ORIGINAL ARTICLE

Science Education in Out-of-School Learning Environments: Views of Teachers and School Principals

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Abstract: The aim of this study is to examine the contributions of out-of-school learning environments to students' cognitive, affective and psychomotor development in the context of science teaching from the perspectives of science teachers and school principals. In the study, which was conducted with the case study method, one of the qualitative research designs, semi-structured interviews were conducted with 16 science teachers and 11 school principals. teachers and school principals were selected using convenience sampling method. The data obtained were evaluated by content analysis. The results show that out-of-school learning environments increase students' attitudes, motivation and interest in science; support the development of scientific process skills; and make significant contributions to permanent learning and the acquisition of social skills such as communication, empathy and self-confidence. Participants emphasize student-centered planning approaches that encourage active participation and are in line with the learning outcomes. However, it was revealed that teachers' knowledge of legislation is more limited than that of school principals and out-of-school activities are usually organized a few times a year.

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Introduction

SCIENCE education has increasingly shifted toward approaches that support students not only in learning scientific concepts but also in developing inquiry skills, critical thinking, problem solving, and the ability to apply scientific knowledge to real-life contexts (Bybee, 2013; Lederman & Abell, 2014). Contemporary science education frameworks emphasize that meaningful learning occurs when students actively participate in authentic, experience-based environments that encourage questioning, observation, investigation, and reflection (National Research Council, 2012). In this regard, out-of-school learning environments, such as museums, science centers, botanical gardens, natural history sites, wildlife parks, and nature-based field locations, provide unique opportunities for experiential and inquiry-oriented learning that go beyond what is typically possible within the classroom (Anderson, Lucas, & Ginns, 2003; DeWitt & Storksdieck, 2008; Falk & Dierking, 1997; Orion & Hofstein, 1994).

A substantial body of research demonstrates that out-of-school learning environments positively influence students' conceptual understanding, science motivation, attitudes toward science, and long-term retention of scientific knowledge (Gerber, Marek, & Cavallo, 2001; Hofstein & Rosenfeld, 1996; Martin et al., 2016). Similar to the findings of Ertaş, Şen, and Parmaksızoğlu (2011), this study also suggests that outdoor science activities can positively influence students' attitudes towards science. These environments are known to promote hands-on engagement, foster inquiry through observation and exploration, and support rich social interactions that facilitate meaning-making (Avraamidou, 2015; Paris, Yambor, & Packard, 1998; Piscitelli & Anderson, 2001). More recent analyses highlight the role of out-of-school learning environments in developing 21st-century skills such as communication, collaboration, creativity, and scientific reasoning—skills essential for learners in contemporary science education (Martin, Dixon, & Betser, 2020; Bevan et al., 2021).

Despite these well-documented benefits for students, considerably less is known about how teachers and school principals conceptualize out-of-school learning, how they integrate out-of-school learning environments into their instructional planning, and what types of pedagogical and administrative challenges they encounter during the planning, execution, and evaluation stages. Existing literature largely focuses on students, while the perspectives of the educators responsible for designing and approving field-based learning remain underrepresented. Moreover, few studies explore teachers' and school principals' knowledge regarding legal regulations, safety procedures, curriculum alignment, accessibility, and post-visit learning consolidation—factors that determine whether out-of-school learning environments can be systematically and sustainably incorporated

into science education. This gap is particularly notable in the Turkish context, where curricular reforms emphasize the use of out-of-school learning environments, yet actual implementation remains inconsistent across schools and regions.

These gaps highlight the need for research that examines, in depth, how educators understand and use out-of-school learning environments. Exploring teachers' and school principals' perceptions, planning practices, perceived contributions, and experienced challenges can provide valuable insights into both the pedagogical and institutional dynamics that shape the integration of out-of-school learning environments into science education. Such understanding is critical for bridging the gap between policy expectations and classroom practice, and for informing strategies that enhance the quality and sustainability of learning experiences outside the classroom.

In response to these needs, the present study aims to investigate how science teachers and school principals conceptualize, plan, implement, and evaluate out-of-school learning environments within the context of science education. By examining both stakeholder groups simultaneously, the study seeks to provide a comprehensive understanding of the structural, pedagogical, and organizational factors that influence the effective and sustainable use of out-of-school learning environments in science teaching. The findings are expected to contribute to the literature by addressing existing gaps and offering evidence-based recommendations for strengthening the role of out-of-school learning environments in science education.

In line with the literature gaps identified in the Introduction, the purpose of this study is to examine how science teachers and school principals conceptualize, plan, implement, and evaluate out-of-school learning environments within the context of science education. Although numerous studies highlight the cognitive, affective, and motivational benefits of out-of-school learning for students, limited attention has been given to the perspectives of teachers and school principals, who play a central role in the planning, approval, and execution of such activities. Therefore, this study aims to provide a comprehensive understanding of the pedagogical and administrative factors that shape the integration of out-of-school learning environments into science teaching practices.

Based on this purpose, the study seeks to address the following research questions:

1. How do science teachers and school principals conceptualize out-of-school learning and out-of-school learning environments within the context of science education?

2. How do science teachers and school principals plan and implement out-of-school learning activities across the pre-trip, during-trip, and post-trip phases?
3. From the perspectives of teachers and school principals, what are the perceived contributions of out-of-school learning environments to students' cognitive, affective, and social development?
4. What challenges, barriers, and regulatory or organizational factors do teachers and school principals encounter when conducting or approving out-of-school learning activities?
5. How do science teachers and school principals assess student learning and engagement in out-of-school learning environments, and what types of evaluation practices do they prioritize?

These research questions were designed to align with the conceptual framework presented in the Introduction and to address critical gaps in previous studies, particularly regarding educator perspectives, administrative processes, and the pedagogical integration of out-of-school learning environments into science education.

Methods

Research Design

This study was conducted using a qualitative case study design. In this research, the unit of analysis was defined as a school district located in the Aegean Region of Türkiye, specifically within the province of Manisa and the district of Akhisar. Both science teachers and school principals in this district regularly plan, implement, and evaluate out-of-school learning activities. The aim of focusing on a single district was to provide an in-depth and holistic understanding of how out-of-school learning practices are perceived and enacted within a shared administrative, curricular, and sociocultural context. Thus, the "case" in this study refers not to individual participants but to the institutional and pedagogical out-of-school learning practices within the Manisa–Akhisar district.

Sample/Study Group

The study included 27 participants: 16 science teachers and 11 school principals employed in public schools in the Manisa–Akhisar school district. Participants worked at the primary (grades 1–4), lower-secondary (grades 5–8), and upper-secondary levels (grades 9–12), ensuring representation across different educational phases.

A convenience sampling method was used based on voluntary participation and accessibility during the data collection period. Inclusion criteria were:

1. Having at least one year of experience conducting or supporting out-of-school learning,
2. Being actively employed in the Manisa–Akhisar district at the time of the study,
3. Volunteering to participate after reading the informed consent form.

Data Collection Tools

Data were collected through semi-structured interviews. The initial pool of questions was developed through a systematic process:

Alignment With the Research Questions

- Each question was drafted to explore participants' perceptions of out-of-school learning, their implementation processes, observed student outcomes, and perceived contributions of out-of-school learning experiences to students' academic and social development.

Expert Review for Content Validity

- Three experts in science education and qualitative methodology examined the clarity, relevance, and coverage of the draft interview form. Based on their feedback, questions that only elicited basic definitions of out-of-school learning (e.g., "What is out-of-school learning?") were either removed or repositioned to serve as introductory questions only.

Reorganization and Final Structure

The final interview form consisted of 10 open-ended questions, arranged in a logical sequence (**Appendix I**):

- Introductory questions about familiarity and experiences with out-of-school learning,
- Questions on implementation processes, opportunities, and barriers,
- Questions on perceived contributions to students' academic, social, and affective development,
- Questions on assessment practices and suggestions for improving out-of-school learning implementation.

Data Collection Procedures

Interviews were conducted face-to-face in quiet and private locations chosen by the participants to facilitate open communication. Each interview lasted 25–35 minutes.

Procedures implemented to ensure ethical and methodological rigor included:

- Audio recording with participants' permission,
- Verbatim transcription of recordings within 48 hours,
- Removal of identifiable information and assignment of participant codes (T1–T16, P1–P11)

Ethical Considerations

In Türkiye, educational research that does not involve students, sensitive personal data, or experimental intervention is exempt from institutional ethics board approval under the national Scientific Research and Publication Ethics Regulation. Accordingly, this study required—and received—official permission from the Manisa Provincial Directorate of National Education and the Akhisar District Directorate of National Education, rather than ethics committee review. All participants provided written informed consent, participation was voluntary, and anonymity was fully protected.

Data Analysis

Interview transcripts were analyzed using Content Analysis. The analysis process involved:

Development of Coding Scheme

An initial code list was created based on research questions and emerging patterns from the transcripts. Codes were refined iteratively, and similar codes were grouped into categories and overarching themes.

Reliability and Researcher Involvement

Two researchers independently coded 30% of the transcripts. Inter-coder reliability, calculated using Miles & Huberman's formula, was .87, demonstrating strong reliability.

Use of Analytical Software

MAXQDA 2024 software was used for systematic coding and theme development.

Presentation of Findings

Themes, categories, and codes were summarized using frequency and percentage tables. In reporting frequencies and percentages, we calculated percentages based on the number of coded statements rather than the number of participants; therefore, totals may exceed 100%.

During the coding process, an initial coding scheme was developed through an inductive–deductive approach. First, all interview transcripts were read multiple times by the researchers to gain a holistic understanding of the data. During this stage, preliminary codes were generated inductively based on recurring patterns, key concepts, and meaningful segments emerging directly from participants' statements. Then, a deductive layer was added by aligning these preliminary codes with the research questions and the conceptual framework related to out-of-school learning environments. The two researchers independently extracted keywords and meaningful units, compared them, and refined the code list through iterative discussion. Similar codes were grouped into broader categories, and these categories were further organized into overarching themes. Throughout the process, memo-writing and constant comparative techniques were used to ensure conceptual clarity and to avoid overlap between codes. The finalized coding scheme was reviewed by an external expert in qualitative research to strengthen content validity before full coding of all transcripts was completed.

Interview Questions

1. How would you describe your general familiarity with out-of-school learning environments?
2. What kinds of out-of-school learning activities have you implemented or supported in your school?
3. What opportunities do out-of-school learning environments offer for science teaching and learning?
4. What challenges or limitations have you encountered during out-of-school learning implementation?
5. In your experience, how does out-of-school learning contribute to students' academic learning?
6. How does out-of-school learning contribute to students' social and personal development?
7. What safety, planning, or logistical considerations do you take into account during out-of-school learning activities?
8. What types of assessment methods do you use to evaluate students' learning in out-of-school learning contexts?
9. How do out-of-school learning activities impact collaboration among teachers, administrators, and families?

Table 1. Their views on Out-of-School Learning.

	Teachers		School Principals	
Code	**f**	**%**	**f**	**%**
Planned and Programmed Learning	12	54	4	36
Learning in outside of school	5	23	4	36
Experiential Learning and Active Participation	5	23	3	28

Teacher 5: Students learn in an environment outside of school, not in the classroom
Teacher 2: Students learn outside of school within the plan and program we make in class.
School Principals 1: Students study with their teachers outside of school.
School Principals 5: Students are taught through activities outside of school within the scope of legal permissions.

10. What recommendations would you make to improve the effectiveness of out-of-school learning practices?

Findings

Participants were first asked, "What is Out-of-School Learning?" Teachers expressed their responses in longer sentences, while school principals provided short, precise answers. Fifty-four percent of teacher responses emphasized "Planned and Programmed Learning", another 23% emphasized "Learning in Outside of School", and the remaining 23% emphasized "Experiential Learning and Active Participation". school principals, on the other hand, emphasized out-of-school learning (36%), planned and programmed learning (36%), and experiential learning and active participation (28%) in approximately equal proportions. The coding results indicate that teachers predominantly define out-of-school learning as structured and curriculum-aligned experiences. This emphasis reflects teachers' instructional responsibilities and their need to ensure that learning environments outside the classroom are aligned with achievement goals. In contrast, school principals' emphasis on legal permissions and authorized activities suggests a more administrative perspective, reflecting their responsibility for safety, compliance with regulations, and approval protocols. **Table 1.**

The second question asked participants, "What are Out-of-School Learning Environments?" Museums were the most frequently mentioned by 19.40% of teachers and 25.71% of school principals. Teachers secondly highlighted "Wildlife Parks and Zoos" (10.45%) and "Natural Historical Sites" (10.45%), while school principals highlighted "Natural Historical Sites" and "Environments with Art Activities" (14.29%), and "Libraries" (11.43%). Interestingly, school principals never mentioned out-of-school learning environments, such as exhibitions, aquariums, planetariums, and

Table 2. What are Out-of-School Learning Environments?

	Teachers		School Principals	
Code	**f**	**%**	**f**	**%**
Museums	13	19.40	9	25.71
Wildlife Parks and Zoos	7	10.45	1	2.86
Natural Historical Sites	7	10.45	5	14.29
Science Centers	6	8.96	1	2.86
Sport Centers	4	597	3	8.57
Art Activities Areas	3	4.48	5	14.29
Library	3	4.48	4	11.43
National Park	3	4.48	2	5.71
Exhibitions	3	4.48	0	0
Aquariums	3	4.48	0	0
Planetariums	2	2.99	0	0
Botanical Gardens	2	2.99	0	0
Industrial Institutions	2	2.99	1	2.86
Nature Camps	2	2.99	1	2.86
Universities	1	1.49	2	5.71
Other	6	8.96	1	2.86

Teacher 3: Anywhere outside the school, especially museums, science centers, natural history museums, zoos, aquariums, parks and gardens, etc
School Principals 4: Museums, art centers, sports centers, library etc.

botanical gardens, which are prominent in science education. The diversity of environments expressed by teachers demonstrates that learning encompasses social, cultural, and natural aspects. This clarification ensures methodological accuracy and prevents misinterpretation of the data. **Table 2.**

The third question was asked to the participants, "How many times a year do you use out-of-school learning environments?" 43.75% of teachers used out-of-school learning environments only 1-2 times a year, while 25% of them reported using them 7 or more times. 18.75% of them used them moderately (3-6 times), and 12.5% of them did not use them at all. school principals were asked this question as "How many times a year do you allow out-of-school learning environments?" school principals had the highest rate of moderate use (45%). 27% of them reported frequent use (over 6), 18% of them reported infrequent use (1-2 times), and 9% of them reported never use. The data indicate a notable discrepancy between teachers' reported frequency of using out-of-school learning environments and school principals' approval rates for such activities. While teachers reported limited use—primarily 1–2 times per year—school principals stated that they approved these activities more frequently. This discrepancy suggests a possible implementation gap, wherein opportunities provided by school principals are not fully utilized by teachers due to constraints such as time, curriculum density, transportation challenges, or limited planning support.

Table 3. How Many Times a Year Do You Use Out-of-School Learning Environments?

	Teachers		School Principals	
	f	%	f	%
Frequently (over 6)	4	25	3	27
Moderately Frequently (3-6)	3	18.75	5	45
Rarely (1-2)	7	43.75	2	18
Never Used (0)	2	12.5	1	9

Teacher 8: at least 2 times a term, 4-5 times a year
School Principals 4: I try to go 3-4 times a day for my own course, but I allow our teachers who come for leave as long as they meet the legal requirements.

Table 4. The Importance of Out-of-School Learning Environments in Terms of Education.

		Teachers		School Principals	
Code		**f**	**%**	**f**	**%**
Permanent Learning		9	33.3	8	50
Skill-Based	Science Process Skills	3	11.1	2	1.25
	Communication Skills	5	18.5	2	12.5
Hands-on (Learning by Doing and Experiencing)		6	22.2	2	12.5
Interest and Motivation		4	14.8	2	12.5

Teacher 3: I think the most important feature of out-of-school environments in terms of learning is that they learn by doing and experiencing, which increases permanence.
Teacher 2: In terms of learning, it increases students' permanent learning and their use of scientific process skills in the process.
School Principals 4: Permanent learning occurs in students
School Principals 6: It helps students learn better by increasing their interest and motivation.

While it was observed that teachers mostly planned a limited number of out-of-school activities, interestingly, school principals who worked at the same schools with teachers were observed to include these practices more regularly and moderately. **Table 3.**

Participants were asked the fourth question, "What is the Importance of Out-of-School Learning Environments in Terms of Education?" The element most emphasized by teachers was permanent learning (33.3%) and skill-based learning (29.6%), followed by learning by doing and experiencing (22.2%) and interest and motivation (14.8%). Among school principals, the highest rate was permanent learning (50%), while the other categories were equally distributed (12.5%). The strong emphasis on permanent learning by both teachers and school principals indicates shared recognition of the lasting impact that out-of-school learning environments can have on students. However, teachers' additional emphasis on hands-on learning, skill development, and motivation reflects a more pedagogically

grounded understanding of how these environments influence learning processes. School principals' focus remained more limited, primarily highlighting general learning outcomes rather than process-oriented dimensions. While permanent learning was emphasized by both groups, teachers appear to have a more comprehensive awareness of the student-centered, experiential, and social aspects of out-of-school environments.
Teacher 3: I think the most important feature of out-of-school environments in terms of learning is that they learn by doing and experiencing, which increases permanence. **Table 4.**

The 5th question asked to the participants, "What is the Role of Out-of-School Learning Environments in Terms of Social Skills?" was analyzed under 3 themes as "communication skills", "collaboration skills", and "social awareness skills". Communication skills were categorized as 6 codes for both teachers and school principals. It was seen that teachers most emphasized the skills of "Socialization and Peer Tutoring" (18%), "Listening to others effectively" (10%), and "Interacting verbally or non-verbally" (10%), while school principals highlighted the importance of "Socialization and Peer Tutoring" (20%). In the collaboration skills theme, among the teachers, "Collaborating with teams or groups" (20%) and "Transforming the outcomes obtained through social interactions into action" (4%), and for school principals, "Collaborating with teams or groups" (15%) and "Transforming the outcomes obtained through social interactions into action" (5%). However, skills such as discussing/negotiating ideas with group mates or other students in the class, reaching consensus on different ideas, and establishing partnerships, which are important features of collaboration, were not mentioned in either group. In the social awareness theme, teachers most frequently mentioned "understanding and respect for others," at 8%, while this figure was 5% for school principals. In contrast, "developing an understanding of social norms" remained at a low level (Teacher, 2%; School Principals, 5%). The data reveal that both teachers and school principals strongly associate out-of-school learning environments with opportunities for communication and basic social interaction. Teachers emphasized peer tutoring, active participation, and verbal/non-verbal interaction, indicating that they view these environments as active spaces for student engagement. School principals also highlighted socialization but offered fewer examples of higher-order social processes.

The ability to heed social cues, a fundamental characteristic of social awareness, was not mentioned at all by either group. **Table 5**.

When asked, "What is your knowledge of the necessary legislation regarding out-of-school learning?", 33.3% of teachers indicated that they were knowledgeable about the legislation and regulations related to out-of-school learning. 18.5% emphasized parental and school principals' permission, while 22.3% stated that they lacked sufficient knowledge.

Table 5. The Role of Out-of-School Learning Environments in Social Skills.

Theme	Code	Teachers		School Principals	
		f	%	f	%
Communication Skills	Socialization and Peer Instruction	9	18	4	20
	Listening to others effectively	5	10	2	10
	Interacting verbally and non-verbally	5	10	2	10
	Expressing feelings and thoughts	4	8	2	10
	Removing barriers to communication	4	8	1	5
	Participating in group communication	3	6	1	5
Collaboration Skills	Collaborating with teams or groups	10	20	3	15
	Transforming outcomes from social interactions into action	2	4	1	5
Social Awareness Skills	Developing understanding and respect for others	4	8	1	5
	Understanding the feelings, thoughts, and perspectives of others	3	3	2	10
	Developing an understanding of social norms	1	2	1	5

Teacher 7: During the learning process, they socialize and do activities with their peers, achieve things together with their group mates, and better understand their friends' feelings, thoughts and perspectives.
School Principals 6: In the learning process, they socialize, listen to each other, work collaboratively with their group mates and turn the results into action through social interactions.

Table 6. Knowledge Level of Necessary Legal Legislation Regarding Out-of-School Learning.

		Teachers		School Principals	
		f	%	f	%
Legal Legislation and Regulation Information		9	33.3	8	47
Official Permission	School Principals Permission	5	18.5	3	17.65
	Parental Permission	5	18.5	3	17.65
	Ministry of Education Permission	2	7.4	3	17.65
Insufficient or Lack of Information		6	22.3	0	0

Teacher 4: I am knowledgeable about Legal Legislation and Regulation Information
School Principals 8: It is my duty to be knowledgeable about legal legislation and regulations, teachers have to get permission from the family, me and the Ministry of National Education.

Among school principals, 47% indicated that they were knowledgeable about the legislation and regulations; 17.65% emphasized parental, school principals and Ministiry of Education permission; no school principals indicated that they were uninformed. Although school principals appear to have a higher level of knowledge about the legislation than teachers, a general lack of knowledge is evident in both groups. **Table 6**.

Data obtained from the seventh question, "How Do You Plan a Lesson in an Out-of-School Learning Environment?" was collected under

Table 7. How to Plan the Lesson Plan in an Out-of-School Learning Environment.

		Teachers		School Principals	
Theme	**Code**	**f**	**%**	**f**	**%**
Before The Trip of Out-Of-School Environment	Clarifying learning objectives	8	18.18	4	16
	Student readiness	8	18.18	1	4
	Safety	0	0	2	8
During The Trip of Out-Of-School Environment	Observation	9	20.45	6	24
	Exploration	9	20.45	6	24
	Acquiring knowledge through practice	9	20.45	6	24
After The Trip of Out-Of-School Environment	Structuring knowledge in the students minds	0	0	0	0
	Ensuring Permanence of Learning	0	0	0	0

Teacher 7: When planning a lesson, I pay attention to students' observations, exploration, and readiness levels. I also do activities to summarize and organize what they have learned in class.
School Principals 4: When planning a lesson, I pay attention to the activities, such as observation and practice, necessary for students to achieve their learning goals, and to student safety in the location.

three themes: Before the Trip, During the Trip, and After the Trip. In Before the Trip theme, teachers considered "Clarifying learning objectives" and "student readiness" to be important for both groups. While 18.18% of teachers indicated both codes, these rates for school principals were 16% and 4%, respectively. "Safety" was emphasized only by school principals (8%). The absence of data in the 'After the Trip' category indicates that neither teachers nor school principals explicitly referenced post-trip consolidation activities during interviews. This absence is meaningful and has been retained as research finding. School principals, however, placed greater emphasis on safety due to their administrative role. This suggests a consensus that the most effective learning during the trip is based on practice and observation. **Table 7.**

The data obtained from the question "How Do You Select an Appropriate Out-of-School Learning Environment?" was collected under 6 codes. The most emphasized criteria by teachers were "Suitable for Outcomes and Learning Objectives" and "Affordability and Transportation" (33.3%), "Student Readiness Level" (19.5%), "Student Interests and Needs" (5.56%), and "Safety and Hygiene" (8.34%). "Teacher Experience" was not mentioned at all (0%). The most frequently mentioned criterion by school principals was "Compliance with Learning Objectives and Achievements" (40%), followed by "Student Interests and Needs" (20%), "Transportation and Affordability" (15%), "Student Readiness Level" (10%), "Teacher Experience" (10%), and "Safety and Hygiene" (5%). The data show that teachers tend to prioritize pedagogical considerations such as alignment with curriculum outcomes, student readiness, and accessibility. Affordability and transportation were equally important, reflecting practical constraints

Table 8. How to Choose the Appropriate Out-of-School Learning Environment.

	Teachers		School Principals	
Code	**f**	**%**	**f**	**%**
Compliance with Learning Objectives and Achievements	12	33.3	8	40
Affordability and Transportation	12	33.3	3	15
Student Readiness Level	7	19.5	2	10
Student Interests and Needs	2	5.6	4	20
Safety and Hygiene	3	8.3	1	5
Teacher Experience	0	0	2	10

Teacher 3: When choosing a suitable out-of-school learning environment, I make sure that it is suitable for the subject the student will learn and is accessible and economical.
School Principals 4: When choosing a suitable out-of-school learning environment, I pay attention to the experience of the teacher, the proximity and ease of access to the destination, its affordability, and its suitability for the subject the student will learn.

Table 9. How to Facilitate Student Meaningful Learning Using Out-of-School Learning Environments.

	Teachers		School Principals	
Code	**f**	**%**	**f**	**%**
Active Participation and Learning by Doing	8	40	3	25
Associating with Outcomes and Context-Based Learning	5	25	6	50
Appropriate Methods and Techniques	3	15	2	16.7
Pre-Activity Information and Curiosity	2	10	0	0
Providing Similar Experiences	2	10	1	8.3

Teacher 7: By choosing appropriate methods and techniques, I try to increase students' curiosity and motivation, ensure their active participation, enable them to learn by doing and experiencing, and integrate what they learn with life in a context-based manner.
School Principals 9: By choosing appropriate methods and techniques, I try to ensure that students integrate what they have learned contextually with life.

commonly reported in the literature. School principals, meanwhile, emphasized outcome alignment but also raised concerns related to teacher experience and safety, demonstrating their administrative responsibilities in approving and supervising out-of-school activities. **Table 8**.

In response to the question "What do you do to facilitate meaningful learning for students by using Out-of-School Learning Environments?", teachers most frequently cite 'Active Participation and Learning by Doing' (40%), while school principals emphasize 'Relating to Achievements and Establishing Meaningful Connections' (50%). Their attention to pre-activity preparation suggests an understanding of how scaffolding supports deeper learning. School principals, however, emphasized meaningful connections to

Table 10. How to Assess Learning Outcomes in Out-of-School Learning Environments.

	Teachers		School Principals	
	f	%	f	%
Question-and-Answer, Discussion	7	23.3	3	18.75
Observation Form	7	23.3	4	25
Presentation	6	20	4	25
Exhibition	3	10	2	12.5
Diary	3	10	1	6.25
Poster	2	6.7	0	0
Self-Assessment Form	2	6.7	2	12.5

Teacher 4: When assessing students' learning levels, I prefer question-answer, observation reports, and posters.
Teacher 7: Question-answer, observation reports, presentation, self-assessment report posters.
School Principals 5: observation reports, presentations, exhibitions.

curriculum outcomes, reflecting a more outcome-oriented perspective aligned with institutional goals. **Table 9**.

Finally, participants were asked the question, "How do you evaluate learning that takes place in out-of-school learning environments?" When examining the methods teachers use to evaluate activities carried out in out-of-school learning environments, the most commonly used methods are question-and-answer (%23.3) and observation forms (%23.3). These are followed by presentations (20%), exhibitions (10%), diaries (10%), posters (6.7%), and self-assessment forms (6.7%). When the school principals' data is examined, the highest rates are for observation forms (25%), presentations (25%), and question-and-answer/discussion (18.75%), which are other notable techniques. School principals, however, tended to highlight product-based or performance-focused assessments such as presentations and exhibitions, reflecting their administrative emphasis on observable student outputs. These differences point to varying assessment cultures shaped by pedagogical versus managerial roles. It was observed that school principals did not use product-based assessment methods such as posters. **Table 10.**

Conclusion

The results of this study highlight how out-of-school learning environments are understood, planned, and implemented by science teachers and school principals. Overall, the findings indicate that both groups value out-of-school learning environments for their potential to enhance students' cognitive, affective, and social development. Teachers emphasized experiential and student-centered dimensions—learning by doing, increased motivation, and interaction—while school principals tended to adopt a more outcome-

oriented perspective focused on curriculum alignment and observable student products.

Despite this shared recognition of the importance of out-of-school learning environments, the study revealed several structural and pedagogical limitations that reduce the effectiveness of such practices. Both teachers and school principals demonstrated limited knowledge of legal procedures and safety regulations, which may restrict the frequency and quality of activity planning. Additionally, although participants frequently mentioned permanent learning as a benefit, almost none described systematic post-visit activities—an essential component for reinforcing learning according to the literature.

Differences between teachers' and principals' expectations also create a misalignment between pedagogical intentions and administrative requirements. Teachers focus on student engagement and exploration, while principals prioritize compliance, safety, and formal assessment. This discrepancy may contribute to inconsistent implementation and underuse of out-of-school learning opportunities.

In conclusion, the study shows that while out-of-school learning environments have strong potential to enrich science education, their effective use requires clearer instructional planning, improved regulatory knowledge, and stronger collaboration between teachers and school principals. Addressing these gaps is essential for transforming out-of-school experiences from isolated events into meaningful, sustained learning processes that support students' long-term scientific understanding and skills development.

Discussion

The findings of this study provide important insights into how science teachers and school principals conceptualize, plan, and implement out-of-school learning environments within the context of science education. When interpreted through the lens of existing theoretical and empirical literature, several deeper patterns become visible—particularly regarding the alignment between educators' perceptions, their professional knowledge, and the structural conditions under which out-of-school learning is practiced.

First, the emphasis placed by both teachers and school principals on the value of out-of-school learning environments for enhancing students' motivation, curiosity, and long-term retention is consistent with long-standing research on informal and experiential learning. The Contextual Model of Learning proposed by Falk and Dierking (2000) highlights that learning in settings such as museums and science centers emerges through the interaction of personal, sociocultural, and physical contexts. The findings of this study align with this model, as participants highlighted the importance

of real-world engagement, hands-on activities, and social interaction—all elements known to promote deeper conceptual understanding (Hofstein & Rosenfeld, 1996; DeWitt & Storksdieck, 2008). However, the limited mention of structured post-visit activities suggests that educators may not fully operationalize this model, particularly the "reinforcement and reflection" components that are essential for ensuring conceptual change (Tal & Dierking, 2014).

A second key finding pertains to the differing orientations of teachers and school principals. Teachers tended to emphasize process-based and experiential dimensions of learning—such as inquiry, exploration, and student engagement—while school principals focused more on compliance, measurable outcomes, and curriculum alignment. This divergence reflects the broader distinction between pedagogical and administrative perspectives documented in educational leadership research. According to Anderson and Zhang (2003), effective field trip implementation requires both pedagogical intentionality and organizational support. The present study shows that although both groups value out-of-school learning environments, their differing priorities may create a structural misalignment that limits the quality and frequency of implementation. Teachers' process-oriented lens aligns with constructivist and inquiry-based learning paradigms, whereas principals' outcome-oriented stance reflects institutional pressures for safety, accountability, and regulation.

Another important theoretical connection concerns teachers' and principals' understanding of social skill development in out-of-school settings. While participants frequently mentioned communication and peer interaction, more complex elements of social awareness—such as understanding perspectives, norms, and emotional cues—were rarely identified. This aligns with Eshach's (2007) assertion that informal learning environments provide the context for social development but do not automatically foster higher-order social competencies unless intentionally integrated into instructional design. The findings suggest that educators tend to perceive social skill gains as natural by-products of participation rather than outcomes requiring structured facilitation. This indicates a need for professional development that deepens educators' understanding of how to incorporate explicit social–emotional learning strategies into out-of-school learning experiences.

Additionally, the study highlights significant gaps in teachers' and principals' knowledge of legal requirements and safety regulations related to out-of-school learning. This is consistent with research showing that institutional barriers—such as limited procedural knowledge, time constraints, and bureaucratic processes—often inhibit the use of out-of-school learning environments even when educators perceive them as beneficial (Bevan et al., 2021; Martin et al., 2020). The limited regulatory

awareness found in this study may explain why teachers reported infrequent implementation despite principals claiming to grant permissions more regularly. This discrepancy suggests that structural and organizational factors may overshadow pedagogical intentions. The literature indicates that when educators lack confidence in logistical or regulatory processes, they tend to avoid or minimize the use of out-of-school settings (Griffin & Symington, 1997).

Finally, differences in assessment preferences further reflect underlying theoretical tensions. Teachers' use of process-based assessment tools—such as observation forms and question–answer sessions—aligns with constructivist learning theory, which emphasizes formative assessment and ongoing feedback. Principals' preference for product-based assessments—presentations and exhibitions—reflects performance-oriented evaluation models. As OECD (2018) notes, robust assessment requires integrating both process and product dimensions. The disconnect observed in this study indicates that assessment practices in out-of-school learning environments remain fragmented and do not yet reflect holistic models recommended in contemporary science education frameworks.

Overall, when interpreted in light of theoretical models and prior research, the findings illustrate that while out-of-school learning environments hold strong potential for enriching science education, their impact is constrained by incomplete planning, limited regulatory knowledge, and divergences between pedagogical and administrative perspectives. Bridging these gaps requires systemic support, shared professional understanding, and more intentional integration of theory-based instructional strategies.

Limitations and Directions for Future Research

This study has several methodological limitations that should be acknowledged. First, the research was conducted with a relatively small sample of 27 participants drawn from a single school district, which limits the transferability of the findings to other geographical or socio-cultural contexts. Second, convenience sampling was used, and participation was voluntary; therefore, the sample may not fully represent all teachers' and school principals' experiences with out-of-school learning. Third, the study relied exclusively on self-reported data obtained through semi-structured interviews, which may be subject to recall bias, social desirability bias, and subjective interpretation. Additionally, although content analysis and inter-coder reliability procedures were rigorously applied, the findings still reflect the interpretations of the researchers and may differ in other contexts. Future research should incorporate multiple data sources—such as classroom observations, student assessments, or document analysis—to strengthen

triangulation. Studies with larger, more diverse samples or comparative studies across regions may also provide a deeper understanding of how institutional, cultural, and policy-related factors shape the implementation of out-of-school learning environments in science education.

Recommendations

These recommendations provide a roadmap for structuring out-of-school learning in science education processes in a more effective, sustainable, and student-centered manner.

First, comprehensive in-service training programs should be organized for teachers to enable more effective use of out-of-school learning environments. These trainings should develop teachers' knowledge and skills in planning pre-trip preparation, during-trip activities, and post-trip evaluation processes. Thus, out-of-school activities can transform from merely experiential activities into structured learning processes that reinforce students' scientific process skills.

Second, cooperation and communication channels between teachers and school principals should be strengthened. Findings show that teachers focus on the process, while school principals focus on the outcomes. These different perspectives can lead to implementation gaps when not integrated towards common goals. Through regular coordination meetings and joint planning efforts, both a process- and outcome-oriented approach can be implemented.

Thirdly, the development of social skills should be incorporated into the planning process of out-of-school learning environments. Findings indicate that communication and collaboration skills have improved, but social awareness skills remain limited. Therefore, when designing activities, there should be a focus on activities that enable students to understand social norms, recognize social cues, and develop empathy. Thus, not only academic but also emotional and social development can be achieved in a holistic manner.

Fourth, the assessment process should be diversified to include both process- and product-based methods. Teachers' observation forms and question-and-answer methods alone are not sufficient, nor are school principals' product-focused approaches such as presentations and exhibitions. Mixed assessment models should be developed to monitor students' learning outcomes in a healthier and fairer way. In this regard, alternative measurement techniques (portfolio, self-assessment, peer assessment, etc.) should also be promoted.

Finally, the Ministry of National Education and relevant institutions should develop policies and support mechanisms that encourage the use of out-of-school learning environments. Providing financial support, preparing

guidelines on safety and legislation, and facilitating transportation and organizational processes are important in this context. In addition, curriculum-level adjustments should be made to permanently integrate out-of-school learning into the education system. Thus, these environments can become a sustainable and effective learning tool in science education.

Although this study provides valuable insights into how science teachers and school principals conceptualize and implement out-of-school learning environments, it is essential to acknowledge several methodological limitations to accurately frame the scope and transferability of the findings. First, the study was conducted with a relatively small sample size and relied on convenience sampling, which reduces the diversity of participant characteristics and limits the generalizability of the results beyond the immediate research context. Additionally, the exclusive use of semi-structured interviews means that the findings are based solely on participants' subjective self-reports rather than triangulated with observational or documentary evidence. This reliance on self-perception may have introduced response bias, particularly given that participants were asked to evaluate their own planning competencies, regulatory knowledge, and pedagogical practices. These limitations suggest that future research should employ more rigorous sampling procedures, include larger and more heterogeneous participant groups, and incorporate mixed-method or longitudinal designs that integrate multiple data sources—such as field observations, student learning artifacts, follow-up interviews, or structured assessment measures. Such methodological expansions would not only strengthen the empirical robustness of the findings but also provide a more comprehensive and theoretically grounded understanding of how out-of-school learning environments influence science teaching, learning outcomes, and school-level implementation processes.

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APPENDIX I.

Interview Question	***Aligned Research Question(s)***	***Explanation***
1. How would you describe your general familiarity with out-of-school learning environments?	*RQ1*	*Measures conceptual understanding of out-of-school learning.*
2. What kinds of out-of-school learning activities have you implemented or supported in your school?	*RQ1, RQ2*	*Assesses conceptualization and implementation experience.*
3. What opportunities do out-of-school learning environments offer for science teaching and learning?	*RQ3*	*Identifies perceived academic and affective contributions.*
4. What challenges or limitations have you encountered during out-of-school learning implementation?	*RQ4*	*Reveals barriers, logistical issues, and regulatory challenges.*
5. In your experience, how does out-of-school learning contribute to students' academic learning?	*RQ3*	*Explores perceived cognitive contributions.*
6. How does out-of-school learning contribute to students' social and personal development?	*RQ3*	*Measures perceived social-emotional development.*
7. What safety, planning, or logistical considerations do you take into account during out-of-school learning activities?	*RQ2, RQ4*	*Evaluates planning processes and administrative constraints.*
8. What types of assessment methods do you use to evaluate students' learning in out-of-school learning contexts?	*RQ5*	*Identifies assessment tools and approaches.*
9. How do out-of-school learning activities impact collaboration among teachers, administrators, and families?	*RQ3, RQ4*	*Examines collaboration and organizational dynamics.*
10. What recommendations would you make to improve the effectiveness of out-of-school learning practices?	*RQ4, RQ5*	*Captures improvement suggestions linked to implementation and assessment.*