the teaching of science subjects in out-of-school environments will affect students?" was asked. The answers given by the teachers were analyzed, and the generated codes and frequency distributions are presented in Table 10. Because a participant can talk about more than one effect in his /her response, the sum of the frequency values of the categories is more than the number of participants.

As can be seen from Table 10, teachers talk about many potential effects of out-of-school science teaching, such as permanent learning, increased interest in the lesson, association with daily life, learning by doing, allowing examining and observing, academic success, and working as a scientist. As seen in the table, they expressed the opinion that out-of-school learning would provide the most permanent learning in science teaching, with the highest rate of these effects being f=14 before the activities and f=15 after the activities. For example, before the activities, Teacher 19 draws attention to permanent learning and observation: "Learning science subjects in out-of-school environments makes it easier to associate the lesson with daily life. The memorability of the subjects increases, i.e., it provides permanent learning. It also offers the opportunity to observe the environment." Teacher 10, on the other hand, stated the importance of learning by doing: "Processing science subjects in out-of-school learning environments enables students to learn subjects better by doing and experiencing. It increases students ' interest in the lesson."

When the opinions of the teachers who observed the applications after the activities were evaluated, frequency increases were seen in general compared with the pre-application. Notably, the highest frequency increase is in increasing academic achievement (f=+7). When some teachers ' opinions were taken as an example after the activities, Teacher 11 said, "I think that the information learned in the lessons will contribute to the academic success of the students by associating them with their daily life practices." Teacher 21, on the other hand, states that such activities will increase the student's interest in the lesson and the environment. "I noticed that these applications make students more interested in the lesson and make them observe the environment more carefully." Teacher 4, however, draws attention to the importance of having experience. "I think students enjoy learning by doing and experiencing." Teacher 5 said, "I became more

Table 11 Teachers' understanding of problems encountered in out-of-school science teaching activities

Codes for Problems That May be Encountered	Before the Activities (f)	After the Activities (f)	Frequency Difference
Transportation shortage	8	8	0
Responsibility for a large group of students	14	8	-6
Out-of-school security problems	5	5	0
Parent's disapproval	4	4	0
Giving responsibility to the teacher	2	3	+1
Traffic accidents	4	4	0
Budget deficiency	6	0	-6
Bureaucratic obstacles	4	5	+1
Total	47	37	

aware of the importance of extracurricular activities while watching the applications." which shows that the activities create awareness in teachers as well."

Theme 8: Teachers ' understanding of the problems encountered in out-of-school science teaching activities: Although teachers think that out-of-school learning is beneficial, they have reservations about organizing out-of-school learning activities. To understand the teachers ' understanding of the problems they may encounter in out-of-school learning activities, the question as to "What do you think are the problems and safety problems that may occur in out-of-school learning activities?" was posed. The frequency distributions of the codes that emerged when the answers given by the teachers both before and after the activities were analyzed are presented in Table 11. Since a participant can mention more than one problem in his /her answer, the sum of the frequency values of the categories is greater than the number of participants.

Before and after the activities, teachers stated problems such as transportation problems, inability to control the large group of students, security problems in the out-of-school area, bureaucratic obstacles, parents ' disapproval, traffic accidents when going out of school, and putting too much responsibility on the teacher before and after the activities. Before the activities, statements indicate difficulties such as student dominance, procedural redundancy, and transportation problems. For example, Teacher 2 draws attention to the transportation problem and Teacher 18 draws attention to student dominance. Teacher 2: "There is a transportation problem in taking students to the out-of-school environment." Teacher 18: "There may be difficulties dominating large groups of students in out-of-school learning environments. Parents can ask for help on such trips. Teacher 9 complains about excessive procedures: "There are too many permission procedures that take students to out-of-school activity environments. These procedures should be reduced."

Following these events, it is seen that similar reservations continue in their minds. Teacher 9, worried about uncontrollable student behavior, expressed concern by saying, "Uncontrollable student behavior makes me nervous." Teacher 14 emphasized the difficulty of having most of the responsibility on the teacher: "The fact that the teacher has all the responsibility in out-of-school trips creates pressure on the teacher." In addition to these reservations, some teachers suggested using positive expressions, as demonstrated by Teacher 12: "Such practices can be done more easily if responsibilities are shared by cooperating."

As seen in Table 11, it is noteworthy that there was a significant decrease in frequency in the codes of "dominance of a large student group" and "no budget" after the activity.

4. DISCUSSION

In this part of the study, the answers given by science teachers who took part as observers in out-of-school learning applications before and after the applications will be discussed, and the findings obtained will be discussed. The answers given to the questions in the interview forms with the teachers were subjected to content analysis, and the codes generated from the data obtained were analyzed under eight themes.

Teachers' definitions of out-of-school learning offer a perspective on the importance of practices in these environments and their contribution to education. Definitions such as "Learning is everywhere," emphasizing that learning has no limits, "Learning through investigation, research, travel, and observation," or "Environments where students can learn by experiencing on their own" were used. Çetinkaya (2021) examined teachers' views on the concept of out-of-school learning in two categories: dependent on physical space and based on plan and practice. Teachers defined all kinds of learning activities outside the school boundaries as out-of-school learning. Henriksson (2018), in his research on the definitions of out-of-school learning, stated that teachers, when defining the learning content, mostly referred to the student's (and teacher's) interest (affective motivations) and concrete activities or actions (process-oriented motivations). Remmen & Frøyland (2017) refer to out-of-school learning as an extended classroom.

When the theme of experiencing out-of-school science learning environments is analyzed, the rate of teachers experiencing out-of-school areas remains low. Generally, science fairs and museums, industrial organizations, science workshops, school gardens, and museums are easily accessible. It is also understood from the teachers'

statements that such activities are generally preferred because they are usually in school gardens or within walking distance. The fact that nature observations are the least used out-of-school activity may be because organizing such trips that require transportation requires additional costs, more organization, and responsibility for the school. Berg, Achiam, Poulsen, Sanderhoff & Tøttrup (2021) emphasized the necessity of using out-of-school learning areas in science teaching in our age. They pointed out that natural history museums, fieldwork, wastewater treatment plans, and DNA laboratories can be used as learning areas that will make a valuable contribution.

National education directorates, universities, and municipalities are the most frequently applied institutions for out-of-school learning because of their easy accessibility to support teachers in using out-of-school learning environments. This theme is not often included in academic research. The importance of communication between teachers and the institution where the trip is organized and the need to improve this communication has been emphasized (Türkmen, 2018; Alkan, 2023). In addition, Alkan (2023), approaching from a different dimension of our study, states that school principals also propose alternative solutions to provide financial support to facilitate the work of teachers and sign some protocols such as alumni associations, civil organizations, parent-teacher associations, and governorships.

The science teachers in the study had very little out-of-school science teaching experience. More than half of the science teachers stated that they did out-of-school learning activities once a year and only three teachers stated that they did four or five activities yearly. One teacher stated that he/she did not participate in any out-of-school learning activities. This result is similar to the findings of other academic studies (Arabaci & Akgül, 2020; Türkmen, 2018). Clarke-Vivier & Lee (2018) surveyed 309 teachers, and 19% reported that they never took their students to experience out-of-school environments. Just over 50% reported taking their students on two field trips. An important finding of our research is that 13 of the 21 teachers who participated in the practices had not previously been involved in any project or out-of-school practice. Considering this result, it can be thought that lack of experience is also an important reason why teachers are not willing to do practicums (Coll & Coll, 2019; Clarke-Vivier & Lee, 2018).

Teachers ' self-efficacy perceptions are crucial in the education and training process. Therefore, this theme was evaluated both before and after the activities. Thus, we attempted to determine the change in the self-efficacy perceptions of teachers who gained experience in such activities. Although 9 out of 21 teachers who participated in the practices before the activities stated that they were competent in conducting out-of-school learning practices, this number increased to 15 after the practices. While this change after the practices is valuable, it is notable that six teachers had reservations. Academic studies in this field show differences compared with our study. According to (Demir & Çetin (2022), teachers ' self-efficacy perceptions, attitudes, and behaviors are critical for the success of a curriculum, and according to the findings obtained from 308 teachers comprising science, social studies, mathematics, and Turkish teachers, their level of feeling competent about doing out-of-school practice was high. However, in another study, science teachers' self-efficacy perceptions about organizing field trips were affected by age, region of the school, professional experience, educational status, and the status of organizing field trips (Sontay & Karamustafaoğlu, 2017). Pekin & Bozdoğan (2021) examined the self-efficacy of science, Turkish, mathematics, and social studies teachers regarding different variables for organizing trips to out-of-school environments and showed that teachers could organize educational trips to out-of-school environments. It also shows no relationship between teachers' self-efficacy perceptions and the length of service. These scientific studies show that variable factors exist between teachers' out-of-school experiences and their self-efficacy beliefs. In a study examining the change in self-efficacy perceptions of teachers who had out-of-school learning experiences, science teachers were allowed to practice in science centers. Because of the application, it was seen that there were positive effects on teachers' self-efficacy beliefs in organizing trips to out-of-school environments (Laçin-Şimşek & Öztuna-Kaplan, 2022). The authors consider this result to be the effect of teachers actively designing and implementing activities. This view is similar to the research result.

One of the issues that teachers should focus on is determining appropriate out-of-school learning environments in science education and associating them with the learning outcomes in the curriculum. When the findings obtained are evaluated, it is seen that teachers know the out-of-school learning areas that can be used in science education. Another result is increased teachers' associations between science course subjects and out-of-school learning environments after implementation. Teachers ' hesitation in implementations despite knowing these associations and out-of-school environments may be due to their lack of experience and concerns such as student control during implementations, economic reasons, and inability to train the curriculum, as discussed below. In their study, Ocak & Korkmaz (2018) stated that science teachers could use out-of-school learning areas while teaching biology subjects such as living things, humans and the environment, and photosynthesis. Many studies show that education in out-of-school environments is beneficial to emphasize the importance of knowing where such activities will occur as well as the appropriateness of the practices in the curriculum (Demir

& Bozdoğan, 2021; Coll & Coll, 2019; Clarke-Vivier & Lee, 2018; Topaloğlu & Kıyıcı, 2015).

In the theme of the potential effects of out-of-school science teaching on students questioned, permanence was the most emphasized effect. Other effects included increasing interest in the lesson, associating with daily life, learning by doing, making investigations and observations, academic success, and working as a scientist. The increase in frequency after the applications can be explained by the positive change in teachers ' awareness. Onal & Cevik (2022) stated that the advantages of science education include permanent learning, learning by doing and experiencing, and the opportunity to learn in a natural environment. In the studies conducted with science teachers and primary school teachers, unlike our study, they stated that such applications would increase students ' interest in science and nature, be a source of motivation, and be fun environments where they could make excursions and observations. In addition to these, teachers also stated that they will gain biodiversity, love of the environment and animals, recycling, awareness of energy consumption, love of science, and cultural awareness (Henriksson, 2018; Sarıgül, 2021; Arabaci & Akgül, 2020; Evans & Achiam, 2021).

The theme of science teachers' identification of the problems encountered in out-of-school science teaching activities is one of the most researched topics in academic studies. Among the findings, controlling crowded classrooms, bureaucratic obstacles, transportation costs, and uncontrollable student behaviors are mentioned as problems. Among these findings, the decrease in the frequency of the problem of controlling crowded classrooms and insufficient budgets after the implementation draws attention. (Büyükkaynak, Ok & Aslan , 2016) Analyzed the responses received from teachers in four subcategories. These are classified as problems arising from the fact that it takes too much time, discipline problems, and student perception that students perceive such environments as entertainment and financial and transportation difficulties. The results given to similar questions in several academic studies in this context agree with the results obtained in this study. In scientific studies conducted in different countries, teachers identified the difficulties in funding and organizing transportation, permission processes, meeting the cost of the trip, student control, and transportation as the biggest obstacles to out-of-school learning. (Sontay & Karamustafaoğlu, 2017; Çiçek, Ö., & Saraç, 2017; Türkmen, 2018; Clarke-Vivier & Lee, 2018).

5. CONCLUSION

When the findings are evaluated, it is seen that science teachers ' experiences in out-of-school learning areas have positive contributions. Considering the importance of these practices, such training for both teachers and pre-service teachers can lead to more use of out-of-school learning environments. Another point that draws attention to our research process is that when current and older academic studies on out-of-school learning are considered as a whole, similar problems persist even though the studies have been spread over many years. To facilitate the resolution of these problems,out-of-school learning centers should be established in cooperation with universities and education ministries, and it is necessary to find solutions to the problems that may be encountered by working in coordination with teachers. For the data obtained from these and similar studies to reach the teachers, whom we consider to be in the kitchen of the practice, it is necessary to organize workshops that will bring teachers and academicians together frequently. It can be said that this kind of academic knowledge sharing is also important in the seminars given to teachers.

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