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Preschool Teachers' Views on Science Education, the Methods They Use, Science Activities, and the Problems They Face

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Abstract

The aim of this study is to reveal preschool teachers' views on science education, science activities they carry out, methods and techniques they use as well as problems they encounter while performing science activities. This study was carried out according to the case study which frequently used in qualitative research methodology. The study group was identified using the convenience sampling method. The study group constitutes 32 preschool teachers working in preschools in Kilis province. A written interview form prepared by field experts was used to collect data. Content analysis procedure was used to analyse the data.

According to the results obtained in the study, it has been determined that the vast majority of preschool teachers consider themselves competent in teaching science, and state that the science education environment should be equipped and rich in teaching materials, and that science concepts can be better taught to children through hands-on activities as well as supporting them with visual materials. Additionally, it has been determined that teachers try to develop scientific process skills in children through science activities. It has also been identified that teachers use common science materials while performing science activities that they mostly use spontaneous/nature-related activities, prefer group activities, and carry out science activities at least once a week. It has further been determined that teachers especially use such methods as experiment, observation, demonstration more than other methods when performing science activities. Besides, it has been specified that the experiment method is children's most favourite method, which is also easy to apply. The main problem faced by the teachers during science activities was determined to be the lack of teaching materials, crowded classrooms, physical inadequacy of classrooms and uninterested parents. It has also been found that the problems encountered are mostly depend on schools, classrooms, parents and lack of materials.

Keywords: Science education, preschool teachers, science activities, methods and techniques, problems

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Introduction

Preschool education is a type of education in which the developmental characteristics, individual differences and abilities of children are taken into consideration in order to enable them to develop physically, emotionally, socially, intellectually and language-wise in a healthy way, and in which positive personality traits are initiated and creative aspects are revealed so that children can develop self-confidence, as well as a systematic education in which parents and trainers are efficient (Ministry of National Education (MoNE), 2013). Preschool education, which is becoming more and more important nowadays, is very helpful for children in understanding and conceptualizing life (Sansar, 2010). Receiving an effective and accurate preschool education in early childhood, where the child is progressing rapidly, ensures that the child is a successful individual in the future.

According to the results of many researches in the literature (Broinowski, 2002; Can-Yaşar & Aral, 2010; Dağlı, 2007; Dursun, 2009; Erkan & Kırca, 2010; Kök, Tuğluk & Bay, 2005; Pagani, Rubenson & Runco, 2003; Pehlivan, 2006; Polat-Unutkan, 2007; Taner & Başal, 2005; Yazıcı, 2002; Yıldız, Özkal & Çetingöz, 2003) children with preschool education are in a more advanced stage in many different areas (language development, creative thinking skills, mathematics and Turkish language skills, maturity at school, motor and social skills, etc.) than those who do not have preschool education. Thus, developed countries place great importance on early childhood education and preschool education programs. In Turkey, the latest preschool education program prepared by the Ministry of National Education in 2013, is being implemented in preschool institutions. This program is based on children-oriented, flexible, spiral, eclectic, balanced, game-based features and includes other features such as exploratory learning, creativity development, daily life experiences and use of nearby facilities for educational purposes, and establishing learning centres. In this context, the teachers are required to prepare and effectively implement the activity plans in line with the achievements and demonstrations determined within the framework of the basic characteristics (MoNE, 2013).

The preschool period is the period in which the bases of knowledge and skills to be used by children all through their life will be established, in which they observe facts and events, seek for answers to questions, and get to understand the primary science-related concepts. Therefore, it is necessary to start science education in preschool period. For this reason, it is of great importance that science education is planned and taught in accordance with the development of the children. Teachers working in the preschool period, therefore, play an important role in science-related academic life of children in the future. From this point of view, teachers should know the importance of science education and support the development of children in this direction by preparing appropriate programs (Lind, 1996, Özbek, 2009). In the preschool period, teachers have significant responsibilities to develop a positive tendency and positive attitudes towards science (Davies & Howe, 2003).

The science activities to be carried out in line with the acquisitions in the preschool program are of great importance in terms of the development of the preschool age children. The science activities performed during this period include activities that support the skills of children to pay attention, ask questions, observe, research and analyse, explore, and make deductions (MoNE, 2013). The effective implementation of science activities in preschools will be very beneficial in terms of contributing to the future life of children. The scientific skills required for a child's life as well as the concepts and skills that form the basis of science education begin to develop in the preschool period (Kallery & Psillos, 2002). In this period, trying to perceive the environment through curiosity and inquiry skills of children makes an important contribution to their achievement in science education. The development of science concepts in children begins with an effort to understand their nature and environment, and then this process is followed by the acquisition of basic process skills with the help of teachers and their environment (Elkind, 1989). The fact that children participate effectively in science activities in pre-school period and they are willing to learn science-related concepts positively affects the development process of science concepts.

During the practices of the preschool science activities that constitute the basis of science education, convenient settings should be created that can provide opportunities for children to investigate, to make predictions and talk about any subject, to be able to satisfy their curiosity, and to create cause-effect relationships between events (Uğraş, Uğraş & Çil, 2013). Effective teaching of science concepts is achieved when the teacher correctly plans and applies the science and nature-related activities in the program during the activities (Özbek, 2009).

The aim of the science-related activities in the preschool period is not to explain the science-related concepts to the children based on memorizing but to help them learn such concepts by hands-on activities. Contrary to learning by hands-on activities the transfer of knowledge based on memorization does not contribute to the cognitive development of children and will only cause the knowledge in the mind to increase. It is important for children to ensure that they acquire scientific thinking by helping the development of basic process skills such as research, analysis and observation in this period (Aktaş-Arnas, 2003; Özbek, 2009; Toğrul, 2012).

Learning will be facilitated if appropriate methods, strategies and techniques are used in the teaching of concepts that are abstract or difficult to understand in science teaching. A variety of methods and techniques should be utilized in applying science and nature-related activities (Yağlıkara, 2006). The preschool program enacted by the MoNE in 2013 includes activities that can be conducted in science and nature education. These include nature-walking, observing the nature and living and non-living beings in nature, informing about the necessity of considering them as valuable and protecting them, making discovery and inventions, preparing food in kitchens, making collections, preparing air graphics, reviewing various books and magazines, taking photographs, observing photographs, watching documentaries, recognizing and using simple science tools, examining natural and unnatural materials, inviting experts in the field of science as guests to the classroom, and concept training studies (MoNE, 2013).

In the preschool period, teachers play an important role in the development of scientific thinking in children and the development of positive attitudes of children towards science courses in primary school years. Teachers' behaviours and the methods used in the science activities lead the children to research, to examine, and to question, which is the basis of scientific thinking. In the preschool period, science activities are those in which both children and teachers can learn at the same time and gain new experiences (Alisinanoğlu, Özbey & Kahveci, 2011). In the preschool period, children should be introduced to science and environment related skills, materials and science education for the sake of their development. Rich learning experiences consisting of activities and materials that are appropriate to the developmental characteristics of children and support their development are of great importance in science education. In this context, taking into account the assumption that their knowledge of science is sufficient, preschool teachers should not only try to develop children with all their developmental aspects and give science education to children, but also to prepare a rich environment to educate children who are interested in science and nature activities and performing relevant activities.

Preschool children construct science and nature knowledge through science education and use the information they learn in different areas of life. To this end, preschool teachers' educational practices should be in such a way as to support children's development and to discover their own knowledge and skills. In preschool period, teachers should present experiences that will enable children to form their knowledge and skills in daily activities. Therefore, the content and nature of the science activities that teachers apply are of great importance. In this respect, the contents and scientific process skills in the science activities in the preschool period, the materials and types of materials in the classrooms, the qualifications of the teachers, their attitudes towards science education and the teachers' viewpoints on the science education significantly affect the quality of science education (Dağlı, 2014).

Activities in science and nature centres in preschool education are the most important of all the activities as they increase children's knowledge of science and nature and provide them with opportunities to gain important experiences. Children make many discoveries by playing games with the materials in this centre. Therefore, an educational environment should be constituted in such a way that will awaken and satisfy the curiosity of preschool children for whom focusing the attention is quite hard to achieve (Karaer & Kösterelioğlu, 2005). The task of the teacher does not end with creating an appropriate and well-equipped educational environment. While a teacher is telling children about topics during science and nature activities, she should ask them such thought-provoking questions to guide and steer them so that they can focus on the topics, explore the events, and solve problems. Through these creative questions, children can actively participate in scientific thinking process (Kıldan & Pektaş, 2009). Since preschool science activities are carried out in a period in which scientific skills and basic science concepts necessary for a child's life have begun to develop and have been acquired in large scale, it is necessary to determine the problems faced by teachers in carrying out the science-related activities in this period and teaching the children about these activities for the purpose of increasing the quality of preschool science education in our country (Karamustafaoğlu & Kandaz, 2006).

In addition to preschool teachers' training in the process of their undergraduate education, many other factors such as the training they receive for science education, the institutions they are teaching at, environmental conditions, the current status of their classrooms, their qualifications in science education, their attitudes towards science education etc. play an important role in the planning and implementation of science education. Likewise, many other factors, such as the current state of preschool classrooms, teaching stuff and materials, and teachers' graduation from different fields can have positive or negative effects on science education. In preschool institutions, the science activities are not given importance and the teachers lack in knowledge and skills about the aims of preschool science education and methods and techniques used in science education (Avcı, 2005). Preschool teachers' competencies related to the subject matter and their attitudes towards the subject matter are as important as their competency in terms of content in this area. It has been observed that there is not much research on how much science and nature content is included in class activities, whether it should be given or not, and on the opinions of teachers on this subject. In this study, it was aimed to reveal the opinions of preschool teachers working in preschools about the problems of science education, science activities, methods and techniques used in preschool period.

Method

Research Design

This study is structured using the case study method in the qualitative research paradigm. Qualitative research includes detailed descriptions by studying the facts, events or behaviour in the natural environment in which they are realized in order to get a deep understanding of the research topic by directly reaching the data. A case study is the in-depth study of one or more events, environment, program, or interconnected systems. Case studies are used to describe and view details of an event, to develop explanations and to evaluate the event (Büyüköztürk, Kılıç-Çakmak, Akgün, Karadeniz, & Demirel, 2013, Yıldırım & Şimşek, 2013).

Participants

The research group of the study was selected according to the convenience sampling from among the purposeful sampling methods. This sampling method accelerates the investigation as in this method the researcher chooses a situation that is close and easy to access. This sampling method is often used when the researcher cannot use the other sampling methods (Yıldırım & Şimşek, 2013). Accordingly, this study group consists of 32 preschool teachers working in different schools in the city centre of the province of Kilis in the academic year of 2016-2017.

Table 1. Demographic Data of Teachers and Their Classes

		f	%
Place of Work	Kindergarten	14	43.75
	Preschool	18	56.25
Number of Students in Classrooms	11-20 children	24	75.00
	21 and over	8	25.00
Age Range of Children in Classrooms	36-48 months old	3	9.37
	48-66 months old	29	90.63
Teachers' Years of Teaching Experiences	0-5 years	13	40.61
	6-10 years	16	50.00
	11-15 years	1	3.13
	16-20 years	1	3.13
	21 years and over	1	3.13
Teachers' Field of Graduation	Preschool Education	24	75.00
	Other (Child Development etc.)	8	25.00
Teachers' Educational Levels	Associate Degree	2	6.25
	Undergraduate	30	93.75
High Schools where Teachers Graduated	Vocational High School	18	56.25
	Others	14	43.75

According to Table 1, 14 of the teachers work in kindergarten and 18 of them work in preschools. In the vast majority of the classrooms (24 classrooms) in which teachers work, the number of children in the classroom varies between 11 and 20, while the number of children in the classroom is over 21 in 8 classrooms. In 29 classrooms, children age 48-66 months and children in three of the classrooms are in the age group of 36-48 months. The half of teachers have 6-10 years (16 teachers) and 0-5 years (13 teachers) of professional teaching experience. Very few teachers have experience for 11 years and over. It can be said that the vast majority of teachers in the scope of the study have experience of working for 10 years or less and they are mainly composed of young teachers. Twenty-four of the teachers are graduates of preschool education, while eight are graduates of other departments (Child Development etc.). Thirty teachers have a bachelor's degree while two teachers have an associate degree. It appears that almost all of the participants are composed of teachers with undergraduate degrees. While 18 of the teachers graduated from vocational high schools, the remaining 14 graduated from other types of high schools. It appears that most of the participants graduated from vocational high schools.

Data Collection Tool

This study was conducted according to the qualitative research methodology in order to obtain in-depth knowledge about the problem situations of teachers working in preschool education institutions. In qualitative research, the process followed includes data collection methods such as observation, interview and document analysis, and the perceptions and events are presented in a natural setting in a realistic and holistic manner. Interviewing is a very powerful method used to reveal people's perspectives, experiences, feelings and perceptions (Yıldırım & Şimşek, 2013). The interview form used in this study consists of two parts. In the first part, some information on the demographics of teachers and the schools/classrooms they work in is given. In the second part, there are questions prepared to get teachers' opinions on science education, science activities, methods they use and problems they encounter. Before the interview form was prepared, necessary literature was searched, problem situation was determined and relevant questions were prepared. Later on, opinions of three specialist faculty members (from department of science education, preschool education and educational sciences) were taken for the content validity of the questionnaire. After the pilot study with the five preschool teachers outside the study, necessary corrections were made and a total of fifteen questions were included in the questionnaire. The final version of the questionnaire was distributed through interviewing the teachers in the study group and their opinions were taken in writing.

Data Analysis

Within the scope of the research, the answers given to the questions in the data collection tool were analysed in terms of qualitative paradigm and analysed using content analysis method. The content analysis was carried out with the aim of reaching the concepts and associations that could explain the collected data. Also, it is the technique of determining the themes that explain the data by way of the first conceptualization of the data and then the logical arrangement according to the emerging concepts. The basic process in content analysis is to bring together similar data within the framework of certain concepts and themes and to interpret them by arranging them in a way that readers can understand (Yıldırım & Şimşek, 2013).

The data obtained from the views of the teachers were coded separately by two researchers. Then the two researchers' codes were compared and the differences found were discussed and agreed. In order to estimate the reliability of the work in the next stage, two different experts, one of whom was from educational sciences and the other from science education, were given the researchers' code lists and asked to match the first list with the second list. Comparisons of the lists produced by the coders with the lists produced by the experts are used to estimate the reliability of the work after identifying the number of agreements and disagreements. To this end, the formula [Reliability = (Consensus) : (Consensus + Dissidence) x100], as specified by Miles and Hubermann (1994), was used. Experts consulted within the framework of the reliability study evaluated seven codes differently from the coding performed by the researchers and associated them with the themes. Accordingly, the reliability of the study was found as [Reliability = (89): (89 + 7) x100 => Reliability = 92%] in the reliability analysis. In qualitative studies, it is stated that once the correspondence between the evaluations of the researchers/coders and the experts approaches to or over 0.90, a satisfactory level of reliability will be achieved (Miles & Hubermann 1994; Saban, 2008).

Results

This section presents findings from preschool teachers' views on science education, science activities, methods and techniques they use, and the difficulties they encounter in science activities. The results obtained from the interviews were presented in tables and some sample teacher views of the theme were directly cited.

Results Obtained from Teachers' Views on Science Education

Teachers were asked questions to get their views on science education. In this regard, in order to get the opinions of the teachers on their level of qualification on science education, they were firstly asked the following questions: "Do you consider yourself competent on science education? Will you explain, please?", and the findings obtained from the answers were indicated in the following table. Sample teacher views on the codes obtained in relation to this topic are also included.

Table 2. Teachers' Qualification about Science Education

Theme	Code	F	%
Teachers' Qualification about Science Education	Qualified	16	50.00
	Partly qualified	10	31.25
	Unqualified	6	18.75

According to Table 2, 50% of the teachers consider themselves qualified about science education, 31.25% consider themselves as being partially qualified and 18.75% regard themselves as unqualified about science education. Some of the expressions that teachers give about not considering themselves as qualified about science education are as follows: The teacher with the code Ö4 says, "*Yes. I consider myself qualified because I do research according to the level of the children and I*

prepare practices accordingly", whereas the teacher with the code Ö1 states that she considers herself unqualified and says, "*I do not consider myself qualified because I did not receive enough training in my first year in my profession and at university*". Another teacher coded Ö13 considers herself moderately qualified and says, "*I can say that I consider myself moderately competent. I think that I can be better if the environment is better and the physical conditions are more appropriate."*

In order to determine the opinions of the teachers about the science education environment, the teachers were asked, "How should the environment of science education be like for you?", and the findings obtained from the answers were presented in the following table. Sample teacher views on the codes obtained in relation to this topic are included.

Table 3. Teachers' Opinions about Environment of Science Education

Theme	Code	F	%
Environment of Science Education	Equipped laboratory facilities and natural setting	17	53.13
	Rich in teaching materials	10	31.25
	Experiment and observation-based	3	9.37
	Modern, rational, instructive	2	6.25

According to Table 3, 53.13% of the teachers state that schools should be equipped with laboratory facilities and natural settings, 31.25% state that schools should be rich in teaching materials, 9.37% state that schools should be based on experiment and observation, 6.25% state that school settings should be designed in a modern, rational and informative manner. In the context of science education, teachers often say that the setting should be natural, convenient for learning by hands-on activities, attention-taking, enabling the active participation of children, enriched with visual materials as well as having an open space. Some exemplary statements in this regard are as follows: The teacher with the code Ö23 states that "*There should be a laboratory environment and it should be a natural setting instead of being dependent to a classroom*" for the science education environment. Another teacher coded Ö4 states, "*The laboratory environment should be equipped with materials suitable for the child's age and experiences*." Similarly, the teacher coded Ö25 says, "*The science education environment should be based on experimentation and observation, and it is necessary for children to be involved in the environment.*" Also, the teacher coded Ö3 says, "*Science education environment must be modern, rational and informative*".

In order to reveal the opinions of teachers on how science-related concepts in science education can be taught to children better, the question of "How can science-related concepts be better taught to children?" was asked and the findings obtained from the answers were presented in the following table. Sample teacher views on the codes obtained in relation to this topic are included.

Table 4. How Science Concepts Taught to Children

Theme	Code	f	%
Teaching Science Concepts	By hands-on activities	18	56.25
	Through visual materials	8	25.00
	Through simple activities	5	15.63
	Through books and science materials	1	3.13

According to Table 4, teachers express their opinions about how science concepts can be better taught to children. 56.25% of the teachers state that science concepts can be better taught through hands-on activities, 25% of them state the necessity of visual materials. Similarly, 15.63% of them state the necessity of simple activities and 3.13% of them state the necessity of books and science materials so that children they can be taught well. Some examples of teachers' opinions about this theme are as follows: The teacher coded Ö4 says, "*I use science activities. Air pollution, evaporation, weight experiments can be better taught through concretizing them via first-hand*

experiences gained by hands-on." Likewise, teacher coded Ö27 states, "*Science concepts can be better taught to children with visual materials. Video slides are useful*." Another teacher coded Ö17 says, "*The science lessons are taught better by making simple experiments with activities according to the age of the children*." Similarly, the teacher coded Ö30 says, "*Well-prepared teaching cards and books should be published in order to teach children science concepts better*".

In order to determine the opinions of the teachers about which scientific process skills children acquire during science education, the following question, "Which scientific process skills do you bring in to children with the science activities that you apply?" was asked and the findings obtained from the answers were presented in a table.

Table 5. Scientific Process Skills in Science Education

Theme	Code	f	%
Acquired Scientific Process Skills	Observation	32	100.00
	Experiment	30	93.75
	Classification	29	90.63
	Prediction	28	87.50
	Interpretation	28	87.50
	İnferring	28	87.50
	Using data and constituting a model	22	68.75
	Setting a number-space relationship	20	62.50
	Measuring	19	59.38
	Determining variables	18	56.25
	Changing and checking variables	16	50.00
	Hypothesizing and testing	16	50.00
	Recording data	10	31.25

According to Table 5, all of the preschool teachers (100.00%) state that they have brought in observation skills to children with the science activities they conduct. Also, a majority of teachers state that, through science activities, they have achieved to make children acquire scientific process skills such as experiment (93.75%), classification (90.63%), prediction (87.50%), interpretation (87.50%), and inferring (87.50%). Recording data (31.25%) seems to be the lowest gained skill from among the scientific process skills that teachers have expressed as an acquisition through the science activities that they have implemented.

Results Obtained from Teachers' Views on Science Activities

Teachers were asked questions to learn about their opinions on science activities carried out in their classrooms. To this end, teachers were first asked "What materials/objects do you use in science activities?" so as to get their opinions about what materials teachers use in science activities, and the findings were presented in the following table. Sample teacher views on the codes obtained in relation to this topic are included.

Table 6. Materials Used by Teachers in Science Activities

Theme	Code	f	%
Materials/Objects Used in Science Activities	Common science materials	32	100.00
	Animals and plants	7	21.88
	Natural materials	8	25.00

According to Table 6, all of the teachers use common science materials (magnifiers, magnets, models, scales, spheres, waste materials, etc.). And also 21.88% use animals and plants, and 25.00% use natural materials (water, salt, sand, soil, stone, flour, sugar, spices, etc.) while performing science

activities as well as. Some examples of teachers' views on this theme are as follows: Teacher coded Ö2 said -while performing science activities- "*I use common and easy-to-find materials such as magnets, magnifiers, animal models, three-dimensional prisms, a sphere etc.*" Another teacher coded Ö7 stated that she mostly used animals and plants and said, "*I mostly use organ vests, water turtles, budgies, and plants. I also use other teaching materials such as a solar system model, tooth model, animal models, scales and so on*." The teacher coded Ö21 stated that she used more natural materials with the expression "*I prefer natural materials (such as water, sand, soil, soap, stone)- materials that can be found quickly*".

To get teachers' views on spontaneous/natural science activities, the question of "Do you use spontaneous/natural activities in science activities?" was asked and the findings were presented in a table. Sample teacher views on the codes obtained in relation to theme in this subject are included.

Table 7. Doing Spontaneous/Natural Activities in Science

Theme	Code	f	%
Spontaneous/Natural Activities	I do	28	87.50
	I sometimes do	3	9.37
	I rarely do	1	3.13

The majority of the teachers (87.50%) state that they do spontaneous and natural activities in science. Only one teacher states that she has rarely do yet while three teachers state that they sometimes give time spontaneous and natural activities (Table 7). Some examples of teacher views are: The teacher coded Ö4 said, "*Yes, I include spontaneous activities to my lesson plan. For example, I can change my activity instantly when it is raining*.", which signifies that she uses spontaneous/natural activities when a natural phenomenon is taking place. The teacher coded Ö16 said, "*I sometimes use a nature-related activity when an important phenomenon coincides*", which signifies that she sometimes uses such activities. Similarly, the teacher coded Ö1 stated that she has rarely done such activities by saying, "*I have rarely had the opportunity to include spontaneous events.*"

To get their opinions about their preference for individual or group activities when doing science activities, the following question of "Do you prefer an individual or a group work in science activities?" was asked, and the findings were given in the following table. Sample teacher views on the codes obtained in relation to theme in this subject are included.

Table 8. Preferences of Individual or Group Work in Science Activities

Theme	Code	f	%
Preferred Type of Activity	Group activities	20	62.50
	Individual and group activities	8	25.00
	Individual activities	4	12.50

The majority (62.50%) of the teachers state that they prefer group work while doing science activities, while 25% say that they include both group and individual work, and 12.50% state that they only include individual work (Table 8). Some examples of teachers' opinions on this theme are as follows: The teacher coded Ö15 said, "*I usually include group work because children enjoy working together*", which signifies that she prefers group work in science activities. Another teacher coded Ö26 said, "*I sometimes give individual and sometimes group work according to the activity type*", and the teacher coded Ö12 expressed that she prefers individual work by saying, "*I include individual work because it is more instructive*".

To get opinions about how often do science activities and how much time teachers spend on science activities, teachers were asked, "How often do you do science activities? How much time do

you spend?", and the findings were given in two tables. Sample teacher views on the codes obtained in relation to the themes in this subject are included.

Table 9. Frequency of Science Activities and Spending Time on Science Activities

Theme	Code	f	%
Frequency of Science Activities	Once a week	21	65.63
	Once every two weeks	8	25.00
	Once in more than two weeks	3	9.37
Spending Time on Science Activities	0-30 minutes	16	50.00
	31-60 minutes	2	6.25
	1 hour	9	28.12
	2 hours	1	3.13
	2 hours and more	4	12.5

According to Table 9, 65,63% of the teachers carry out science activities once a week, 25% every two weeks and 9,37% more than every two weeks. Some examples of the teachers' opinions on this theme are as follows: The teacher coded Ö9 says, "*I try to do science-related activities at least once a week because I think that the sooner and more the children meet with the concepts related to science, the more I can contribute to the future probability of their being a good scientist.*" The teacher coded Ö27 also states, "*It depends on the acquisitions, but every two weeks I do experiments according to the possibilities available.*" Another teacher coded Ö11 says, "*Actually, there is not much opportunity in our school. We are trying to do it once or twice a month, according to the possibilities available*", which represents that she carries out very few science activities. Table 9 shows that half of the teachers (50%) spend time on science activities between 0-30 minutes and 28.12% can devote to one hour. Moreover, 12,5% of the teachers state that they spend more than two hours on science activities. The teacher coded Ö11 mentions the time she spent on science activity with the response of "*The science activity carried out with children usually takes about 30 minutes*". The teacher coded Ö7 says, "*The duration of science activities vary according to the activity, but I can say that it lasts for an hour*."

To get teachers' views on the efficiency of science activities, the question of "What should the number of children in the classroom be in order for the science activities to be efficient?" was asked, and the findings were given in the following table. Sample teacher views on the codes obtained in relation to the theme in this subject are included.

Table 10. The Optimum Number of Students in a Classroom for Efficient Science Activities

Theme	Code	f	%
The Optimum Number of Students	0-10 children	7	21.88
	10-15 children	20	62.50
	15 children and over	5	15.62

According to Table 10, the majority of the teachers (62.50%) state that the number of children in the class should be between 10-15, 21.88% of them state it should be between 0-10, and 15.62% state that the number of children should be 15 and over. Some examples of the teachers' views on this theme are as follows: The teacher coded Ö23 says, "*I think if there are 8-10 students in the school, we can do more science activities. In fact, in order to be able to perform effective science activities, the lab is a must, and sometimes it has to be taken to natural settings.*" The teacher coded Ö17 says, "*The classroom size must be 15. There are difficulties in learning when there are few or many students*.". Similarly, the teacher coded Ö3 says, "*The classroom size is important, but average 18 students can be an optimum number*."

Results Obtained from Teachers' Views about Methods and Techniques Used in Science Activities

Teachers were asked about their views about the methods and techniques they used in the process of science activities. In this regard, firstly, the question of "Which method or techniques do you use in the process of science activities" was asked to investigate the methods and techniques teachers used to perform science activities and the findings obtained from the answers were given in the following table. Sample teacher views on the codes obtained in relation to the theme in this subject are included.

Table 11. Using Methods and Techniques while Performing Science Activities

Theme	Code	f	%
Methods and Techniques Used in Science Activities	Experiment	23	71.88
	Observation	20	62.50
	Demonstration	12	37.50
	Brainstorming	7	21.88
	Narration	5	15.62
	Concept maps	5	15.62
	Questioning	4	12.50
	Drama	4	12.50
	Trips	4	12.50
	Simulation	3	9.37
	Case study	2	6.25
	Trial and error	2	6.25
	Discussion	1	3.12

According to Table 11, experiment (23 teachers), observation (20 teachers) and demonstrations (12 teachers) are the most common among methods and techniques used by the teachers while performing science activities. Some teachers' views on the theme of methodology-techniques used in the process of science activities are as follows: The teacher coded Ö7 mentions the method-techniques she uses with the expression, "*I often use methods and techniques such as experiment, observation, demonstration, narration, and a mind map.*" The teacher coded Ö25 says, "*I mostly prefer brain storm, simulation, drama, and observation when doing science activities.*" Similarly, the teacher coded Ö11 says, "*I use experiments, observations, demonstrations, narration and mind maps etc.*".

The question of "Which of the methods and techniques you use are favoured by children?" was asked to determine which of the methods and techniques teachers used to perform science activities were more liked by children, and the findings obtained from the answers were given in the following table. Sample teacher views on the codes obtained in relation to the theme in this subject are included.

Table 12. Children' Favoured Methods and Techniques in Science Activities

Theme	Code	f	%
Favoured Methods and Techniques	Experiment	21	53.85
	Demonstration	9	23.07
	Observation	5	12.82
	Drama	2	5.14
	Trips	1	2.56
	Simulation	1	2.56

According to Table 12, of all the methods and techniques used by the teachers in the science activities process, the children mostly prefer the experiments (53.85%), demonstration (23.07%) and observation (12.82%) respectively. Some example teacher views about the methods and techniques that are used during science activities, and which are most favourable for children are as follows: The teacher coded Ö12 says, "*Children usually like experiment as they include learning by hands-on".* Similarly, the teacher coded Ö2 says, "*I use the demonstration method most. In fact, I think that all methods and techniques related to science would be favourable by children if carried out properly.*" The teacher coded Ö15 says, "*Experiment and observation. Learning is permanent during experiments because children learn both the construction phase and the result. Observation is also enjoyable. For example, they express their ideas on the weather and watch the plants we grow with pleasure.*"

To determine which of the methods and techniques teachers use to perform science activities is easy to implement, the question of "Which method/technique do you use makes it easy for you to apply?" was asked, and the findings obtained from the answers are given in the following table. Sample teacher views on the codes obtained in relation to the theme in this subject are included.

Table 13. Methods and Techniques Facilitating the Implementation for Teachers in Science Activities

Theme	**Code**	**f**	**%**
Methods and Techniques Facilitating the Implementation	Experiment	11	28.95
	Observation	9	23.68
	Demonstration	7	18.42
	Brainstorming	3	7.89
	Narration	2	5.26
	Concept maps	2	5.26
	Trips	2	5.26
	Simulation	1	2.64
	Drama	1	2.64

According to Table 13, what teachers expressed among the methods and techniques that facilitated their process of science activities were experiment (28.95%), observation (23.68%) and demonstration (18.42%). Some examples of teachers' opinions about the methods and techniques that facilitate teachers during the process of science activities are as follows: The teacher coded Ö5 says, "*Experimental method, because the children in this age group like it and it is easy to do and fun to try.*". Likewise, the teacher coded Ö12 says, "*Observation. It is easy for me to observe an event or a situation and to get the ideas of the children about it.".* Moreover, the teacher coded Ö16 says, "*Demonstration. I have prepared visual materials and applications that I demonstrate to my students and get them to do them*", which signifies that demonstration facilitates the science activities.

Results Obtained from Teachers' Views about Problems Faced During Science Activities

Results obtained from the questions asked to get teachers' opinions about the problems they face while performing science events are given in the following table. In this regard, firstly, the question of "What problems do you encounter while performing science activities?" was asked and the findings obtained from the answers are given in the following table in order to determine what problems teachers encounter while performing science activities. Sample teacher views on the codes obtained in relation to the theme in this subject are included.

Table 14. Problems Faced While Performing Science Activities

Theme	Code	f	%
Problems During Science Activities	Lack of materials	24	36.92
	Crowded classrooms	16	24.62
	Insufficiency of classrooms	9	13.85
	Indifferent families	8	12.30
	Insufficiency of schools	3	4.62
	Inadequate in-service trainings	3	4.62
	Indifferent children	2	3.07

According to Table 14, when science activities are carried out, teachers mostly encounter such problems as lack of materials (36.92%), crowded classrooms (24.62%), insufficiency of classrooms (13.85%) and indifference of families (12.30%). Some example teacher views on the problems faced by teachers in the process of realizing science activities are as follows: The teacher coded Ö1 says, "*Especially due to lack of materials, family indifference, and crowded classes, we cannot carry out science activities properly*". The teacher coded Ö31 says, "*To me, it is a very big problem to have large classes while conducting the activities,*" while the teacher coded Ö5 says, "*There are many problems arising from the classroom environment. The classes are not very suitable for preschool teaching".*

In order to determine the sources of the problems faced by the teachers during the science activities, the question of "Where do you think the problems you encounter in science activities stem from" was asked, and the findings obtained from the answers are given in the following table. Sample teacher views on the codes obtained in relation to the theme in this subject are included.

Table 15. Sources of Problems Faced During Science Activities

Theme	Code	f	%
Sources of Problems	School (administration, facilities etc.)	13	27.09
	Classroom environment	13	27.09
	Parents	8	16.66
	Materials	6	12.50
	Implementation	3	6.25
	Teachers	3	6.25
	Children	2	4.16

According to Table 15, schools (27.09%), classroom environment (27.09%), parents (16.66%) and materials (12.50%), respectively are among the sources of the problems faced by teachers in performing science activities. Some sample teacher views on the sources of the problems encountered during the science activities are: The teacher with the code Ö6 expresses the problem of the school and materials as the sources of the problems they encountered, "*I am suffering from the school or administration about finding materials, taking field trips and getting permission"*. The teacher with the code Ö5 says, "*The problems result from the classroom environment because the conditions in the classroom are not suitable for preschool education"* and adds that the physical condition of the classes is a source of problems. Another teacher with the code Ö13 says, "*Problems are sometimes caused by the school, financial potential and the timid or indifferent behaviour of parents. Especially, families are very insensitive. They consider us as babysitters.*" and expresses the indifferent parents as a source of problems.

In order to determine the competence of teachers to solve the problems they face during their science activities, the question of "Are you satisfied with the way you handle the difficulties you encounter during science activities?" was asked, and the findings from the answers are given in the

following table. Sample teacher views on the codes obtained in relation to the theme in this subject are included.

Table 16. Teachers' Competence of Handling with Problems

Theme	Code	f	%
Handling the Problems	Yes	20	62.50
	Partly	9	28.13
	No	3	9.37

According to Table 16, 62.50% of the teachers state that they are competent to handle the problems encountered in conducting science activities, 28.13% of them consider themselves to be partially competent, and 9.38% find themselves incompetent to overcome the difficulties encountered in science activities. Some examples of teachers' views on the situations that teachers consider themselves as being competent to overcome the difficulties they encounter while performing science events, and the solutions they develop are as follows: The teacher coded Ö15 says, "*Yes, I consider myself competent. In general, I deal with the problems I have encountered. I am using something different if there is material shortage. If I need to collect the attention of the children, I do a different activity and continue the science activity.*" Another teacher with the code Ö21 says, "*Partially. I get prepared before problems. I separate children into groups because they are crowded."* The teacher with the code Ö13 says, *"I do not consider myself competent. The difficulties we face sometimes cause teachers to be unable to do these activities. We're putting them off. I think that if we have a science workshop where kindergarten classrooms can use in every school, we will not encounter these difficulties and I think that we will be able to make the science activities more efficiently and successfully in a better environment."*

Conclusion, Discussion and Suggestions

This study was carried out according to the case study design within the scope of qualitative research methodology in order to reveal the opinions of preschool teachers about whether they consider themselves qualified in science activities, the kind of science activities they use, the methods and techniques they use in science activities, and the problems they encounter.

According to the results reached in the study, the vast majority of preschool teachers consider themselves qualified in terms of science education. Teachers often state that the science education environment should be equipped with laboratory facilities and a natural environment but should also be rich in materials. Uğraş, Uğraş, and Çil (2013) found that preschool teachers' competence in science activities was good according to the professional experience of the preschool teachers. Özbey (2006) concluded that teachers in preschool education institutions generally encountered problems at the planning and implementation level of science activities, and that they could not apply science activities regularly, although they were qualified in the preschool science activities. Garbett (2003) concluded that preschool teacher candidates regarded themselves as unqualified in science teaching, and the knowledge of teacher candidates and their planning skills of science activities suitable for children were inadequate. In a study conducted on preschool teachers' qualifications for science and nature activities, Şahin (1996) found that more than half of the teachers who participated in the study felt themselves incompetent during science teaching. Ayvacı, Devecioğlu, and Yiğit (2002) found that most preschool teachers did not understand the importance of science and natural phenomena, and that they did not have the ability to plan and implement science and nature activities in the desired quality. According to the study conducted by Karaer and Köşterelioğlu (2005), teachers stated that their levels of proficiency in science studies were low and that science-related knowledge levels were also limited to pre-service education. Hashweh (1987) emphasizes that missing concepts and conceptual mistakes that exist in the teacher will pass on to the students.

The vast majority of teachers state that science concepts can be better taught to children through learning by hands-on activities as well as using visual materials. It has also been observed that as a result of the science activities teachers have applied, they make efforts to improve scientific process skills in children. In a study conducted by Kefi, Çeliköz, and Erişen (2013) to identify the extent to which preschool teachers use basic scientific process skills, the writers found that preschool teachers mostly include observation into the science activities. On the other hand, it was observed that teachers did not use the ability to predict, measure, record and infer data when practicing science activities. Furthermore, in a study by Öztürk-Yılmaztekin and Tantekin-Erden (2011) in which they observed the science teaching practices of preschool teachers, it has been found that all of the preschool teachers sampled are performing activities that bring in the ability to observe in science activities and do not include any of the the basic scientific processes such as measuring and recording data.

Almost all teachers state that they use common science teaching materials, while few number of them express that they use animals, plants, and natural materials. According to the results of the study conducted by Karaer and Kösterelioğlu (2005), all of the teachers in the study stated that there should be a science corner (center) in preschool classrooms. In addition, while teachers felt themselves incompetent to develop science-related material, they stated that they considered themselves to be most competent in experimentation.

Nearly all of the teachers were observed to include spontaneous/natural activities in science activities. More than half of the teachers often say that they prefer group activities in science and that they perform science activities at least once a week. Half of the teachers state that they perform science activities for 0-30 minutes. Again, more than half of the teachers say that the number of children in the classroom should be between 10 and 15 children so that science activities can be effective. Özbek (2009) states that individual and group-based activities, which include processes such as being aware of the problems children encounter in science activities, the ways of finding creative solutions and the putting them into life have improved the creativity of children towards their problem solving skills.

It has been revealed that teachers use many methods and techniques when performing science activities. In particular, experimentation, observation and demonstration are the most widely used methods and techniques. More than half of the teachers say that the experimentation method is the most favourite method for children. Teachers also indicate that methods and techniques such as experiment, observation, demonstration can be easily implemented while performing science activities. In a study conducted by Karaer and Kösterlioglu (2005), in order to determine the teaching methods used by preschool teachers in science teaching, it was determined that a large proportion of the preschool teachers sampled operated their science activities through experimentation. In addition, Şahin (1996) has also found that preschool teachers use experimental methods in science activities and that they do not benefit from other science teaching methods such as concept mapping and analogy. Many field studies in the literature indicate that preschool teachers mostly use experimental methods in science teaching (Alabay, 2007, Karamustafaoğlu & Kandaz, 2006, Kıldan & Pektaş, 2009, Özbek, 2009). In his study, Şahin (1996) found that teachers mostly use play and experiment as teaching methods and use very few other teaching methods. According to Sansar (2010), it is clear that demonstration method is mostly used in science activities. The demonstration method is followed by experiment, observation, question-answer and use of visual materials, respectively. The results of these studies are in parallel with the results obtained in the present study. However, when the teaching methods and techniques used by teachers in science activities are examined, it is observed that methods and techniques such as field trip, case study, trial and error, drama, analogy and discussion are rarely carried out in science activities.

The teachers in the study express the leading problems they face in science activities as lack of materials, crowded classrooms, insufficiency of classrooms in physical terms, and indifferent parents. They also indicate that the problems encountered are often caused by school, classroom, family and material shortage. A large number of teachers consider themselves competent enough to overcome the

problems they encounter in the process of realizing science activities. According to the study conducted by Karamustafaoğlu and Kandaz (2006), most of the pre-school teachers do not find the equipment they use in science nature activities sufficient. In their study Kandir, Özbey, and İnan (2009) report that teachers have a hard time choosing and preparing materials and arranging the environment because of the large number of children in the classroom. Çınar (2013) state that teachers face with problems such as lack of source materials and equipment, inadequacy of information about science subjects, and negative attitudes and behaviours of parents and administration while conducting activities. Kıldan and Pektaş (2009) found that the physical equipment of the classrooms was not sufficient in teaching science and nature subjects. Aslan, Zor, and Cicim (2015) ranked the most common problems of pre-school teachers in science education as lack of material, lack of information, lack of sample/guide experiments, insufficient level of readiness of children and attitude of administrators. Similar results have been found by Karaca and Aral (2011) in their study of preschool teacher candidates to identify problems they encounter in teaching practice. In the study of Özsırkıntı, Akay, and Yılmaz-Bolat (2014) on the preschool teachers' views on preschool education programs, it has been concluded that the physical possibilities of schools and the density factors in classrooms cause various difficulties in establishing learning centers. In addition, teachers have indicated that adequate in-service training was not provided at the appropriate time. Teachers have also indicated that there must be in-service trainings, courses, seminars on the program; and that solutions should be provided to eliminate in the event that problems arise. Kallery (2004) emphasized that the problems faced by teachers include the lack of teaching materials, the inadequate classroom environment for activities, and the difficulties in choosing appropriate materials for activities. However, with the establishment of a better infrastructure system, the state must pay more attention to preschool education. An appropriately organized physical environment for effective learning in preschool education programs is of great importance. Care should be taken to ensure that learning centers in the classroom and the materials in these centers are in a position to organize children's learning (Kandir, Özbey & İnal, 2010; Kandir et al., 2012). The classroom environment needs to have comfortable and modifiable features according to the children's interests, which allow them to do research (Brunton & Thornton, 2010).

For science education at preschool education institutions, physical inconveniencies in education settings (small classrooms, crowded classes, difficulties in forming learning centers) quantitative and qualitative lacking of science teaching materials and guide resource materials, deficiencies in educational areas, lack of resources, materials, and guidance materials to be provided by MoNE (s) still remain and lead to problems for teachers such as having to undertake all responsibilities including having to shape the educational process in line with their own initiative. It is thought that all innovations and updates to the problem areas will undoubtedly provide positive reflections to preschool science education. Based on the results of this study and similar studies in the literature, the following suggestions can be made:

- Teachers can increase their knowledge and skills by participating in various courses and seminars at regular intervals so that they can follow the innovations and changes related to science and nature education.

- The number of courses for science education can be increased in terms of quality and quantity by arranging undergraduate preschool teacher education programs.

- Preschool teacher candidates can be made more practical to be able to use science materials effectively.

- Teachers can organize activities by investigating different methods and techniques in the course of implementing the activities, and they can support children's senses of discovering and curiosity.

- In the preschool education program, the materials and equipment indicated in the MoNE 2013 program for science education can be provided to the schools every year.

- A standard may be set for the number of children in the class.

- Some renovation studies could be carried out with the purpose of enabling learning centres more efficient and applying the sample classroom order mentioned in MoNE schedule.

- Informational meetings on the structure and function of preschool education should be organized for parents and more participation the parents into science activities should be achieved.

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