The Effect of Outdoor Science Activities Based on Scientific Process Skills on Students' Academic Achievement

Assoc. Prof. Dr. Mustafa YADİGAROĞLU, Aksaray University, Faculty of Education, Türkiye
Teacher Abdullah TAŞ, Ministry of Education, Türkiye

Abstract

The purpose of this study is to determine the effect of outdoor science activities based on Scientific Process Skills (SPS) on the academic achievement of 7th-grade middle school students within the scope of the "Pure Substances and Mixtures" unit in the science course, and to identify their views on outdoor learning environments. The study group consists of 47 students. Of these students, 24 (11 males, 13 females) form the experimental group, while 23 (14 males, 9 females) form the control group. A quasi-experimental design with pre-test and post-test control groups was used in the study. Students in the experimental group participated in activities at Yozgat Çamlık National Park outside the classroom, while students in the control group received instruction based solely on the science curriculum. Quantitative data were obtained through an "Academic Achievement Test." Qualitative data were collected through semi-structured interviews with 7 students from the experimental group. The research results show that the activities conducted in the national park led to a significant increase in students' views on outdoor learning environments and their academic achievement. Retention test results reveal that activities in outdoor learning environments have a lasting effect on students' academic achievement. The results obtained from the qualitative data of the research indicate that the activities increased students' interest in science lessons and enriched their learning experiences.

Keywords: Outdoor activities, Out-of school learning, Academic achievement, Scientific process skills

1. Introduction

Individuals experience learning not only in their classrooms at schools but also outside the classroom environment. Educational activities carried out in schools are not limited to the classroom and school settings but can also take place outside these environments. Learning that occurs outside the classroom environment is expressed in different ways such as "out-of-school learning" (Tal, 2012), "informal, authentic, everyday learning" (Griffin and Symington, 1997), "free-choice learning" (Falk, 2001), and "non-formal learning" (Eshach, 2007). When the literature is examined, it is seen that out-of-school learning is expressed in different ways by researchers. While Eshach (2007) defines learning in out-of-school environments as a place that encompasses all areas outside school boundaries where an individual has experiences, Gerber et al. (2001) define out-of-school learning as all learning that occurs with the accompaniment of a teacher. Out-of-school learning environments offer students a more free and comfortable learning experience while allowing them to learn at their own pace (Melber and Abraham, 1999). Additionally, it enables students to acquire skills included in the curriculum and facilitates positive development in students' attitudes and behaviors (Kelly, 2000). This situation provides students with lasting learning experiences.

Outdoor education is generally a complementary element to traditional classroom education. This approach is expressed with different terms in the literature. Among these terms are many intertwined concepts such as out-of-space/classroom education (Civelek et al., 2018; Okur-Berberoğlu & Uygun, 2013), outdoor education (Balcı, 2005), out-of-school/classroom learning (Karadoğan, 2016), out-of-space learning (Kanat, 2020), and out-of-classroom/school practices (Fidan, 2012). As can be seen, out-of-space education has been associated with many concepts such as outdoor education and learning in nature (Aynal Öztürk, 2009). In outdoor education, as it can focus particularly on interaction with nature and environmental sensitivity, such education can be carried out in natural environments like nature, forests, mountains, camping areas, seashores, and similar settings (Yıldırım & Özyılmaz Akamca, 2017). Activities conducted in open areas help children develop scientific process skills by offering a unique discovery experience (White, 2013). Such activities can encourage students to use basic scientific process skills such as observation, measurement, classification, prediction, and inference in practice. At the same time, outdoor environments allow for the use of all senses and greater involvement of imagination, which is said to improve students' creativity and problem-solving abilities (Dowdell et al., 2011; Yayla Ceylan & Ülker, 2014). Therefore, outdoor activities play an important role not only in enhancing students' scientific process skills but also in enriching their overall learning experiences and encouraging creative thinking. Teo et al. (2007) examined the effects of the 'Science Alive!' program, which includes direct experience methods such as laboratory work and field trips, on students' scientific process skills and perception of science in daily life. In the study, 147 students were given a 13-week course, and as a result, a significant improvement was observed in students' scientific process skills such as inquiry, research planning, using scientific tools, and data analysis; additionally, it was found that the program increased students' awareness of science. Scientific process skills, one of the fundamental components of science education, appear to represent an important learning area that helps students develop their ability to understand and apply science. Based on this idea, the study sought to answer the question, "What is the effect of outdoor science activities based on scientific process skills on students' academic achievement?"

2. Method

In this study, a quasi-experimental design with pretest-posttest control group from the experimental research model was used. Although there are different types of the method, the pretest-posttest control group design was preferred in this study (Robson, 1988; Karasar, 2011). With this method, quantitative data is first collected and analyzed, then qualitative data is collected based on the findings obtained, or vice versa (Kemper et al., 2010).

Study Group

The study group of the research consisted of a total of 47 seventh-grade students (25 girls, 22 boys). One of the classes was randomly assigned as the experimental group (N = 24; 11 boys, 13 girls), while the other was assigned as the control group (N = 23; 14 boys, 9 girls). In the experimental group, instruction was carried out using open-field science activities based on developed activities, while in the control group, a teacher-centered instruction (lecture, question-answer, note-taking, etc.) was implemented. Students' prior knowledge and post-implementation achievements were determined using the Academic Achievement Test as a data collection tool.

Data Collection Tools

In this study, data were collected using two different tools: Academic Achievement Test and interviews. Information about the development and use of these tools is provided below.

Academic Achievement Test

This test consists of 23 multiple-choice questions. The test questions were compiled based on literature research, taking into account the objectives of the subject (Demir et al., 2016; Yüksel, 2017; Yıldırım, 2021). The validity of the test was ensured by having it reviewed by 3 faculty members who are experts in the field and 3 experienced science teachers. For the reliability of the test, it was administered to 163 students as a pilot. The difficulty index, discrimination index, and reliability coefficient (KR-20) were calculated for the items in the test, and the reliability coefficient was found to be .874.

Interviews

In this study, semi-structured interviews were conducted to reveal students' thoughts about the implemented activities and the teaching model. The interviews were carried out with 7 randomly selected students from the experimental group two days after the implementations were completed. Student interviews were conducted individually in a quiet laboratory environment. Each interview lasted approximately 15-20 minutes and was recorded with the permission of the interviewee. The students who participated in the interviews were given the codes S1, S2, S3, S4, S5, S6, S7.

Analysis of Data

The academic achievement test used in the study consists of 23 multiple-choice questions. Each correct answer is evaluated as 1 point; students are given 0 points for incorrect or blank answers. In this case, the highest score that can be obtained from the test is 23. It was determined that the obtained data showed normal distribution. The data obtained by the control and experimental groups from the pre-test, post-test, and retention test were statistically compared using the t-test. In the analysis of interviews, each interview was listened to from the tape and noted down.

Development of Activities

In this study, 8 science activities based on Scientific Process Skills were developed for the unit on pure substances and mixtures. The activities were prepared by the researchers. While developing the activities, the learning outcomes for the 7th Grade Science course's "Pure Substances and Mixtures" topic were examined, and the activities were developed utilizing the ideas of three faculty members and two experienced science teachers. Necessary adjustments were made as a result of the pilot study of the developed activities.

3. Findings

In this section, findings obtained from the pre-test, post-test, and retention test, as well as findings from student interviews, are presented separately.

Findings Obtained from Pre-Test, Post-Test, and Retention Applications of the Academic Achievement Test

Data obtained from pre-tests applied to both groups before the implementation were evaluated and compared using an independent samples t-test. As seen in Table 1, the t-test results show that there is no statistically significant difference in achievement between the experimental group ($\bar{X}$= 8.25, SD= 3.74) and the control group ($\bar{X}$= 7.50, SD= 2.93) ($t = -0.0772$, $df = 46$, $p > 0.05$). Since there was no significant difference between the groups, the post-test means were also compared using a t-test.

Table 1. Findings Obtained from Academic Achievement Test Pre-Test, PosTest abs Retention Test Applications

Tests	Group	N	$\overline{X}$	SD	df	t	p
Pre-test	Experiment	24	8,25	3,74			
	Control	23	7,50	2,93	46	-,0772	,116
Post-test	Experiment	24	16,41	3,92			
	Control	23	13,04	4,98	46	-2,607	,026
Retention Test	Experiment	24	16,01	2,42			
	Control	23	12,54	5,29	45	-3,21	,003

The data obtained from the post-tests after the application were evaluated and compared using the t-test. As shown in Table 1, the t-test applied to the post-test scores revealed a statistically significant difference in achievement between the experimental group ($\overline{X}$ = 16.41, SD = 3.92) and the control group ($\overline{X}$ = 13.04, SD = 4.98) ($t = -2.607$, $df = 46$, $p < 0.005$).

To answer the question "whether there is a significant difference in the mean scores of the Academic Achievement Test Retention test after 7 weeks between students in the experimental group, where out-of-school SPS-based activities were conducted, and students in the control group, where curriculum-based instruction was implemented," a retention test was administered to both the experimental and control group students. An independent samples t-test was used to determine the potential difference between the retention tests. As shown in Table 1, the t-test applied to the retention test scores revealed a statistically significant difference in achievement between the experimental group ($\overline{X}$= 16.01, SD = 2.42) and the control group ($\overline{X}$ = 12.54, SD = 5.29) ($t = -3.21$, $df = 45$, $p < 0.005$).

Findings Obtained from Interviews with Students

This section provides detailed thoughts of students who participated in the activities regarding the applications. Some examples of the students' answers to the questions are given below.

1. Did conducting lessons outside of school in this manner cause any change in your interest in the science course? If so, what kind of changes occurred?

> *S1: "Conducting lessons in this way attracted my interest in the science course. Of course, it caused my interest to change in a positive direction. It increased my interest in the lesson and my determination to study."*

> *S7: "The activities conducted contributed positively to my perspective on the lesson."*

2. Was there any change in your desire to learn science when lessons were conducted outside of school? If there was a change, what kind of changes occurred?

S3: "There was an increase in my desire to learn because being in an out-of-class environment made me think it was more fun, and this increased my desire to learn science."

S5: Also expressed that processing the subjects outside of school with BSB activities helped them understand the lessons better with the following words: "Yes, I realized that I could learn the lesson better thanks to the activities, which increased my desire to learn."

3. Do you believe that conducting lessons in this way (with out-of-school learning environment activities) will affect your Science Achievement? Please explain.

S3: "Yes, my science lesson was poor, but after the activities, I started to do better in exams."

S6: "Yes, it definitely affects lesson success. Also, my lesson motivation increased."

4. What do you think are the positive and negative aspects of conducting our lesson in this way outside of school? Please explain.

S2: "The positive aspects of the activities being outside of school increased our desire to learn. My curiosity about the subject matter increased. I don't think there are any negative aspects."

S4: "As a positive aspect, it's a change. When the lesson is conducted in places other than the classroom environment, our desire for the lesson increases even more, and I think there are no negative aspects."

5. Do you think conducting our lesson in this way outside of school contributes to scientific process skills (such as prediction, observation, inference, and measurement)? Please explain.

S7: "Of course, we made plenty of observations during the activities. I think learning through observation increases retention in memory."

S5: "Of course, I think it contributes because when we do the activities, we process the lesson through observation and experiment, so we perceive it better. This way, we understand it better."

6. Would you like to learn other topics in Science lessons in a similar way (outside of school)? Why?

S7: "Yes, I would. A different environment, nature, is both fun and educational for people. I think this is more enjoyable compared to learning at school."

S6: "Certainly. For example, in subjects like geography and history, out-of-school learning can be integrated into the process to increase concretization."

7. Were there any activities among those conducted that caught your attention or that you liked? If so, could you explain why?

S4: "I really liked the separation of mixtures because I saw some objects there for the first time."

S6: "The activity of collecting trash and creating a chart from it was both useful and fun. Also, the orienteering activity was nice. I enjoyed working collectively and in groups; everyone's thoughts and ideas created different perspectives."

Discussion and Conclusion

When examining the research findings, the pre-test results indicate that the prior knowledge of students in both the experimental and control groups regarding Pure Substances and Mixtures was similar. The absence of a significant difference between the experimental and control groups prior to the implementation is meaningful in terms of evaluating the effectiveness of Scientific Process Skills (SPS) activities conducted outside of school. This situation suggests that with a comparable level of knowledge among students before the implementation, the results can be evaluated more reliably. In this context, the similarity in initial levels between the experimental group and the control group allows us to assess the effects of the implementation more accurately.

When examining the post-test scores of the experimental and control group students (Table 1), it is evident that Scientific Process Skills (SPS) activities conducted outside of school increased students' academic achievement more than curriculum-based teaching methods. Upon reviewing the relevant literature, it was determined that Turpin and Cage (2004) reported in their study that activity-based science studies developed students' scientific process skills more effectively compared to traditional curriculum. The research results support this study. In the research, students in the experimental group demonstrated higher academic performance following activities conducted in out-of-school environments. This situation illustrates how activities not limited to the traditional curriculum and carried out in external environments contribute to students' learning and understanding processes. This can be interpreted as SPS activities playing a role in increasing academic achievement by allowing students to develop their experiential learning, exploration, and problem-solving skills.

When examining the retention test scores of the experimental and control group students (Table 1), it is shown that Scientific Process Skills (SPS) activities conducted outside of school increased students' retention levels more than curriculum-based methods. The fact that the experimental group has a higher mean retention test score compared to the control group, and a significant difference was determined as a result of statistical analysis, supports these findings. This can be interpreted as an indication that SPS activities have the potential to increase the retention level of students' understanding of the subject. When quantitative data are evaluated as a whole, it can be said that SPS activities are effective in students' permanent learning. Therefore, it can be readily stated that addressing course content and out-of-school activities together contributes to students' permanent learning.

Findings from the qualitative data of the research indicate that out-of-school learning activities increase students' interest in science, strengthen their learning motivation, and contribute to the development of scientific process skills. Students finding lessons conducted outside of school more interesting, relaxing, and enjoyable has emerged as a factor that enhances their desire to learn. Additionally, processes such as observation, gaining experience, and learning by doing have supported the development of scientific process skills. These findings are consistent with many studies in the literature. In the study by Bozdoğan and Kavcı (2016), it was reported that students participating in out-of-classroom activities showed more interest in lessons, found the process more enjoyable, and experienced ease in learning topics/concepts. Similarly, Avcı and Gümüş (2019) revealed that students had fun, felt excited, and experienced different emotions simultaneously during out-of-school activities. Soysal's (2019) research emphasizes that out-of-school learning environments are an important tool in increasing students' interest and motivation towards the course. Balkan Kıyıcı and Atabek Yiğit (2010), Bakioğlu (2017), and Kulalıgil (2016) also state that such experiences improve students' thinking skills, increase their environmental awareness, and contribute to the development of social skills. Furthermore, Scaramella et al. (2002) indicate that out-of-school learning environments can instill aesthetic sensitivity in students, increase motivation, and support personal identity development.

The findings obtained indicate that out-of-school learning environments are also effective in promoting permanent learning. Ocak and Korkmaz (2018) and Bakioğlu and Karamustafaoğlu (2020) emphasize that these environments contribute positively to permanent learning. Gürsoy (2018) revealed that these environments support students in learning subjects through hands-on experience and prevent forgetting. Similarly, Mertoğlu (2019) states that students' learning experiences are enriched through first-hand experience, observation, and discovery opportunities, while Kubat (2018) indicates that out-of-school learning contributes to a deeper understanding of subjects.

The literature shows that out-of-school learning activities also positively reflect on academic achievement. Studies conducted by Alp, Ertepınar, Tekkaya and Yılmaz (2006), Falk and Adelman (2003), Kenny (2009), Türkmen, Topkaç and Atasayar Yamık (2016), and Yavuz (2012) demonstrate that visits to informal learning environments increase students' academic achievement. Similarly, Civelek and Özyılmaz-Akamca (2018), Tal and Morag (2009), and Tatar and Bağrıyanık (2012) emphasize that out-of-school learning environments develop students' affective, psychomotor, and social skills in addition to their academic achievement.

From the perspective of scientific process skills, similar results are found in the literature. Balım et al. (2013), Bodur and Yıldırım (2018), Erten and Taşçı (2016), Keil et al. (2009), Jeenthong et al. (2014), and Ting and Siew (2014) reveal that experiential activities conducted in out-of-school learning environments improve students' scientific process skills. The critical role of these skills in science education is also emphasized in various studies. Tan and Temiz (2003), Bilgin (2005), Kanlı and Yağbasan (2008), and Aktamış (2007) have drawn attention to the importance of scientific process skills in students' learning process and stated that these skills increase science achievement. Öztürk (2008) and Başdaş (2007) also reached similar conclusions in their studies on experimental and control groups.

However, it is observed that there are also studies in the literature with different results. In Karahan's (2006) study, no significant difference in achievement was found between the experimental and control groups. This situation was explained by the traditional teaching methods applied in the control group showing a different effect compared to the science teaching program based on scientific process skills. This finding indicates that the quality of teaching methods and curriculum content are determinative in learning outcomes.

When evaluated generally, the findings obtained from this research reveal that out-of-school learning environments have the potential to develop students' interest in science and scientific process skills, contribute to academic achievement, and support social-emotional development. However, practical limitations such as time loss and difficulties in classroom management expressed by students indicate that careful planning is needed for the effective implementation of such activities.

References

Aktamış, H. (2007). *Fen eğitiminde bilimsel süreç becerilerinin bilimsel yaratıcılığa etkisi*, (Doctoral Thesis), Dokuz Eylül Üniversitesi, İzmir.

Alp, E., Ertepınar, H., Tekkaya, C. & Yılmaz, A. (2006). İlköğretim öğrencilerinin çevreye yönelik tutum ve bilgileri üzerine bir çalışma. *7. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi*, Ankara, Türkiye.

Avcı, G. & Gümüş, N. (2019). Sınıf dışı eğitim etkinliklerine yönelik öğrenci görüşleri. *Turkish Studies Educational Sciences*, *14*(3), 351-357.

Aynal Öztürk, Ş. (2009). Okulda eğitimle bütünleştirilmiş mekân dışı eğitim. *Milli Eğitim Dergisi, 181*, 131-145.

Bakioğlu, B. (2017). *5. Sınıf vücudumuz bilmecesini çözelim ünitesinin okul dışı öğrenme ortamı destekli öğretiminin etkililiği*. (Master Thesis) Amasya Üniversitesi, Amasya.

Bakioğlu, B. & Karamustafaoğlu, O. (2014). Okul dışı ortamlarda fen eğitimi: diyaliz merkezine teknik bir gezi. *Turkish Journal of Teacher Education*, *3*(2), 15-26.

Balcı, A. (2005). *Açıklamalı eğitim yönetimi terimleri sözlüğü*. Ankara: Tek Ağaç.

Balım, A., Deniş-Çeliker, H., Türkoğuz, S. & Kaçar, S. (2013). Bilimin doğaya yansımaları projesinin öğrencilerin bilimsel süreç becerilerine etkisi. *Eğitim ve Öğretim Araştırmaları Dergisi*, *2*(1), 149-157.

Balkan Kıyıcı, F. & Atabek Yiğit, E. (2010). Sınıf duvarlarının ötesinde fen eğitimi: rüzgâr santraline teknik gezi. *International Online Journal of Educational Sciences*, *2*(1), 225-243.

Başdaş, E. (2007). *İlköğretim fen eğitiminde basit malzemelerle yapılan fen aktivitelerinin bilimsel süreç becerilerine, akademik başarıya ve motivasyona etkisi*. (Master Thesis), Manisa Celal Bayar Üniversitesi, Manisa.

Bilgin, İ. (2005). The Effects of hands-on activities ıncorporating a cooperative learning approach on eight grade students‟ science process skills and attitudes toward science. *Journal of Baltic Science Education*, 1(9), 27-37.

Bodur, Z. & Yıldırım, M. (2018). Sınıf dışı etkinliklerinin ortaokul yedinci sınıf öğrencilerinin akademik başarıları ve bilimsel süreç becerileri üzerine etkisi. *Marmara Üniversitesi Atatürk Eğitim Fakültesi Eğitim Bilimleri Dergisi*, 47, 125- 140.

Bozdoğan, A. E. & Kavcı, A. (2016). Sınıf dışı öğretim etkinliklerinin ortaokul öğrencilerinin fen bilimleri dersindeki akademik başarılarına etkisi. *Gazi Eğitim Bilimleri Dergisi*, 2(1), 13-30.

Civelek, P. & Özyılmaz-Akamca, G. (2018). Açık alan etkinliklerinin okul öncesi dönemdeki çocukların bilimsel süreç becerilerine etkisi. *Kastamonu Eğitim Dergisi,* 26(6), 2011-2019.

Dowdell, K., Graya, T. & Malone, K. (2011). Nature and its influence on children's outdoor play. *Australian Journal of Outdoor Education*, 15(2), 24-35.

Erten, Z. & Taşçı, G. (2016). Fen bilgisi dersine yönelik okul dışı öğrenme ortamları etkinliklerinin geliştirilmesi ve öğrencilerin bilimsel süreç becerilerine etkisinin değerlendirilmesi. *Erzincan Üniversitesi Eğitim Fakültesi Dergisi*, 18(2), 638-657.

Eshach, H. (2007). Bridging in-school and out-of-school learning: Formal, non-formal, and informal education. *Journal of Science Education and Technology*, 16(2), 171–190.

Falk, J. H. (2001). Free-choice science education: How we learn science outside of school. New York: Teachers College Press.

Falk, J. H. & Adelman, L. M. (2003). Investigating the impact of prior knowledge and interest on aquarium visitor learning. *Journal of Research in Science Teaching*, 40(2), 163-176.

Fidan, Ö. (2021). *Okul öncesi eğitimde açık havada öğrenme deneyimlerine yönelik bir eylem araştırması: "Bahçe Çocuk' ta öğreniyorum"*. (Master Thesis). Anadolu University, Eskişehir.

Gerber, B.L., Cavallo, A. M. L. & Marek, E.A. (2001). Relationships among informal learning environments, teaching procedures and scientific reasoning ability. *International Journal of Science Education*, 23(5), 535- 549.

Griffin, J. & Symington, D. (1997). Moving from task-oriented to learning-oriented strategies on school excursions to museums. *Science Education, 81*(6), 763–779.

Gürsoy, G. (2018). Fen öğretiminde okul dışı öğrenme ortamları. *Turkish Studies-Educational Sciences*, 13(11), 623-649.

Karadoğan, A. (2016). *Classroom and out-of-school learning practices in education and encountered problems.* In R. Aksu (Ed.), *Academic evaluations on educational problems in Turkey, Volume I* (pp. 47–84). Maya Academy Publishing.

Karahan, Z. (2006). *Fen ve teknoloji dersinde bilimsel süreç becerilerine dayalı öğrenme yaklaşımının öğrenme ürünlerine etkisi*. (Master Thesis), Karaelmas Üniversitesi, Zonguldak.

Karasar, N. (2011). *Scientific Research Method* (22th Edition). Ankara: Nobel

Kanat, T. (2020). Orman okulu uygulamalarının okul öncesi dönem çocukları üzerindeki etkilerinin değerlendirilmesi. (Master Thesis). Çanakkale On sekiz Mart Üniversitesi, Çanakkale.

Kanlı, U. & Yağbasan, R. (2008). 7E modeli merkezli laboratuar yaklaşımının öğrencilerin bilimsel süreç becerilerini geliştirmedeki yeterliliği, *Gazi Eğitim Fakültesi Dergisi*, 28(1), 91-125.

Keil, C., Haney, J. & Zoffel, J. (2009). Improvements in student achievement and science process skills using environmental health science problem based learning curricula. *Electronic Journal of Science Education*, 13, 1-17.

Kenny, H. A. (2009). *Monkeying around: Examining the effects of a community zoo on the science achievement of third graders* (Unpublished doctoral dissertation). The University of Toledo, Ohio, United States.

Kelly, J. (2000). Rethinking the elementary science methods course: A case for content, pedagogy, and informal science education. *International Journal of Science Education, 22*(7), 755-777.

Kemper, E., Stringfield, S. & Teddlie, C. (2010). *Mixed methods sampling strategies in social and behavioral research.* In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (2nd ed., pp. 273–296). Sage.

Kubat, U. (2018). Okul dışı öğrenme ortamları hakkında fen bilgisi öğretmen adaylarının görüşleri. *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi*, 48, 111-135.

Kulalıgil, A. (2016). *The effect of teaching practices occurring in out-of-class teaching environments on academic success, creativity and motivation of fifth grade science class students*. (Master thesis). Pamukkale University, Denizli.

Mertoğlu, H. (2019). Fen bilgisi öğretmen adaylarının farklı öğrenme ortamlarında gerçekleştirdikleri okul dışı etkinliklere ilişkin görüşleri. *İnformal Ortamlarda Araştırmalar Dergisi*, 3(3), 101-124.

Ocak, İ. & Korkmaz, Ç. (2018). Fen bilimleri ve okul öncesi öğretmenlerinin okul dışı öğrenme ortamları hakkındaki görüşlerinin incelenmesi. *Uluslararası Alan Eğitimi Dergisi*, 4(1), 18-38.

Okur-Berberoğlu, E. & Uygun, S. (2013). Sınıf dışı eğitimin dünyadaki ve Türkiye'deki gelişim durumunun örgün ve yaygın eğitim kapsamında incelenmesi. *Mersin Üniversitesi Eğitim Fakültesi Dergisi*, 9(2), 32-42.

Öztürk, Ç. (2008). *Coğrafya öğretiminde 5e modelinin bilimsel süreç becerilerine, Akademik Başarıya ve Tutuma Etkisi*. (Doktora Tezi), Gazi Üniversitesi, Ankara.

Robson, C. (1998). *Real world research.* Blackwell Publishers Ltd.Soysal,

E. (2019). *Okul dışı öğrenme ortamlarının ortaokul 7. sınıf öğrencilerinin fen bilimleri dersine yönelik ilgi, tutum ve motivasyonlarına etkisi*. (Master Thesis). Gazi Üniversitesi, Ankara.

Scaramella, L. V., Conger, R. D., Spoth, R. & Simons, R. L. (2002). Valuation of a social contextual model of delinquency: A cross-study replication. Child Development,

Tal, T. & Morag, O. (2009). Reflective practice as a means for preparing to teach outdoors in an ecological garden. *Journal of Science Teacher Education*, 20, 245- 262.

Tatar, N. & Bağrıyanık, K. E. (2012). Fen ve teknoloji dersi öğretmenlerinin okul dışı eğitime yönelik görüşleri. *İlköğretim Online*, 11(4), 883-896.

Tal, T. (2012). *Out-of-school: Learning experiences, teaching and students' learning.* In B. J. Fraser, K. Tobin, & C. J. McRobbie (Eds.), *Second international handbook of science education* (pp. 1109–1122). Springer Netherlands.

Tan, M. & Temiz, B. K. (2003). Fen Öğretiminde bilimsel süreç becerilerinin yeri ve önemi. *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi*, 13(1), 89-101.

Teo, G., Mei, Y., Kaling, C., Seah Xinyi, C., Sim, J., Sing, K., Nai, K., & Khoon, S. (2007). Promoting science process skills and the relevance of science through Science Alive programme. In *Proceedings of the Redesigning Pedagogy: Culture, Knowledge and Understanding Conference* (Singapore, May 2007).

Turpin, T. & Cage, B. N. (2004). The Effects of an Integrated Activity-Based Science Curriculum on Student Achievement, Science Process Skills and Science Attitudes, *Electronic Journal of Literacy through Science*, 3, 1-17.

Türkmen, H., Topkaç, D. D. & Atasayar-Yamık, G. (2016). İnformal öğrenme ortamlarına yapılan gezilerin canlıların sınıflandırılması ve yaşadığımız çevre 245 konusunun öğrenilmesine etkisi: Tabiat tarihi müzesi ve botanik bahçesi örneği. *Ege Eğitim Dergisi*, 17(1), 174-197.

White, J. (2013). *Playing and learning outdoors: Making provision for high quality experiences in the outdoor environment with children aged 3–7* (2nd ed.). Routledge.

Yavuz, M. (2012). *Fen eğitiminde hayvanat bahçelerinin kullanımının akademik başarı ve kaygıya etkisi ve öğretmen-öğrenci görüşleri*. (Master Thesis). Sakarya Üniversitesi, Sakarya.

Yayla Ceylan, Ş. & Ülker, P. (2014). *Çocuk ve çevre: Küçük çocuklar ve çevre eğitimi el kitabı.* In H. G. Ogelman (Ed.), *Küçük çocuklar ve çevre eğitimi el kitabı* (pp. 1–16). Eğiten Kitap.

Yıldırım, G. & Özyılmaz Akamca G. (2017). The effect of outdoor learning activities on the development of preschool children. *South African Journal of Education, 37*(2), 1-10