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# CHALLENGES EXPERIENCED BY PRESCHOOL TEACHERS IN SCIENCE EDUCATION PRACTICES IN TURKEY: A META-SYNTHESIS STUDY (2014-2022)

**Didem Özsırkıntı**[1]

**Cenk Akay**[2]

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**ABSTRACT**

Children's first formal education begins with preschool education. The science activities included in the preschool curriculum are the children's first planned learning experience to support their scientific process skills. During the preschool period, teachers have an important role in planning and implementing science activities. Therefore, the challenges teachers encounter in science education practices during preschool are significant. The purpose of this research is to examine the challenges preschool teachers encounter in science education practices in Turkey through a meta-synthesis method and to discuss the findings of qualitative studies that suggest solutions to these challenges. As a result of this meta-synthesis research, the challenges experienced by preschool teachers in science education were presented under five themes: 'Challenges Related to Shortages of Materials', 'Challenges Related to Physical Conditions', 'Challenges in Establishing a Science Center', 'Challenges Encountered in Planning', and 'Challenges in Practice and Evaluation'. As a result, it was concluded that preschool teachers had problems with lack of materials in science education, had problems in creating science centers in their classrooms, did not feel competent in planning science activities, and had problems because they carried out science education in a limited area due to the physical conditions of the school. Suggestions have been made for the problems experienced by teachers in science education.

**Keywords**: Preschool education, science education in preschool education, preschool teacher, meta-synthesis

[1] Teacher, Mersin, Türkiye, didemandirinn@hotmail.com, ORCID: 0000-0001-8384-648X

[2] Associate Professor, Mersin University, Türkiye, E-mail: cenkakay35@mersin.edu.tr, ORCID: 0000-0001-9892-6255

# TÜRKİYE' DE OKUL ÖNCESİ ÖĞRETMENLERİNİN FEN EĞİTİMİ UYGULAMALARINDA KARŞILAŞTIKLARI SORUNLAR: BİR META-SENTEZ ÇALIŞMASI (2014-2022)

**ÖZET**

Çocukların ilk örgün eğitimi okul öncesi eğitim ile başlar. Okul öncesi müfredatında yer alan fen etkinlikleri, çocukların bilimsel süreç becerilerini destekleyecek ilk planlı öğrenme deneyimidir. Okul öncesi dönemde öğretmenler fen etkinliklerinin planlanması ve uygulanmasında önemli bir role sahiptir. Bu nedenle, öğretmenlerin okul öncesi dönemde fen eğitimi uygulamalarında karşılaştıkları zorluklar önemlidir. Bu araştırmanın amacı, Türkiye'de okul öncesi öğretmenlerinin fen eğitimi uygulamalarında karşılaştıkları zorlukları meta-sentez yöntemiyle incelemek ve bu zorluklara çözüm önerileri getiren nitel çalışmaların bulgularını tartışmaktır. Bu meta-sentez araştırması sonucunda, okul öncesi öğretmenlerinin fen eğitiminde yaşadıkları zorluklar beş tema altında sunulmuştur: 'Materyal Eksikliği ile İlgili Zorluklar', 'Fiziksel Koşullarla İlgili Zorluklar', 'Bilim Merkezi Kurmada Karşılaşılan Zorluklar', 'Planlamada Karşılaşılan Zorluklar' ve 'Uygulama ve Değerlendirmede Karşılaşılan Zorluklar'. Sonuç olarak, okul öncesi öğretmenlerinin fen eğitiminde materyal eksikliği sorunu yaşadıkları, sınıflarında bilim merkezi oluşturmada sorun yaşadıkları, fen etkinlikleri planlamada kendilerini yeterli hissetmedikleri ve okulun fiziksel koşulları nedeniyle sınırlı bir alanda fen eğitimi gerçekleştirdikleri için sorun yaşadıkları sonucuna ulaşılmıştır. Öğretmenlerin fen eğitiminde yaşadıkları sorunlara yönelik önerilerde bulunulmuştur.

**Anahtar Kelimeler:** Okul öncesi eğitim, okul öncesi eğitimde fen eğitimi, okul öncesi öğretmeni, meta-sentez

## 1. INTRODUCTION

Children are naturally curious and inquisitive from birth, and this characteristic continues throughout the preschool period. The preschool period is a critical stage for supporting the development of children's cognitive, social-emotional, motor, language, and self-care skills. It is believed that environmental factors play a significant role in supporting the development of children during the preschool period. Therefore, having a planned and formal learning environment during the preschool period contributes significantly to the children's development. The first formal education process for children begins with preschool education. During this formal education period, various activities are conducted with a specific purpose in line with the learning outcomes and indicators found in the preschool curriculum. These activities encompass Turkish, Arts, Drama, Music, Physical Education, Play, Science, Mathematics, Preparatory Reading and Writing Activities, and Field Trips. Among these activities, science activities are the children's first planned learning experience in the process of developing their scientific process skills.

Science activities direct children to pay attention, ask questions, wonder, observe, research, examine and discover (MoNE PREC, 2013). The starting point of science education for preschool children is their natural environment (Aktaş Arnas, 2002). Many events we encounter in our daily lives are related to science (Coşkun & Arık, 2022). The sky, the temperature of the air and classroom, seasonal changes, weight, length, the sun, the moon, day and night, the growth and development of plants, and the interaction of living things with each other are among the daily experiences of preschool children. For this reason, it would be useful to develop materials and provide a learning environment to help children develop a scientific perspective through science activities in early childhood (Eshach & Fried, 2005). In addition, in early childhood, children need the support of adults to reach their potential as scientists. During this period, children benefit from teachers who

interact with them in a way that structures and supports their research ( Hoisington, Chalufour, Winokur, & Clark-Chiarelli, 2014 ). The place of teachers who are competent and willing to carry out science activities with children in early childhood and who care about scientific understanding during educational program applications is very important in terms of science education (Tekerci, 2022).

Considering the importance of teachers in the implementation of science activities, which are the basis of science education in early childhood, it can be stated that the problems faced by teachers during science education practices are important. When the studies were examined, it was revealed that teachers experienced different problems in science education in the preschool period (Aslan, Şenel Zor & Tamvakas Cicim, 2015; Gezgin & Kılıç 2015; Sağlam & Aral, 2015; Akyol, 2016; Akman, Gangal & Ateş, 2017; Ültay, Ültay & Çilingir, 2018; Orhan, 2019; Simsar & Doğan, 2019).

The literature review shows that Coşkun and Arık (2022) conducted a systematic literature review of postgraduate theses in the field of preschool science education. Yılmaz, Özen-Uyar and Dikici-Sığırtmaç (2020) conducted a thematic content analysis of studies in the field of science education conducted in pre-school education between 2015 and 2019. Güneş (2018) examined 40 studies

involving the preschool period within the scope of science and nature education in Turkey between 2013 and 2018. However, when the studies were examined, no study between 2014-2022 was found examining the problems experienced by teachers in depth under a single heading. For this reason, it can be stated that it is important to thoroughly examine the problems that preschool teachers encounter during their implementation of science activities and suggestions for these problems. The purpose of this study is to examine in depth the problems encountered by teachers regarding science education practices in the preschool period and offer solution suggestions, to evaluate the qualitative findings of the studies, to provide a general perspective based on the similarities and differences of the problems experienced, and to evaluate the findings as a whole by making inferences from the studies. In addition, since there is no meta-synthesis study covering the years 2014-2022, it is thought that it will contribute to this field by synthesizing the qualitative findings of research on the problems experienced by preschool teachers in science education. The problem statement of the research was constructed as "What are the problems that preschool teachers encounter in science education practices, and suggestions for these problems?"

## 2. METHOD

This section provides information regarding the research design, data collection tools, data collection process, and data analysis. In this study, research studies examining the challenges encountered by preschool teachers in science education practices were reviewed using a meta-synthesis method. Meta synthesis studies require a systematic approach to collecting and analyzing qualitative research and using qualitative methods to synthesize the findings of these studies. (Sandelowski & Barroso, 2006). Therefore, the Enhancing Transparency in Reporting Qualitative Research Protocol (ENTREQ) was used in this research (Tong et al.,

2012). Erwin, Bortherson, and Summers (2011) summarized the qualitative meta-synthesis research process in six steps. The research process in this study was carried out based on these six steps.

Step 1: Describing the research problem

Step 2: Conducting a comprehensive literature search

Step 3: Deciding on studies to include

Step 4: Integrating and analyzing qualitative research findings

Step 5: Presenting the synthesis of findings obtained from studies

Step 6: Reflecting the findings in the research process

*Step 1. Describing the research problem:* Clearly stating the research problem is an important step for meta-synthesis studies. The purpose of supporting qualitative data is to synthesize and interpret the primary research findings related to a topic of interest. Therefore, it is important to define the research problem clearly. This research focuses on challenges experienced by preschool teachers in science education in Turkey. When reviewing the literature to formulate the research problem, no meta-synthesis study examining the challenges experienced by preschool teachers in science education between 2014 and 2022 was found. This study aims to provide solution suggestions by thoroughly examining the problems encountered in science education practices in the preschool period, to evaluate the qualitative findings of the studies, to provide a general perspective based on the similarities and differences of the problems experienced, and to evaluate them as a whole by making inferences from the studies.

*Step 2. Conducting a comprehensive literature search:* This research aimed to identify and summarize the challenges experienced by preschool teachers in science education in Turkey by conducting a comprehensive review. To access the relevant qualitative research reports, Google Scholar, the National Thesis Center, TR Index, and Ulakbim databases were searched. In addition, the search was conducted using the keywords “preschool + science”, and “preschool education + science activities”. In addition, the study started in March 2023 and was completed in September.

### 2.1. Study Group

*Step 3. Deciding on studies to include:* The inclusion and exclusion criteria specified in the table below were employed to determine the studies to be included in this meta-synthesis.

**Table 1.** Inclusion and Exclusion Criteria of the Study

| Inclusion Criteria for Studies | Exclusion Criteria for Studies |
|---|---|
| a) Studies using qualitative methods<br>b) Studies including the direct statements of participants<br>c) Studies on challenges experienced by preschool teachers in science education<br>d) Full-text articles or theses<br>e) Full-text articles and theses with research participants consisting of only teachers and more than 15 teachers | a) Studies containing mixed or quantitative data<br>b) Studies not written in Turkish |

The inclusion and exclusion criteria for the studies specified in Table 1 were determined by the authors, considering the principles of the meta-synthesis method and the fundamental characteristics of the study. Studies containing qualitative data on the challenges encountered by preschool teachers in science activities in Turkey, found in scientific indexes or published in databases, were selected for the meta-synthesis. Studies containing mixed and quantitative data, as well as non-Turkish studies were excluded. Since the findings of qualitative data were used in the meta synthesis study, mixed and quantitative data were excluded. In addition, as the problems faced by preschool teachers in science education practices in Turkey were evaluated, non-Turkish studies were excluded in this meta-synthesis study. The information flow to the meta-synthesis study, including the different stages of a systematic review, is presented in Figure 1.

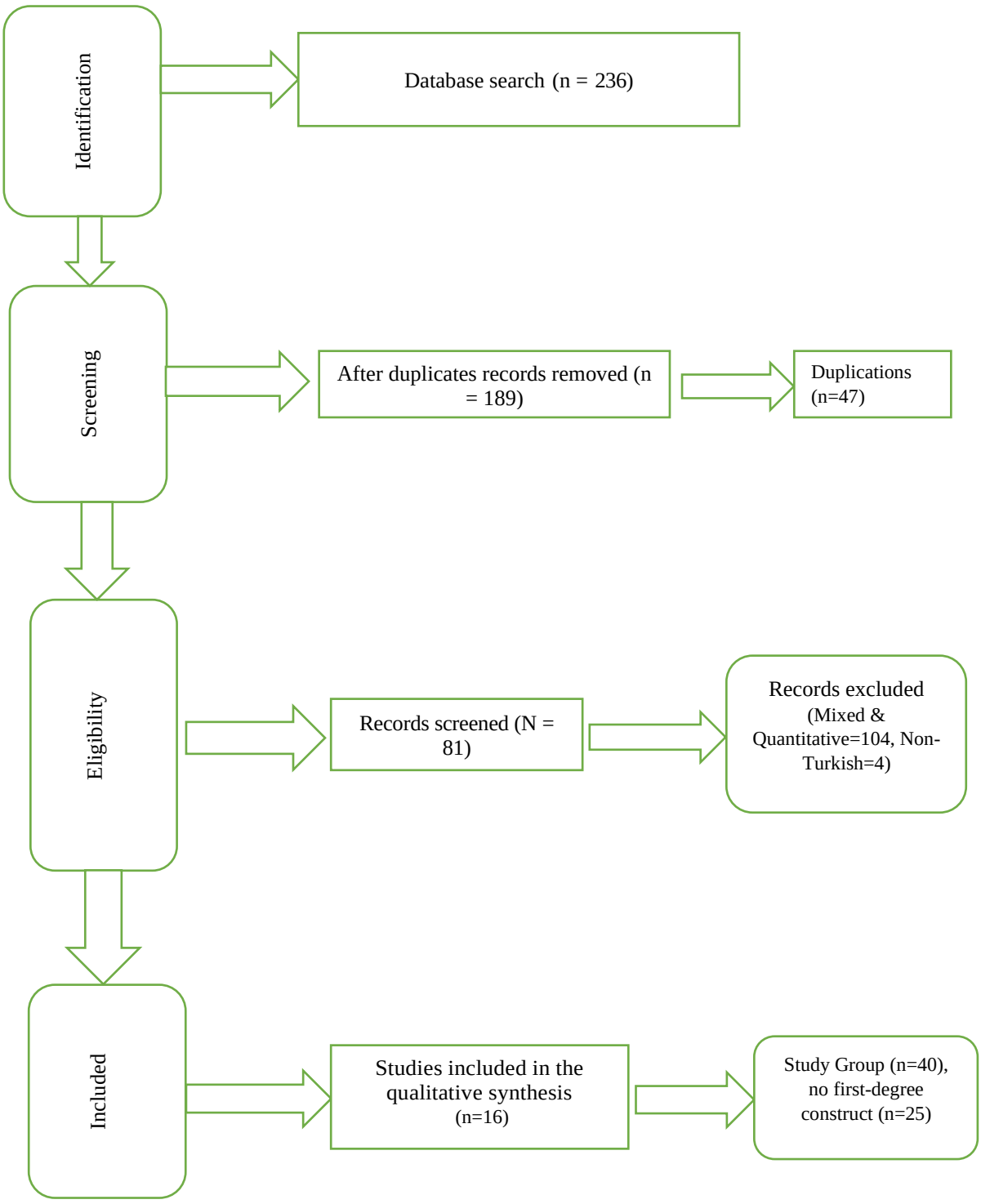


**Figure 1.** Information Flow Chart of Different Stages of a Systematic Review

A total of 236 studies were accessed during the database search. After removing the duplicates (n = 47), 189 studies were determined. Out of 189 studies, 108 were excluded from the research process based on the exclusion criteria. Of these studies, 104 employed mixed and quantitative methods, and 4 were foreign studies. As a result, 81 studies were screened. Out of these 81 studies, 65 studies not matching the inclusion criteria were excluded from the research, including 40 studies with fewer than 15 teachers or participants such

as teacher candidates, children, families, and administrators, and 25 studies without first-degree construct. In total, 14 articles and 2 master's theses were included in the meta-synthesis study.

### 2.2. Data Collection Tools

*Step 4: Integrating and analyzing qualitative research findings:* The data of the study were obtained by reviewing the research on challenges encountered by preschool teachers in science education practices. As shown in Table 2, the characteristics of the studies used in the meta-synthesis (n = 16) were categorized by authors, research methods, data collection tools, study groups, data analysis, and study type.

**Table 2.** Characteristics of Studies Used in the Meta-Synthesis

| Author Year | Method | Data Collection Tool | Study Group | Data Analysis | Study Type |
|---|---|---|---|---|---|
| Sağlam & Aral 2015 (A1) | Qualitative | Semi-structured interview form | 30 | Inductive Analysis | Article |
| Uysal et al.2016 (A2) | Qualitative | Unstructured interview from | 58 | Descriptive Analysis | Article |
| Akcanca & Gürler Alkan 2017 (A3) | Qualitative | Semi-structured interview form | 20 | Content Analysis | Article |
| Alabay 2017 (A4) | Qualitative | Semi-structured interview form | 73 | Content Analysis | Article |
| Uğraş 2017 (A5) | Qualitative | Semi-structured interview form | 19 | Content Analysis | Article |
| Türk 2018 (A6) | Qualitative | Open-ended questionnaire | 20 | Content Analysis | Article |
| Abanoz & Deniz 2021 (A7) | Qualitative | Semi-structured interview form | 24 | Content Analysis | Article |
| Önal, T.K (2020) (A8) | Qualitative | Semi-structured interview form | 15 | Content Analysis | Master's Thesis |
| Orhan 2019 (A9) | Qualitative | Semi-structured interview form | 60 | Descriptive Analysis | Article |
| Mercan & Kandır 2019 (A10) | Qualitative | Interview form | 106 | Content Analysis | Article |
| Simsar & Doğan 2019 (A11) | Qualitative | Structured open-ended interview form | 70 | Content Analysis | Article |
| Başkan Takaoğlu & Demir 2019 (A12) | Qualitative | Questionnaire Activity plan | 31 | Descriptive Analysis | Article |
| Sadıkoğlu & Durmuş (2022) (A13) | Qualitative | Semi-structured interview form | 40 | Descriptive Analysis | Article |
| Tanık Önal & Kızılay 2021 (A14) | Qualitative | Semi-structured interview protocol | 12 | Descriptive Analysis | Article |
| Ültay & Ültay (2022) (A15) | Qualitative | Semi-structured interview | 52 | Content Analysis | Article |
| Arı 2022 (A16) | Qualitative | Semi-structured interview form | 20 | Descriptive Analysis | Master's Thesis |

### 2.3. Data Analysis

Assessing the quality scores of research reports included in meta-synthesis studies is an important stage in ensuring the integrity of the data used in the meta-synthesis study. Hence, the Critical Appraisal Skills Protocol (CAPS) was administered to assess the quality of articles and theses. CAPS consists of a total of ten questions, including two questions concerning the appropriateness of the research purpose and qualitative research method and eight questions related to research design (Sibeoni et al., 2017).

The studies included in the meta-synthesis were scored according to the criteria involving ten questions prepared within the scope of CAPS, with scoring levels of '0: Insufficient', '0.5: Partially Sufficient', and '1: Sufficient'. After two experts assessed the quality of the studies, Miles and Huberman's formula (Reliability = consensus / (consensus + disagreement) * 100) was utilized to assess the inter-rater reliability between the experts. The research is considered reliable when the inter-coder agreement is at least 80% (Miles & Huberman, 2016). Since the consensus between the two experts was calculated as 0.87, it could be concluded that the inter-coder agreement is reliable (Table 3).

**Table 3.** Summary of CAPS According to the Criteria

| Expert/Author | | The aim of the study is determined clearly | Use suitable qualitative research methods | Rationale for the study design | Appropriate sampling strategy, description of the sample, and discussion about the sample | Appropriate description of data collection methods | Researchers critically examine their own roles in collecting and analyzing data and their potential prejudices | Approval evidence by a relevant institution | Adequate and in-depth description of the analysis process | Clear description of the findings, discussion of the evidence, reliability, honesty | Contribution to the existing knowledge and transferability | Quality Score |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sağlam & Aralık | Expert 1 | 1 | 1 | 1 | 1 | 1 | 0.5 | 0 | 1 | 1 | 1 | 8.5 |
| 2015 | Expert 2 | 1 | 1 | 1 | 1 | 1 | 0.5 | 0 | 1 | 1 | 1 | 8.5 |
| Uysal et al. | Expert 1 | 1 | 1 | 0.5 | 0.5 | 1 | 0.5 | 0 | 1 | 1 | 1 | 7.5 |
| 2016 | Expert 2 | 1 | 1 | 0 | 0.5 | 1 | 0.5 | 0 | 1 | 1 | 1 | 7 |
| Akcanca, Gürler, & Alkan | Expert 1 | 1 | 1 | 1 | 0.5 | 0.5 | 1 | 0 | 0.5 | 1 | 1 | 7.5 |
| 2017 | Expert 2 | 1 | 1 | 1 | 0.5 | 0.5 | 1 | 0 | 0.5 | 1 | 1 | 7.5 |
| Alabay | Expert 1 | 1 | 1 | 0.5 | 1 | 1 | 1 | 0 | 0.5 | 1 | 1 | 8 |
| 2017 | Expert 2 | 1 | 1 | 0.5 | 1 | 1 | 1 | 0 | 0.5 | 1 | 1 | 8 |
| Uğraş | Expert 1 | 1 | 1 | 0.5 | 0.5 | 1 | 1 | 0 | 1 | 1 | 1 | 7.5 |
| 2017 | Expert 2 | 1 | 1 | 0.5 | 0.5 | 1 | 0.5 | 0 | 1 | 1 | 1 | 7 |
| Türk | Expert 1 | 1 | 1 | 0.5 | 0.5 | 1 | 1 | 0 | 1 | 1 | 1 | 8 |
| 2018 | Expert 2 | 1 | 1 | 0.5 | 0.5 | 1 | 1 | 0 | 1 | 1 | 1 | 8 |
| Abanoz & Deniz | Expert 1 | 1 | 1 | 1 | 1 | 1 | 0.5 | 0 | 1 | 1 | 1 | 8.5 |
| 2021 | Expert 2 | 1 | 1 | 1 | 1 | 1 | 0.5 | 0 | 1 | 1 | 1 | 8.5 |
| Önal | Expert 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 |
| 2020 | Expert 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 |
| Orhan | Expert 1 | 1 | 1 | 0.5 | 0.5 | 1 | 1 | 0 | 0.5 | 1 | 1 | 7 |
| 2019 | Expert 2 | 1 | 1 | 0.5 | 0.5 | 1 | 1 | 0 | 0.5 | 1 | 1 | 7 |
| Mercan & Kandır | Expert 1 | 1 | 1 | 0.5 | 0.5 | 1 | 1 | 0 | 1 | 1 | 1 | 8 |
| 2019 | Expert 2 | 1 | 1 | 0.5 | 0.5 | 1 | 1 | 0 | 1 | 1 | 1 | 8 |
| Simsar & Doğan | Expert 1 | 1 | 1 | 0.5 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 8.5 |
| 2019 | Expert 2 | 1 | 1 | 0.5 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 8.5 |
| Başkan Takaoğlu & Demir | Expert 1 | 1 | 1 | 1 | 1 | 1 | 0.5 | 0 | 1 | 1 | 1 | 8.5 |
| 2019 | Expert 2 | 1 | 1 | 1 | 1 | 1 | 0.5 | 0 | 1 | 1 | 1 | 8.5 |
| Sadıkoğlu & Durmuş | Expert 1 | 1 | 1 | 1 | 0.5 | 1 | 0.5 | 0 | 1 | 1 | 1 | 8 |
| 2022 | Expert 2 | 1 | 1 | 1 | 0.5 | 1 | 0.5 | 0 | 1 | 1 | 1 | 8 |
| Tanıl Önal & Kızılay | Expert 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 9 |
| 2021 | Expert 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 9 |
| Ültay & Ültay | Expert 1 | 1 | 1 | 1 | 0.5 | 1 | 1 | 1 | 1 | 1 | 1 | 9.5 |
| 2022 | Expert 2 | 1 | 1 | 1 | 0.5 | 1 | 1 | 1 | 1 | 1 | 1 | 9.5 |
| Arı | Expert 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 |
| 2022 | Expert 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 |

## 3. FINDINGS

*Step 5 and 6. Synthesizing and Presenting the Research Findings and Reflecting the Findings in the Research Process*

At this stage, the articles and theses included in the meta-synthesis were read in detail to fully understand all concepts. First-degree, second-degree, and third-degree constructs were included in the research findings process to analyze and reinterpret the studies. First-order constructs are based on participants' own experiences and directly consist of participants' feedback. Second-order constructs consist of interpretations by the authors of the studies. Third-order constructs constitute the synthesis stage of the research. At this stage, the researchers examine the first and second-order constructs and incorporate their own interpretations into the research (Erwin et al., 2011). In this section, first and second-degree constructs are discussed, and in the discussion process, the third-degree constructs derived from the synthesis of multiple studies under review are presented. This research examined the challenges experienced by preschool teachers in Turkey regarding science education using the meta-synthesis method. Based on the findings, the challenges encountered by teachers were addressed under five themes, namely 'Challenges Related to Shortages of Materials', 'Challenges Related to Establishing a Science Center', 'Challenges Encountered in Planning', 'Challenges Encountered in Practice and Evaluation', and 'Challenges Related to Physical Conditions'. In the findings and discussion section, first, second, and third-degree constructs are presented based on these themes. As seen in Table 2, the studies included in the research were coded as A1, A2, and so on.

### 3.1. Challenges Related to Shortages of Materials

During the preschool period, the aim is for children to develop a positive attitude towards science education. In this process, the presence of materials that attract children's attention and allow them to gain direct experience can be considered an important factor in science education practices, both in the preparation and implementation of science activities. Classrooms that are rich in materials can provide direct learning experiences by appealing to various senses. Furthermore, the presence of materials for science education in both indoor and outdoor play and learning environments can contribute positively to science education in the preschool period. However, the results of the meta-synthesis study revealed that one of the challenges encountered in preschool science education is the shortage of materials.

In this meta-synthesis study, the first-degree and second-degree constructs containing the findings regarding the problems and solution suggestions in science education in the preschool period are as follows;

*Second-degree constructs*

- Akcanca, Gürler and Alkan (2017): *"Teachers should be able to use various materials effectively in order to teach the concept to the child."*
- Türk (2018): *"Based on the fact that teachers stated that there is a lack of materials regarding astronomy activities, it is recommended to provide resource materials and equipment related to astronomy activities to preschool schools."*

• Uysal et al. (2016): *"Material deficiencies in science corners in pre-school education institutions should be determined. In this regard, training should be organized to provide educational support to teachers on creating, producing and repairing creative materials."*

• Önal (2020): *"Updating of materials related to science activities should be carried out by taking into account teacher demands and suggestions."*

*First-degree constructs*

- A8: *"... Since I am not at school, I prepare it at home and bring it the day before. Or if there is something I cannot bring, I request it from the parents. Since it is a disadvantaged area, I do not want materials that they cannot buy. It is not sufficient..."*
- A12: *"I usually have problems in obtaining materials. Because materials for science education are expensive."*
- A16*: "I may have difficulties from time to time due to lack of materials."*

Within the scope of the meta-synthesis study, it was revealed that teachers had problems in supplying and developing materials in science education in the preschool period. In the second-degree construct of materials for the problems experienced by preschool teachers in science education, there are solution suggestions such as teachers' material deficiencies can be determined, material support can be provided, educational support can be provided to teachers in material development, materials can be edited by taking teachers' opinions when updating them.

Within the scope of the meta-synthesis study, it was revealed that there was a lack of materials in the first-degree construct where teachers lived in science education in the pre-school period, in disadvantaged regions, and that teachers had problems with the lack of materials due to reasons such as the expensiveness of materials for science education.

The reasons for the lack of materials, which is one of the problems experienced in science education in the preschool period, may be due to insufficient school facilities, crowded class sizes, and teachers' deficiencies in developing materials suitable for activities. Preschool teachers have problems due to lack of materials in science education (Aslan, Şenel Zor & Tamvakas Cicim, 2015; Akyol, 2016; Orhan, 2019; Simsar & Doğan, 2019; Ültay, Ültay & Çilingir, 2018; Karaman Eflatun & Kuloğlu, 2021; Arı, 2022; Seymen Çeken, 2022 ). In their study, Ağgül Yalçın and Yalçın (2018) examined the opinions of pre-school teachers about the problems of pre-school education and stated that teachers had problems because the school's facilities were inadequate and families had difficulty in obtaining the materials. Barbaroğlu and Okur Metwalley (2018) stated in their study that preschool teachers who do not have enough materials prefer activities that require less materials. Kılıç (2022) suggested that in order to solve the problems experienced by teachers regarding the lack of materials, science education materials should be arranged in a way that provides easy access, teachers should be made aware of material sharing, and in-service training or courses can be organized for teachers. Seymen Çeken (2022) suggested solutions to the problems experienced by teachers in science education, such as making the materials sufficient and reducing the class size. In the meta-synthesis study, the findings of the

first-degree constructs containing the statements of the teachers and writers and the problems in the second-degree constructs and the suggestions for the problems are parallel to the studies carried out.

### 3.2. Challenges Related to Establishing a Science Center

According to the preschool curriculum, there are various centers in the classroom environment. The arrangement of science centers in classroom environments and the materials available in these centers are crucial elements in implementing science activities. Science centers should be arranged in a way that captures children's interest and allows them to work comfortably. Teachers have important responsibilities in establishing a science center within the classroom. The meta-synthesis study revealed that preschool teachers encounter challenges in creating a science center in their science education practices.

The second-degree constructs containing the findings of the authors of the studies discussed in this meta-synthesis study regarding the problems related to creating a science center and the suggestions for these problems are as follows;

- Uysal et al. (2016): *"Material deficiencies in science corners in pre-school education institutions should be determined. In this regard, training should be organized to provide educational support to teachers on creating, producing and repairing creative materials."*
- Akcanca, Aktemur Gürler and Alkan (2017): *"In order for science applications to be carried out efficiently in pre-school education institutions, a science center should be created and kept alive."*

The first-degree constructs "related to the most frequently mentioned problems in the theme of problems experienced due to the creation of science centers in pre-school science education are;

- A8: *"We have a science corner, but we do not have any materials. It was determined as follows: "We do not have the tools and equipment to perform the application..."*
- A9: *"Our science center is not sufficient. We have a place and some things that we set with the board. There should be a large science center and a place with science materials. "I think children should be able to touch and use these materials easily."*

Within the scope of the meta-synthesis study, it was revealed that preschool teachers had problems in establishing science centers in their classrooms due to the lack of materials. In the suggestions for this issue, second-degree suggestions were presented, such as determining the material deficiencies in the science center and providing educational support to teachers on creating materials, creating materials and repairing materials. Teachers may have problems creating science centers in their classrooms due to lack of materials or small classes. When the studies are examined, it has been revealed that teachers include science centers in their classrooms (Sağlam & Aral, 2015; Orcan Kaçan, Dedeoğlu Aktuğ, Karaçelik & Kimzan, 2021; Aktın & Aşçı, 2021; Gürler 2021), but they say that the science center is not efficient and they experience a problem in supply of materials (Simsar, Doğan & Yalçın, 2017; Ültay, Ültay & Çilingir, 2018; Gürler, 2021). Although there are science centers for science education in pre-school classrooms, it can be stated that teachers have problems in science centers due to lack of materials. In the meta-synthesis study, teachers stated that they had difficulties

in creating science centers, but the studies revealed that there were science centers in the classrooms. It can be stated that even if teachers create a science center in their classrooms, they experience problems due to the lack of materials in the science center. It is necessary to have science centers for science education in the preschool period that will provide students with the opportunity to learn by doing and experiencing (Dubosarsky, 2011; Seymen Çeken, 2022). In pre-school education, science centers help children gain different experiences. Science centers in classrooms can be an opportunity for children to find answers to their questions about the world they live in. At the science center, children can have the opportunity to do research or an investigation. In addition, keeping update materials in the center can attract children's attention and help increase children's interest in science education and improve their science process skills. For this reason, it can be stated that science centers in pre-school classrooms are very important. Problems experienced by teachers in creating science centers in the preschool period can be solved by providing material support. In addition, small classes may cause teachers to have problems in creating a science center, but in this case, teachers can create temporary learning centers in their classrooms according to the selected subject.

### 3.3. Challenges Encountered in Planning

Teachers have an important responsibility in planning science education practices in preschool education. Teachers can prioritize planning their science activities based on the learning outcomes, the science concepts in the curriculum, students' developmental levels, their ages, the potential of activities to capture children's attention, their integration with other activities, and their support for different developmental areas.

The second-degree constructs containing the primary research authors' views and recommendations on planning examined in this meta-synthesis are as follows:

- Sağlam and Aral (2015): *"..it is thought that the advancement of technology and especially the increase in sharing and accessibility opportunities over the internet are related to teachers' use of ready-made and previously tested plans instead of original plans. In addition to this situation, it is thought that teacher inadequacies in planning may be related to this result."*

The first-degree constructs containing the primary research authors' views and recommendations on challenges experienced in planning science activities examined in this meta-synthesis are as follows:

- A3: "*I do not consider myself competent, I decide which experiment to do by surfing the internet."*
- A5: *".. I don't want to use it because I don't know much about STEM disciplines…"*
- A6: *"I have difficulty in planning activities other than the activities in the program."*

With the meta-synthesis study, it has been revealed in the first-degree constructs regarding the problems experienced by teachers while planning activities in science education that teachers have a lack of knowledge about the stem, they have difficulty in planning activities other than the activities in the program, and they do not consider themselves competent. In the second-degree constructs included in the meta-synthesis study, it was stated that the problems experienced by teachers in planning may have caused teachers to use

ready-made plans. Teachers may have problems in preparing plans for science education because they lack knowledge about science education or do not feel competent.

Akyol (2016) stated in his study that preschool teachers use ready-made plans as a result of their plans and lesson observations, so science activities are not frequently included. Spektor Levy, Kesner Baruch, and Mevarech (2013) stated that teachers did not feel competent in the process of planning scientific activities. It has been stated that preschool teachers are more efficient and competent in putting science activities into function when they research information and add their own comments and apply it (Çevik, 2022). It can be stated that preschool teachers' preparation of their own plans by eliminating their lack of knowledge about the planning process of science education will make science education in the preschool period more efficient.

### 3.4. Challenges Encountered in Practice

It can be stated that the methods and techniques used by preschool teachers, the concepts they include regarding the science education content and the materials they use in science education practices in the preschool period are important. Various methods and techniques, such as concept maps, drama, stories, STEM education practices, the analogy method, investigation, and observation, can be used in preschool science education. However, this meta-synthesis study revealed that teachers experience difficulties in preschool science practices.

The second-degree constructs encompassing of primary study authors' views and recommendations on challenges encountered in implementing science activities examined in this meta-synthesis study are as follows:

- Abanoz and Deniz (2021): *"... in order to implement a qualified STEM education, it is necessary to organize in-service training in this field in order to increase the awareness of preschool teachers about STEM education."*
- Arı (2022): *"Teachers can organize activities by researching different methods and techniques during the implementation of the activities and support children's feelings of discovery and curiosity."*

The first-degree constructs containing the views and recommendations of the authors of studies reviewed in this meta-synthesis on challenges encountered in implementing science activities are as follows:

- A10: *"We can receive training on the implementation of the Steam program, but we are not competent in its implementation."*
- A12: *"Children have a little more difficulty understanding abstract concepts than we do. That's why I have a hard time explaining questions to students that involve abstract concepts."*

As a result of the first-degree and second-degree constructs examined in this research, it is seen that teachers have problems with methods and techniques and concept teaching in science applications in pre-school education. In addition, teachers have problems in teaching abstract concepts in science education

practices in the preschool period. Suggestions have been presented in secondary structures, such as teachers can be supported in planning activities by receiving in-service training on different methods and techniques, and in-service training can be organized for teachers. Teachers may have problems in implementation due to their lack of knowledge about the content of some science education in the preschool period or because they do not feel adequate about the methods and techniques they use. Okur- Okur Akçay (2021) revealed that preschool teachers do not feel adequate about the methods and techniques used in science education. Güngör Seyhan (2015) and Şahin (2016) stated that it is very important for preschool teachers to be informed about methods such as analogy enabling abstract concepts to be learned more easily by concretizing them. However, in their study to determine the methods and techniques used by preschool teachers in science activities, Gezgin and Kılıç (2015) concluded that the least used method by teachers was analogy. Ekizler (2022) stated in his study that preschool teachers use the educational game method in science education, but teachers experience problems during the educational game process in science education due to class size, lack of materials and personnel. Digital stories for science education (Kurhan, 2022), inquiry-based stem activities (Bursa, 2022), drama method and puppet technique (Aydın, 2021), augmented reality tools (Kahriman-Pamuk, Elmas & Pamuk, 2021) are used in science education in preschool period. Using methods and techniques to support children's scientific thinking skills in education will positively affect children's development. Supporting teachers with in-service training that will support their professional development in different methods and techniques in the preschool period will make a positive contribution to the process (Güngör Seyhan, 2015; Sağlam & Aral, 2015, Şeker & Çavuş, 2017; Ültay, Ültay & Çilingir 2018; Karaman Eflatun, 2021 ). Supporting teachers with in-service training on different methods and techniques in science education in the preschool period can also help teachers in planning. Using different techniques, such as educational games, analogies or digital stories, can enable teachers to need less material. For this reason, supporting the professional development of teachers in science education practices in the preschool period can be expressed as an important process.

### 3.5. Challenges Related to Physical Conditions

Challenges related to physical conditions are another issue in preschool education. In preschool science education practices, class size, classroom size, the brightness of the classroom, having an area where children can study comfortably, and having an outdoor play and learning environment can be expressed as crucial factors for preschool science education practices.

The second-degree constructs regarding the challenges related to physical conditions and the solutions proposed by the authors of the studies examined in this meta-synthesis are as follows:

Önal (2020): *"In order for science education to be carried out effectively and to produce results appropriate to its purpose, the physical conditions of the environment where the activities are carried out must be sufficient and suitable for developing children's scientific skills."*

The first-degree constructs concerning the challenges encountered in practice due to the physical conditions of schools are addressed as follows:

A13: *"Our practice area is very limited. The classroom is not an environment where we can do all activities. For example, how wonderful it would be if we had a practice garden where children could play, bask in the sun, and count the insects and butterflies to their hearts' content."*

The meta-synthesis study concluded that teachers in first-degree constructs do not have the classroom structure to implement all activities in science education, there are no practice areas in schools, school gardens are not arranged to implement the activities, and the garden structure is not suitable. In the second- degree constructs that include suggestions for this problem, it is stated that for the effective implementation of science education, physical conditions must be sufficient and suitable for developing children's scientific skills. It can be stated that the physical structure of the classroom and the indoor and outdoor equipment of the school are important factors in science education practices in the preschool period. Arrangement of internal and external physical environments in pre-school education institutions will positively affect children's behavior. Educational environments and equipment prepared in accordance with the developmental characteristics of children will increase the quality of education children receive (Özkubat, 2013). In their study, Kıldan and Pektaş (2013) examined the opinions of preschool teachers about teaching science and nature-related subjects in early childhood and revealed that teachers thought that the physical equipment of their classrooms was not sufficient for teaching science and nature-related subjects. Can and Kılıç (2019) and Başturan and Görgü (2020) revealed in their studies that teachers in pre-school education found the physical infrastructure and conditions of schools inadequate. In line with the studies and findings, it can be stated that the physical conditions of the school and the classroom are important in the preschool period and that improving physical conditions is an important step towards science education in the preschool period. Having places where children can feel comfortable in the preschool period is as important in science education as in all activities. For this reason, open spaces can be arranged as learning areas for science education, so that children can feel comfortable in the open space. In addition, arranging the physical structure of the school in a way that attracts children's attention in accordance with their developmental levels can improve children's imagination and contribute positively to their scientific process skills. It can be stated that well-planned physical structures in the preschool period are important for science activities, as in all activities.

## 4. CONCLUSION

This study synthesized the primary research findings to identify the challenges experienced by preschool teachers in science education in Turkey. As a result, the challenges encountered by teachers in preschool science education were revealed. These challenges were addressed under the following five themes: 'Challenges Related to Shortage of Materials', 'Challenges Related to Establishing a Science Center', 'Challenges Encountered in Planning', 'Challenges Encountered in Practice and Evaluation', and 'Challenges Related to Physical Conditions'.

In the first theme, it was concluded that preschool teachers lack materials for science education and, therefore, have difficulty in planning activities. In the second-degree constructs, which include suggestions for material deficiencies, teachers' material deficiencies were identified and suggestions were made to provide educational support to teachers on issues such as material development, repair and production.

In the second theme, it was revealed that another problem preschool teachers experience in science education is establishing a science center in their classrooms. It has been revealed that one of the main problems of teachers in creating science centers is the lack of materials, and even if science centers are created, their materials are missing. In addition, in the solution suggestions for the problems experienced in establishing science centers, it was stated that establishing and keeping science centers in second-degree constructs is important for the effective implementation of science practices. Suggestions include organizing training that will provide educational support to teachers on creating, producing and repairing creative materials.

In the third theme, another problem faced by preschool teachers is that they do not feel competent in planning science activities. This study revealed that teachers use ready-made plans and do not want to include science activities in their plans due to their lack of knowledge. It was concluded that teachers may have problems in preparing plans for science education because they lack knowledge about science education or do not feel competent.

The fourth theme is the problems experienced by preschool teachers during the practice process in science education. It is seen that teachers have difficulty in explaining science concepts, do not have knowledge about the implementation of the stem program, and have problems in answering children's questions. The second-order structures examined regarding these questions include organizing practical in-service training and using different alternative measurement methods other than the question-answer method that teachers use most in measurement.

## SUGGESTIONS

### Suggestions for practice

1. In-service training can be organized for pre-school teachers on developing materials for science education.
2. Material support can be provided to teachers to address the problems they experience in establishing a science center, which will enable teachers to renew the science center at regular periods and organize the science center to support their daily education plans.
3. The physical structure of the school can be arranged for pre-school science education practices.
4. Applied in-service trainings covering methods and techniques for science education can be organized so that teachers can prepare activities that will improve students' higher-level thinking skills in case of problems they experience in practice and evaluation.

**Suggestions for Future Research**;

1. The problems experienced in preschool science education can be examined based on different years.

2. Studies in different databases regarding the problems experienced by teachers in preschool science education can be examined.

3. The problems experienced in science education in the preschool period in Turkey can be examined and compared with the problems in science education in the preschool period in a different country.

4. The problems experienced in science education in preschool periods in Turkey can be examined through meta-synthesis and meta-analysis by including studies containing both qualitative and quantitative findings.

5. In this study, only the problems experienced in science education in the preschool period in Turkey are discussed. Studies can be addressed more comprehensively by including the problems experienced in different countries regarding science education in the preschool period.

## REFERENCES

**Studies included in the meta synthesis study are marked as '*'.**


*Abanoz, T. & Deniz, Ü. (2021). Okul öncesi dönemde stem yaklaşımı ve bu yaklaşıma uygun fen etkinlikleri: Sahadan görüşler. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi*, *41(*1), 1-24.

Ağgül Yalçın, F. A. & Yalçın, M. (2018). Okul öncesi öğretmenlerin okul öncesi eğitimin sorunlarıyla ilgili görüşleri: Ağrı ili örneği. *Elementary Education Online, 17*(1), 367-383. DOİ: 10.17051/ilkonline.2018.413784

*Akcanca, N., Aktemur Gürler, S. & Alkan, H. (2017) . Okul öncesi öğretmenlerinin fen eğitimi uygulamalarına yönelik görüşlerinin belirlenmesi, *Caucasion Journal of Science,* s:1-19. www.cjoscience.com

Akman, B., Gangal, M. & Kardeş, S. (2017). Okul öncesi eğitim sınıflarındaki bilim eğitimi öğrenme merkezlerinin incelenmesi. *Akdeniz Üniversitesi Sosyal Bilimler Enstitüsü Dergisi. 1* (1), 40-56

Aktaş Arnas, Y. (2002). Okul öncesi dönemde fen eğitiminin amaçları. *Çocuk Gelişimi ve Eğitimi Dergisi. 6* (7), 6-7.

Aktın, K & Aşcı, A. (2021) Okul öncesi sınıflarında öğrenme merkezlerine yönelik öğretmen görüşleri. *Başkent Unıversıty Journal Of Educatıon. 8* (1), 57-66.

Akyol, N. (2016). *Okul Öncesi Dönemde Fen Eğitiminin Uygulanabilirliğine Yönelik Öğretmen Ve Yöneticilerin Görüşlerinin İncelenmesi*. Retrieved From: Yüksek Öğretim Kurulu Tez Merkezi (https://tez.yok.gov.tr/UlusalTezMerkezi/ ) (Tez No:429917)

*Alabay, E. (2017). Okul öncesi öğretmenlerinin fen etkinliklerine ilişkin görüşlerinin incelenmesi. *Eğitim Fakültesi Dergisi*, *3* (1), ss: 1-25.

*Arı, S. (2022). Okul Öncesi Eğitim Kurumlarında Uygulanan Fen Ve Doğa Etkinliklerine Yönelik Öğretmen Görüşlerinin İncelenmesi.(Yüksek Lisans Tezi). Retrieved From: Yüksek Öğretim Kurulu Tez Merkezi ( https://tez.yok.gov.tr/UlusalTezMerkezi/ ) (Tez No: 772886)

Aslan, O., Şenel Zor, T & Tamkavas Cicim, E (2015). Okul öncesi öğretmenlerinin fen eğitimine yönelik görüşlerinin ve hizmetiçi eğitim ihtiyaçlarının belirlenmesi. *Uluslararası Sosyal Araştırmalar Dergisi( The Journal of International Social Research)*. *8* (40), ss:519-530.

Aydın, R. (2021). Okul öncesi fen eğitiminde drama ve kukla uygulamalarının öğrenmenin kalıcılığına etkisi. (Yüksek Lisans Tezi). Retrieved From: Yüksek Öğretim Kurulu Tez Merkezi (https://tez.yok.gov.tr/UlusalTezMerkezi/ ) (Tez No: 662843)

Babaroğlu, A. & Okur Metwalley, E. (2018). Erken çocukluk döneminde fen eğitimine ilişkin okulöncesi öğretmenlerinin görüşleri. *Hitit Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, *11* (1), 125-148. DOİ: 10.30794/pausbed.425633

*Başkan Takaoğlu, Z. & Demir, V. (2018). Okul öncesi eğitimde uygulanan fen etkinliklerinin değerlendirilmesi. *Akdeniz Eğitim Araştırmaları Dergisi (Mediterranean Journal of Educational*. *12* (25), 76-101. https://doi.org/10.29329/mjer.2018.153.5

Başturan, C. & Görgü, E. (2020). Öğretmenlerin mesleki sorun tanımları: Okul öncesi öğretmenleri bağlamında bir değerlendirme. *Yaşadıkça Eğitim Dergisi, 34*(1), 79-98. DOI: 10.33308/26674874.2020341163

Bursa, E. (2022). Sorgulama temelli stem etkinlikleri ile fen öğretiminin okul öncesi öğrencilerinin bilimsel süreç becerilerine olan etkileri. (Yüksek Lisans Tezi). Retrieved From: Yüksek Öğretim Kurulu Tez Merkezi ( https://tez.yok.gov.tr/UlusalTezMerkezi/ ) (Tez No: 769688)

Can, E. & Kılıç, Ş. (2019). Okul öncesi eğitim: temel sorunlar ve çözüm önerileri. *Millî Eğitim Dergisi*, *48* (1), 483-519.

Coşkun, A. & Arık, S. (2022). Okul öncesi fen eğitimi alanında yapılan lisansüstü tezlerin eğilimleri. *Anadolu Öğretmen Dergisi*, *6* (2), 183-211, DOI: 10.35346/aod.1199589.

Çevik, S. (2022). Okul öncesi öğretmenlerinin epistemolojik inançları ile fen etkinlik yeterlilikleri arasındaki ilişkinin bazı değişkenler açısından incelenmesi. (Yüksek lisans tezi). Retrieved From: Yüksek Öğretim Kurulu Tez Merkezi ( https://tez.yok.gov.tr/UlusalTezMerkezi/ ) (Tez No: 762817)

Dubosarsky, M.D. (2011). Science in the eyes of preschool children: findings from an innovative research tool. *Retrieved from the University of Minnesota Digital Conservancy*, https://hdl.handle.net/11299/116144

Ekizler, B.S. (2022). Okul öncesi öğretmenlerinin fen eğitiminde eğitsel oyun yönteminin kullanımına yönelik görüş ve uygulamalarının incelenmesi. (Yüksek Lisans Tezi). Retrieved From: Yüksek Öğretim Kurulu Tez Merkezi ( https://tez.yok.gov.tr/UlusalTezMerkezi/ ) (Tez No: 731661)

Erwin, J. E., Brotherson, J. M. & Summers, A. J. (2011) Understanding qualitative metasynthesis: ıssues and opportunities in early childhood ıntervention research. *Journal of Early Intervention*, *33*(3), 186-200.

Eshach, H. & Fried, M. N. (2005). Should science be taught in early childhood. *Journal of Science Education and Technology*, *14* (3), 315-336.

Gezgin, D. & Kılınç, D. (2015). Okul öncesi öğretmenlerinin fen etkinliklerinde tercih ettikleri kazanım ve yöntemlerin belirlenmesi. *Mersin Üniversitesi Eğitim Fakültesi Dergisi ( Mersin University Journal of the Faculty of Education) ,11* (3),620-630, DOI: 10.17860/efd.46048

Güngör Seyhan, H. (2015). Okul öncesi fen eğitiminde analoji kullanımının önemi ve analoji örnekleri. *Cumhuriyet International Journal of Education*-CIJE ,*4* (2), 15 – 28

Güneş, G. (2018). Okul öncesi fen ve doğa eğitimi araştırmalarına ilişkin bir tarama çalışması: Türkiye örneği. *Erken Çocukluk Çalışmaları Dergisi, 2* (1), 33-67. DOI: 10.24130/eccd-jecs.196720182150

Gürler, P. (2021) . Okul öncesi öğretmenlerinin fen eğitiminde deney yönteminin kullanımına ilişkin görüş ve uygulamaları. (Yüksek Lisans Tezi ). Retrieved From: Yüksek Öğretim Kurulu Tez Merkezi ( https://tez.yok.gov.tr/UlusalTezMerkezi/ ) (Tez No: 683096)

Hoisington, C., Chalufour, I., Winokur, J., & Clark-Chiarelli, N. (2014). Preschool: promoting children's science ınquiry and learning through water ınvestigations. *YC Young Children, 69* (4), 72-79.

Kahriman-Pamuk, D., Elmas, R. & Pamuk, S. (2020). Artırılmış gerçeklik ve fen etkinlikleri: okul öncesi öğretmen ve öğretmen adaylarının görüşleri. *YYÜ Eğitim Fakültesi Dergisi (YYU Journal of Education Faculty), 17* (1), 671-699 ( http://efdergi.yyu.edu.tr)

Karaman Eflatun, H. & Kuloğlu A. (2021). Okul öncesi öğretmenlerinin fen öğretimine yönelik tutumları ile fen ve doğa etkinliklerine yönelik görüşleri. *İnönü Üniversitesi Eğitim Fakültesi Dergisi, 22* (3), 2078-2095 . DOI: 10.17679/inuefd.1000517

Kıldan, O. & Pektaş, M., (2009). Erken çocukluk döneminde fen ve doğa ile ilgili konuların öğretilmesinde okulöncesi öğretmenlerinin görüşlerinin *belirlenmesi Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi (KEFAD), 10* (1),s. 113-127

Kılıç, R. (2022). Okul öncesi dönem çocukları ile ebeveyn ve öğretmenlerinin fene yönelik tutumları arasındaki ilişki. (Yüksek Lisans Tezi). Retrieved From: Yüksek Öğretim Kurulu Tez Merkezi ( https://tez.yok.gov.tr/UlusalTezMerkezi/ ) (Tez No: 710991)

Kurhan, H. (2022). Okul öncesi dönemde fen eğitiminde dijital hikâyelerin kullanımı: teknolojik pedagojik alan bilgisi bağlamında bir inceleme. (Yüksek Lisans Tezi). ). Retrieved From: Yüksek Öğretim Kurulu Tez Merkezi ( https://tez.yok.gov.tr/UlusalTezMerkezi/ ) (Tez No: 763190)

*Mercan, Z. & Kandır, A. (2019). Preschool teachers opinions regarding steam approach in education.. *Journal of Current Researches on Educational Studies, 8* (2), 15-28. DOİ: 10.26579/jocures-9.1.2

Miles, B. M. & Huberman, M. A. (2016). Qualitative data analysis (Translate Editors: S. Akbaba Altun ve A. Ersoy). Ankara: Pegem Akademi. (2. Baskıdan Çeviri)

Milli Eğitim Bakanlığı (2013). *Okul Öncesi Eğitim Programı*. https://tegm.meb.gov.tr/dosya/okuloncesi/ooproram.pdf (Erişim tarihi:24.04.2014).

Okur, E. & Okur Akçay, N. (2021). Okul öncesi öğretmenlerinin fen eğitiminde kullanılan yöntem ve tekniklere ilişkin görüş ve yeterliklerinin incelenmesi. *Uluslararası Eğitim Bilim Ve Teknoloji Dergisi (International Journal Of Education Science And Technology ) , 7* (2), 98-115. DOI: 1047714/uebt.985628

Orcan Kaçan, M., Dedeoğlu Aktuğ, N., Karaçelik, S. & Kimzan, İ. (2021). Okul öncesi sınıflarda öğrenme merkezlerinin incelenmesi. *Muğla Sıtkı Koçman Üniversitesi Eğitim Fakültesi Dergisi [MSKU Journal of Education], 8*(2), 436-451. DOI: 10.21666/muefd.761825

* Orhan, A. T. (2019). Okul öncesi öğretmenlerinin okullarındaki fen merkezine ve fen eğitimine yönelik bakış açıları. Gazi Eğitim Bilimleri Dergisi, *5*(1), 91-101. DOI: https://dx.doi.org/10.30855/gjes.2019.05.01.005

* Önal, T. K. (2020). *Sosyo-Ekonomik Açıdan Dezavantajlı Bölgelerde Öğretmenlik Yapan Okul Öncesi Öğretmenlerinin Fen Etkinlikleri Uygulamaları Sırasında Karşılaştıkları Sorunlar.* (Yüksek Lisans

Tezi). Retrieved From: Yüksek Öğretim Kurulu Tez Merkezi ( https://tez.yok.gov.tr/UlusalTezMerkezi/ ) (Tez No: 630096)

Özkubat, S. (2013). Okul Öncesi Kurumlarında Eğitim Ortamlarının Düzenlenmesi ve Donanım. *Adnan Menderes Üniversitesi Eğitim Fakültesi Eğitim Bilimleri Dergisi*, *4*(2), 58-66 http://dergi.adu.edu.tr/egitimbilimleri/.

* Tanık Önal, N. & Kızılay, E. (2021). Okul öncesi öğretmenlerinin perspektifinden erken çocukluk döneminde fen kavramları nasıl sunulmalıdır?. *Araştırma Ve Deneyim Dergisi (Adeder) Research And Experıence Journa*l *6* (2), 158-168

*Sadıkoğlu, M. & Durmuş, C.B. (2022). Okul öncesi eğitimde öğretmenlerin fen ve doğa etkinliklerini uygulama düzeylerinin belirlenmesi (Tokat ili örneği). *Türkiye Bilimsel Araştırmalar Dergisi (Turkısh Scıentıfich Researchies Journal*) *(7*)1, 161-188.

*Sağlam, M. & Aral, N. (2015). Okul öncesi öğretmenlerin fen etkinlikleri hakkındaki görüşlerinin belirlenmesi. *İnönü Üniversitesi Eğitim Fakültesi Dergisi*, *16* (3),87-102. DOI: 10.17679/iuefd.16308213

Sandelowski, M. & Barroso, J. (2006). Handbook For Synthesizing Qualitative Research, New York: Springer Publishing

Seymen Çeken, G.B. (2022). Okul öncesi öğretmenlerinin erken çocukluk döneminde fen etkinliklerinin uygulanabilirliğine dair görüşleri.( Yüksek Lisans Tezi). Retrieved From: Yüksek Öğretim Kurulu Tez Merkezi ( https://tez.yok.gov.tr/UlusalTezMerkezi/ ) (Tez No: 729511)

Sibeoni J, Orri M, Valentin M, Podlipski M-A, Colin S, Pradere J, et al. (2017). Metasynthesis Of The Views About Treatment Of Anorexia Nervosa İn Adolescents: Perspectives Of Adolescents, Parents, And Professionals. PLoS ONE, 12(1): 1-21.

Simsar, A., Doğan, Y. & Yalçın, V. (2017). Okul öncesi sınıflarındaki fen merkezleri ve kullanım durumlarının incelenmesi- Kilis Örneği. *Sosyal Bilimler Dergisi,* 7(14) ,147-164

*Simsar, A. & Doğan, Y. (2019). Okul öncesi öğretmenlerinin fen eğitimi süreçleri üzerine görüşlerinin incelenmesi. *E-Kafkas Eğitim Araştırmaları Dergisi*, *6*(2), 19-32. DOI: 10.30900/kafkasegt.590361

Spektor Levy, O., Kesner Baruch, Y. & Mevarech, Z. (2013). Science and scientific curiosity in pre-school—the teacher's point of view. *International Journal of Science Education, 35*(13), 2226-2253. DOI:10.1080/09500693.2011.631608

Şahin, H. (2016). Okul öncesi fen eğitiminde analoji yöntemi ve analojinin okul öncesı eğıtım programlarında yer alma düzeyi. *Uluslararası Türk Eğitim Bilimleri Dergisi*, *4* (6) S:48-62

Şeker, P.T.,& Çavuş, S.Z. (2017). Okul öncesi öğretmen adaylarının fen eğitimine yönelik özyeterlik algıları. *Anadolu Eğitim Liderliği ve Öğretim Dergisi*. , *5* (2), 19-28

Tekerci, H. (2022). Okul öncesi dönemde bilim eğitiminin diğer yöntemler ile bütünleştirilmesi. *International Social Sciences Studies Journal, 8*(103), 3364-3376 Doi: http://dx.doi.org/10.2922 8/sssj.64864

Tong, A., Flemming, K., McInnes, E., Oliver, S. & Craig, J. (2012). Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ. BMC Medical Research Methodology, *12* (1), 1- 8. https://doi.org/10.1186/1471-2288-12-18

*Türk, C. (2018). Preschool teachers in the context of teaching astronomy. *Kuramsal Eğitimbilim Dergisi [Journal of Theoretical Educational Science]*, *11*(3), 544-561. DOI NUMBER: http://dx.doi.org/10.30831/akukeg.380398

*Uğraş, M. (2017). Okul öncesi öğretmenlerinin stem uygulamalarına yönelik görüşleri. *The Journal of New Trends in The Educational Science (Eğitimde Yeni Yaklaşımlar Dergis*i.*1* (1), 38-54.

*Uysal, H., Tepetaş Cengiz, Ş., Güçhan Özgül, S., Akar Gençer, A. & Akman, B.(2016). Okul öncesi öğretmenlerinin bilim defterlerine ilişkin görüşlerinin incelenmesi. *10* ( 1), 85-106.

*Ültay, E. & Ültay, N.(2022). Pre-school teachers' experiences in astronomy education. Inonu University Journal of the Faculty of Education, *23*(2), 892-909. DOI: 10.17679/inuefd.1085678

Ültay, N., Ültay, E. & Çilingir, K.S. (2018). Okul öncesi öğretmenlerinin fen konularındaki uygulamalarının incelenmesi. *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi* , 22 (Özel Sayı), 773-792.

Yılmaz, M.M., Özen-Uyar, R. & Dikici-Sığırtmaç, A. (2020). Okul öncesi fen eğitimi alanında yapılan çalışmaların tematik içerik analizi: 2015-2019 yılları arası. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi*, *40*(2), 553-589.

# GENİŞLETİLMİŞ TÜRKÇE ÖZET

# TÜRKİYE' DE OKUL ÖNCESİ ÖĞRETMENLERİNİN FEN EĞİTİMİ UYGULAMALARINDA KARŞILAŞTIKLARI SORUNLAR: BİR META-SENTEZ ÇALIŞMASI (2014-2022)

**Giriş, Araştırma Problemi ve Amaç**

Erken çocukluk döneminde bilim eğitiminin temeli olan fen etkinliklerinin uygulanması aşamasında öğretmenlerin önemi göz önüne alındığında öğretmenlerin fen eğitimi uygulamaları sırasında öğretmenlerin karşılaştıkları sorunların önemli olduğu ifade edilebilir. Yapılan çalışmalar incelendiğinde öğretmenlerin okul öncesi dönemde fen eğitimi konusunda farklı problem yaşadıkları ortaya koyulmuştur ( Aslan, Şenel Zor & Tamvakas Cicim, 2015; Gezgin & Kılıç 2015; Sağlam & Aral, 2015; Akyol, 2016; Akman, Gangal & Ateş, 2017; Ültay, Ültay & Çilingir, 2018;Orhan, 2019; Simsar & Doğan, 2019 ). Bu çalışmanın amacı okul öncesi dönemde fen eğitimi uygulamalarına yönelik karşılaştıkları sorunları derinlemesine inceleyerek çözüm önerileri sunan 2014-2022 yıllarını kapsayan bir meta-sentez çalışma bulunmadığı için okul öncesi öğretmenlerinin fen eğitimi konusundaki yaşadıkları sorunları içeren araştırmaların nitel bulgularını sentezleyerek bu alanda ve bu konuya yönelik çözüm önerileri üretmektir. Araştırmanın problem cümlesi "Okul öncesi öğretmenlerinin fen eğitimi uygulamalarında karşılaştıkları sorunlar ve çözüm önerileri nelerdir?" şeklinde oluşturulmuştur.

**Litaratür Taraması:**

. Erken çocukluk döneminde bilim eğitiminin temeli olan fen etkinliklerinin uygulanması aşamasında öğretmenlerin önemi göz önüne alındığında öğretmenlerin fen eğitimi uygulamaları sırasında öğretmenlerin karşılaştıkları sorunların önemli olduğu ifade edilebilir. Yapılan çalışmalar incelendiğinde öğretmenlerin okul öncesi dönemde fen eğitimi konusunda farklı problem yaşadıkları ortaya koyulmuştur ( Aslan, Şenel Zor & Tamvakas Cicim, 2015; Gezgin & Kılıç 2015; Sağlam & Aral, 2015; Akyol, 2016; Akman, Gangal & Ateş, 2017; Ültay, Ültay & Çilingir, 2018;Orhan, 2019; Simsar & Doğan, 2019 ). Alan yazın incelendiğinde Coşkun ve Arık (2022) yaptığı çalışmada okul öncesi fen eğitimi alanındaki lisansüstü tez çalışmalarının sistematik litaratür incelemesini yapmıştır. Yılmaz, Özen-Uyar ve Dikici-Sığırtmaç (2020) okul öncesi eğitimde 2015-2019 yılları arasında yapılan fen eğitimi alanındaki çalışmaların tematik içerik analizi yapmışlardır. Güneş (2018) 2013-2018 yılları arasında Türkiye'de fen ve doğa eğitimi kapsamında okul öncesi dönemi içeren 40 çalışmayı incelemiştir. Fakat çalışmalar incelendiğinde öğretmenlerin yaşadıkları problemleri tek başlık altında derinlemesine inceleyen 2014-2022 yıllarını kapsayan bir çalışmaya rastlanmamıştır. Bu nedenle, okul öncesi öğretmenlerinin fen etkinliklerini uygulamaları sırasında öğretmenlerin karşılaştıkları sorunları ve çözüm önerilerini derinlemesine incelemenin önemli olduğu ifade edilebilir.

**Yöntem**

Bu çalışmada meta-sentez yöntemi kullanılarak okul öncesi öğretmenlerinin fen eğitimi uygulamalarında karşılaştıkları sorunları inceleyen çalışmalar yorumlanmıştır. Yapılan meta sentez çalışmalarında nitel araştırmaların toplanarak analizine ve bu araştırmaların bulgularını sentezlemek için nitel yöntemlerin kullanılmasına yönelik sistematik bir yaklaşım gerektirir (Sandelowski & Barroso, 2006). Bu nedenle yapılan araştırmada Nitel Araştırma Sentezinin Raporlanmasında Şeffaflığın Arttırılması Protokolü (ENTREQ) kullanılmıştır (Tong and al, 2012). Erwin, Bortherson ve Summers (2011) tarafından nitel meta-sentez araştırma sürecini altı basamak şeklinde özetlenmiştir. Bu araştırmada amaç, Türkiye'de okul öncesi öğretmenlerinin fen eğitimi konusunda yaşadıkları sorunları tanımlamak ve özetleyerek toplu bir inceleme yapmaktır. İlgili nitel araştırmaların raporlarını ulaşmak için '' *Google Akademik*'', ''*Ulusal Tez Merkezi*'', ''*TR Dizin''*, ''*Ulakbim*'' veri tabanlarında araştırma gerçekleştirilmiştir. Ayrıca bu araştırma için '' okul öncesi+ fen ', 'okul öncesi eğitim+ fen etkinlikleri' anahtar kelimeleri kullanılarak araştırma yapılmıştır. Araştırmanın çalışma grubunu için veritabanı aramasında 236 çalışmaya ulaşılmıştır. Yinelemeler kaldırıldıktan sonra (n:47) 189 çalışma belirlenmiştir. 189 çalışma içerisinden hariç tutma kriteleri kapsamında karma ve nicel yöntemle çalışılan 104 çalışma ve 4 yabancı çalışma olmak üzere toplam 108 çalışma araştırma sürecinden çıkarılmıştır. Bunun sonucunda 81 çalışma taranmıştır. Veritabanı aramasında 236 çalışmaya ulaşılmıştır. Yinelemeler kaldırıldıktan sonra (n=47) 189 çalışma belirlenmiştir. 189 çalışma içerisinden, hariç tutma kriteleri kapsamında karma ve nicel yöntemle çalışılan 104 çalışma ve 4 yabancı çalışma olmak üzere toplam 108 çalışma araştırma sürecinden çıkarılmıştır. Bunun sonucunda 81 çalışma taranmıştır. 81 araştırma içerisinden dahil edilme kriterleri kapsamında bulunmayan 15 öğretmenden az ve çalışma grubunda öğretmen adayı, çocuk,aile, yönetici vb. katılımcı bulunan 40 araştırma, birinci derece yapıların olmadığı 25 çalışma**,** toplamda 65 çalışma, araştırma kapsamında çıkarılmış ve 14 makale ve 2 tane yüksek lisans tezi meta sentez çalışmasına dahil edilmiştir.

Meta sentez çalışmalarına dâhil edilen makalelerin kalite puanlarının değerlendirilmesi, meta sentez çalışmasında kullanılan verilerin bütünlüğünün sağlanması açısından önemli bir aşamadır. Makale ve tezlerin kalitesini değerlendirmek için Kritik Değerlendirme Becerileri Protokolü (CAPS) uygulanmıştır. CAPS, araştırma amacının uygunluğu ve nitel araştırma yöntemini içeren iki soru ve araştırma tasarıma yönelik sekiz soru olmak üzere toplam on sorudan oluşmaktadır (Sibeoni vd, 2017).

Meta sentez çalışmasına dahil edilen çalışmaların tabloda verilen CAPS kapsamında hazırlanmış on soruya göre kriterleri karşılama düzeyleri "1: Yeterli", "0.5: Bir Ölçüye Kadar Yeterli" ve "0: Yetersiz" olarak puanlandırılmıştır. Çalışmaların kalitesi ise iki uzman tarafından değerlendirildikten sonra uzmanlar arasındaki kodlama güvenirliliği için Miles ve Huberman'ın formülü (Güvenirlik = görüş birliği / (görüş birliği + görüş ayrılığı)*100) kullanılmıştır. Kodlayıcılar arası görüş birliğinin en az %80 olması sonucunda araştırmanın güvenilir olduğunu ifade edilebilir (Miles & Huberman, 2016). Uzmanlar arası görüş birliği iki uzman tarafından hesaplanarak .87 olarak bulunduğundan, kodlayıcılar arası görüş birliğinin güvenilir olduğu sonucu elde edilmiştir.

**Sonuçlar**

Bu araştırmada Türkiye'de okul öncesi öğretmenlerinin fen eğitimi konusunda yaşadıkları sorunlarını belirlemeye yönelik yapılan araştırma bulgularının sentezlenmesi sonucunda, okul öncesi dönemde fen eğitimi konusunda öğretmenlerin yaşadıkları sorunlar ortaya konmuştur. Bu sorunlar; "Materyal Eksikliği Sorunu", "Fen Merkezi Oluşturma Sorunu", "Planlamaya Yönelik Yaşanan Sorunlar", "Uygulama Yönelik Yaşanan Sorunlar" ve "Fiziki Şartlar Sorunu" olmak üzere beş temadan oluşmaktadır.

Birinci temada, okul öncesi öğretmenlerinin fen eğitimine yönelik materyal eksiklerinin olduğu ve bu nedenden ötürü etkinlik planlamakta zorluk yaşadıkları sonucuna ulaşılmıştır. Materyal eksikliğine yönelik önerileri içeren ikinci derece yapılarda ise öğretmenlerim materyal eksikleri belirlenerek, öğretmenlere materyal geliştirme, onarma, üretme gibi konularda eğitimsel destekler sağlanmasına yönelik önerilerde bulunulmuştur.

İkinci temada okul öncesi öğretmenlerinin fen eğitiminde yaşadıkları sorunlardan bir diğerinin sınıflarında fen merkezi oluşturmak olduğu yapılan çalışma sonucunda ortaya konmuştur. Öğretmenlerin fen merkezi oluşturmadaki temel problemlerinden birinin materyal eksikliği olduğu, fen merkezleri oluşturulsa bile materyallerinin eksik olduğu ortaya konmuştur. Ayrıca fen merkezi oluşturma konusunda yaşanan sorunlara yönelik çözüm önerilerinde ise ikinci derece yapılarda fen merkezinin oluşturulmasının ve canlı tutulmasının fen uygulamalarının etkin bir şekilde uygulanması için önemli olduğu belirtilmiştir. Öğretmenlere yaratıcı malzemeleri oluşturma, üretme ve materyalleri onarma konularında eğitimsel destekler sağlayacak eğitimler düzenlenmesi önerilerde yer almıştır.

Üçüncü temada ise okul öncesi öğretmenlerinin karşılaştıkları sorunlardan bir diğeri, fen etkinliği planlama konusunda kendilerini yeterli hissetmemeleridir. Bu çalışmada öğretmenlerin hazır plan kullandıkları ve bilgi eksikliklerinden dolayı fen etkinliklerine yönelik bilgi eksikliklerinden dolayı planlarında yer vermek istemedikleri ortaya konmuştur. Öğretmenler, fen eğitimine yönelik bilgi eksiklikleri olduğu ya da kendilerini yeterli hissetmedikleri için fen eğitimine yönelik plan hazırlamakta sorun yaşıyor olabilecekleri sonucuna ulaşılmıştır.

Dördüncü temada ise okul öncesi öğretmenlerinin fen eğitiminde uygulama sürecinde yaşadıkları sorunlardır. Öğretmenlerin fen kavramlarını anlatmakta zorlandıkları, stem programının uygulanışı ile ilgili bilgi sahibi olmadıkları, çocukların sorularını cevaplama sürecinde sorun yaşadıkları görülmektedir. Bu sorulara yönelik incelenen ikinci derece yapılarda ise uygulamalı hizmet içi eğitimler düzenlenmesi ile öğretmenlerin ölçmede en çok kullandıkları soru-cevap yöntemi dışında farklı alternatif ölçme yöntemlerinin kullanılması yer almaktadır.

Öğretmenlerin yaşadıkları sorunlardan bir diğeri ise fiziki şartlar sorunudur. Fiziki şartlar sorununda öğretmenlerin okul bahçelerini yeterli bulmadıkları, uygulama alanlarının kısıtlı olduğu sonucuna ulaşılmıştır. Bu soruna yönelik ikinci derece yapılarda ise anasınıflarına ait fen ve doğa etkinliklerini için uygulama alanlarının oluşturulması şeklinde öneriler belirtilmiştir.

**Öneriler**

Uygulamaya yönelik öneriler;

1. Okul öncesi öğretmenlerine fen eğitimi konusuna yönelik materyal geliştirme konusunda öğretmenlere hizmet içi eğitimler düzenlenebilir.
2. Öğretmenlere, fen merkezi oluşturma konusunda yaşadıkları sorunlara yönelik öğretmenlerin fen merkezini belirli aralıklarla yenilemesi ve fen merkezinin günlük eğitim planlarını destekleyecek şekilde düzenlemesini sağlayacak materyal desteği sağlanabilir.
3. Okulun fiziki yapısı okul öncesinde fen eğitimi uygulamalarına yönelik düzenlenebilir.
4. Öğretmenlerin uygulama ve değerlendirmede yaşadıkları sorunlarda öğrencilerin üst düzey düşünme becerilerini geliştirecek etkinlikler hazırlayabilmeleri için fen eğitimine yönelik yöntem ve teknikleri kapsayan uygulamalı hizmet içi eğitimler düzenlenebilir.

Araştırma Yapacaklara Öneriler;

1. Okul öncesi fen eğitimi konusunda yaşanan sorunlar farklı yıllar temel alınarak incelenebilir.
2. Okul öncesi fen eğitiminde öğretmenlerin yaşadıkları sorunlara yönelik farklı veri tabanlarındaki çalışmalar incelenebilir.
3. Türkiye'de okul öncesi dönemde fen eğitimi konusunda yaşanan sorunlar ile farklı bir ülkede yaşanan okul öncesi dönemdeki fen eğitimi konusunda sorunlar incelenerek karşılaştırılabilir