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Thematic Analysis of Conducted Studies Regarding Preschool Science Education in Turkey

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ABSTRACT

In this study, it is aimed to investigate the conducted researches in Turkey in the field of preschool science education in a comprehensive manner between the years 2016-2019. In this study, thematic content analysis method was used and the journals were examined which were indexed by DergiPark databases and published in social and human sciences. While the surveys were conducted, the conducted studies in 2016 and beyond were scanned and 88 articles were subjected to thematic content analysis. The articles in the study were analyzed through the thematic analysis matrix. The obtained data were analyzed by using descriptive and content analysis method. According to the findings of the study, pre-school science education started to gain importance and there was a significant increase in the conducted studies in each year. In the study; The most common aims were to determine the ideas/information related to science concepts and to examine the effects of science activities in the classroom in the analyzed articles. In this context, it is thought that in-depth studies on preschool science education will be important for the literature.

Keywords: Preschool, science education, environmental education, thematic analysis.

INTRODUCTION

The education given in preschool period is very important both for the individual's own development and for the education-teaching process to be more productive. With the education provided in preschool period, the foundations are laid of children's physical, social, emotional, cognitive, moral, language, motor development and self-sufficiency and production skills (Basaran & Ulubey, 2013; Veziroglu & Gonen, 2012). In addition, preschool children have improved their research and problem-solving skills; have a sense of confidence and self-expression; they can be raised as entrepreneurs who can make the right decisions (Karamustafaoglu & Kandaz, 2006). At this point, it can be said that the education provided

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in different fields such as science, speech and social skills in the preschool period forms the basis for them to acquire the necessary knowledge and skills.

Preschool children have a natural tendency to explore and learn (Harman & Cokelez, 2017). Early childhood period can be expressed as a period full of experiences in which children acquire basic concepts and scientific process skills (Kildan & Pektas, 2009). Science education is thought to be important for children to grow up as individuals with scientific process skills starting from early childhood. As Güneş (2018) states, countries aim to support children's natural curiosity and to develop a positive attitude towards science with their desire to explore through including science subjects in their curriculum in pre-school period.

In many countries, it can be stated that science teaching started at an early age. One of the main reasons why science entered pre-school education is; children should be able to understand scientific concepts better and develop scientific thinking in a positive way when they are introduced to scientific language early (Andersson & Gullberg, 2014). Developmental research shows that young children think and understand the concepts of scientific disciplines related in physics, biology, psychology and the chemistry (Nayfeld, Brenneman & Gelman, 2011). In addition, developmental theories and recent studies have shown that young children are well prepared for science learning and can learn basic science concepts (Guo, Piasta & Bowles, 2015). However, the education process for the environment should start from the early stage which should last a lifetime (Gulay-Ogelman & Gungor, 2015). It is believed that if children are provided with successful experiences and positive attitudes about science/environment in this period when they are just starting science/environmental education, they can continue willingly to learn science in future learning processes (Camlibel Cakmak, 2012; Can & Sahin, 2015; Taskin & Sahin, 2008). At this point, it can be stated that science education provided in early childhood will have positive effects on cognitive and affective development of children.

Science education starts in the natural environment of children, children live science in every breath they take, every game they play, every new creature they discover in nature (Nuhoglu & Ceylan, 2012). In preschool education, it is emphasized that bringing children to nature and equipping them with knowledge and skills to promote, popularize and protect living and non-living beings in nature is important (Kesicioglu & Alisinanoglu, 2009). In other words, science becomes part of their daily experiences in attempts to understand their personal world (Howitt, Lewis & Upson, 2011). As the child interacts with the environment, she/he wants to get answers to concepts and observations, and from this moment on, cognitive and affective structuring in their mind regarding science and nature begins to occur and continue throughout their life (Alabay, 2009). Parallel to this situation, science education enables the child to develop his/her research, examination and observation skills and to learn scientific thinking by creating scientific foundations (Kefi, Celikoz & Erisen, 2013). Children are constantly studying and researching while learning, because of these characteristics, the behavior of the child and the behavior of the scientist are similar in learning something (Uyanik Balat, 2014).

Early science education is important for children to develop positive attitudes towards science, to understand science concepts better and to provide scientific thinking skills (Eshach & Fried, 2005). Science activities carried out to children; scientific thinking skills and scientific attitude as well as gaining; It helps them develop scientific process skills and contributes to all development areas (Elmas & Kanmaz, 2015). Since early experiences affect subsequent educational outcomes, providing research-based science learning opportunities to young children positively affects their achievement, literacy and business skills (Brenneman, Stevenson-Boyd & Frede, 2009). Thanks to their readiness and natural interest in science, teachers enable them to use their scientific process skills and conduct their own research (Akman, Alabay & Veziroglu Celik, 2015). In other words, the teacher in science education

should encourage and encourage the child to start a scientific process (Unal & Akman, 2006). At this point, as Sackes, Akman and Trundle (2012) pointed out, preschool teachers and prospective teachers play an important role in providing rich and effective science learning experiences to children. In this context, in order to maintain science education effectively in pre-school, teachers / prospective teachers and researchers in this field play an important role.

Considering that children started to acquire many concepts, including science, mathematics and scientific concepts in pre-school period (Ayvaci, 2010), the importance of science education and related studies become improtant in pre-school period. In this context, it is considered that it is important to examine the studies conducted in the field of science education in the preschool period and to make applications accordingly, and to make new studies related to the un-studied areas. In order to realize this, there is a necessity of the analysis of the studies on pre-school science education. It can be stated that a study aimed at examining the researches related to pre-school science education is needed both for researchers working in this field and teachers who are practitioners. Considering the literature in the works at this point, Gulay-Ogelman and Gungor (2015) investigated master's and doctoral theses between 2000-2014 years on environmental education in preschool held in Turkey studied national and international articles. Ozen, Uyar and Ormanci (2016) investigated the researches in a comprehensive manner which conducted on preschool science education in Turkey between 2010-2016. Also, Gunes (2018) carried out an examination of the studies as part of pre-school education of science and nature in Turkey in the last five years (2013-2017). In this context, it can be stated that literature review studies are conducted in preschool science education. It can be stated that similar studies should be repeated every 3-5 years in parallel with the rapid increase in the number of studies carried out every year because of the development of information and technology and the updating of the subjects. In this context, it can be said that the investigations conducted in the field of pre-school science education between 2016-2019 will be important for the literature. In this direction, the aim of the research is to examine researches in the field of preschool science education between the years 2016-2019 in Turkey in a comprehensive manner. Accordingly, the research questions included in the study are as follows:

1. What are the objectives of the studies conducted in the field of pre-school science education?
2. What are the methods, samples and data collection tools of the studies conducted in the field of pre-school science education?
3. What are the issues in the studies conducted in the field of pre-school science education?
4. What are the results of the studies in the field of pre-school science education?
5. What are the recommendations in the studies conducted in the field of pre-school science education?

METHODS

The thematic content analysis method was adopted in the study that investigates the researches in preschool science education. Thematic analysis provides identification of analyzed studies through matrix, execution of similarities and differences, in parallel with the exhibition of trends in the research topic (Çalık, Ayas and Ebenezer, 2005; Kurnaz and Çalık, 2009; Ormancı, Cepni, Deveci and Aydın, 2015). In this research, thematic analyze method was preferred to be appropriate since the focus was on revealing the similarities and differences and identification of trends through examining the researches in the fields of pre-school science education under certain themes.

Indexed journals in the field of social and humanities science by the DergiPark databases in Turkey were investigated in scope of the study. With this aim, DergiPark website was visited and a survey was conducted through the search button. The survey was for the articles dated in 2016 and beyond. In addition, article titles and keywords were considered while conducting the survey. Titles and keywords were deemed to have pre-school, science, environment or related concepts to these. The surveys were performed to reveal subject specific words such as "preschool + science ", "preschool + STEM", "preschool + environment ", "early childhood + science", "early childhood + STEM", "early childhood + environment", "kindergarten + science", "kindergarten + STEM", "kindergarten + environment. Despite conducted surveys, it is natural to ignore some of the articles belong to preschool science education and this situation makes the limitation of the study. 98 articles in total was revealed through the realized surveys. However, 10 articles were excluded from the study group during the analysis process since being out of the research scope. The survey was realized in July 2019 and did not include all the articles published in 2019. As a result, 88 articles were subjected to thematic content analysis and these articles cited as (*) in the bibliography.

After determining the articles in the study, thematic analysis matrix developed by the Ormancı et al. (2015) was used through making arrangements in term of the aim research. There are two sections in the matrix as general and content features. Journal, journal year and affiliations of the published artcile were placed in general features part. The distribution of the analyzed studies in terms of the journals published for these sections is presented in Table 1.

Table 1. *The distribution of the analyzed studies in terms of journals being published*

Journal Name	Type	f	%	f	%
Eurasian Journal of Educational Research	ERIC	1	1.14	1	1.14
Kastamonu Education Journal		7	7.96		
Mersin University Journal of the Faculty of Education		4	4.55		
Abant Izzet Baysal University Journal of Faculty of Education		3	3.41		
Hitit University Journal of Social Sciences Institute		3	3.41		
Bartin University Journal of Faculty of Education		2	2.27		
Gazi University Journal of Gazi Educational Faculty		2	2.27		
Hacettepe University Journal of Education		2	2.27		
Marmara University Journal of Educational Sciences		2	2.27		
Mehmet Akif Ersoy University Journal of Education Faculty		2	2.27		
Necatibey Faculty of Education Electronic Journal of Science and Mathematics Education		2	2.27		
Sakarya University Journal of Education		2	2.27		
Trakya Journal of Education		2	2.27		
Yuzuncu Yil University Journal of Education Faculty		2	2.27		
Ankara University Journal of Faculty of Educational Sciences	Ulakbim	1	1.14	52	59.09
Ataturk University Journal of Graduate School of Social Sciences		1	1.14		
Creative Drama Journal		1	1.14		
Cumhuriyet International Journal of Education		1	1.14		
Ege Journal of Fisheries and Aquatic Sciences		1	1.14		
Electronic Journal of Social Sciences		1	1.14		
Erzincan University Journal of Education Faculty		1	1.14		
Gumushane University Journal of Health Sciences		1	1.14		
Journal of Bayburt Education Faculty		1	1.14		
Journal of Computer and Education Research		1	1.14		
Journal of Early Childhood Studies		1	1.14		
Journal of Theoretical Educational Science		1	1.14		
Journal of the Human and Social Sciences Researcher		1	1.14		
MANAS Journal of Social Studies		1	1.14		
Ondokuz Mayis University Journal of Faculty of Education		1	1.14		

Pamukkale University Journal of Social Sciences Institute		1	1.14		
Turkish Online Journal of Qualitative Inquiry		1	1.14		
International Journal of Education, Science and Technology		2	2.27		
Journal of International Social Sciences Education		2	2.27		
Journal of Research in Informal Environments		2	2.27		
Journal of the International Scientific Researches		2	2.27		
Online Science Education Journal		2	2.27		
Academic Overview International Refereed Journal of Social Sciences		1	1.14		
Akdeniz University Journal of the Institute of Social Sciences		1	1.14		
Anatolian Journal of Educational Leadership and Instruction		1	1.14		
Anatolian Journal of Teacher		1	1.14		
Ataturk University Journal of Kazim Karabekir Education Faculty		1	1.14		
Bilecik Seyh Edebali University Journal of Social Sciences Institute		1	1.14		
Caucasian Journal of Science		1	1.14		
Eurasian Journal of Researches in Social and Economics		1	1.14		
Gazi Journal of Education Sciences		1	1.14		
Gazi University Journal of Health Sciences	Others	1	1.14	35	39.77
Hacettepe University Faculty of Health Sciences Journal		1	1.14		
International Journal of Early Childhood Education Studies		1	1.14		
International Journal of Field Education		1	1.14		
International Journal of Turkish Education Sciences		1	1.14		
Istanbul Aydın University Journal of Education Faculty		1	1.14		
Journal of Awareness		1	1.14		
Journal of Research in Informal Environments		1	1.14		
Journal of Social Sciences of Mus Alparslan University		1	1.14		
Journal of the Institute of Education Sciences Dumlupınar University		1	1.14		
Mustafa Kemal University Journal of Social Sciences Institute		1	1.14		
Science, Education, Art and Technology Journal		1	1.14		
The Black Sea Journal of Social Sciences		1	1.14		
The Journal of Educational Reflections		1	1.14		
The Journal of Social Sciences		1	1.14		
Usak University Journal of Educational Research		1	1.14		
Total		88	100.0	88	100.0

As can be seen in Table 1, it was understood that the studies analyzed were generally published in different journals. In the analyzed studies, the articles published in SSCI journals were not included and it was understood that only one study was conducted within the scope of ERIC. While 59.09% of the studies were published in journals indexed by Ulakbim, 39.77% were published in journals in other indexes. Seven of these studies were published in Kastamonu Journal of Education and four of them were published in Mersin University Journal of Education. The distribution of the analyzed studies according to publication year is as shown in Table 2.

Table 2. *The distribution of the analyzed studies according to publication year*

Year	ERIC		Ulakbim		Others		Total	
	f	%	f	%	f	%	f	%
2016	-	-	7	7.96	7	7.96	14	15.91
2017	1	1.14	11	12.50	11	12.50	23	26.14
2018	-	-	24	27.27	14	15.91	38	43.18
2019	-	-	10	11.36	3	3.41	13	14.77
Total	1	1.14	52	59.09	35	39.77	88	100.0

When Table 2 is analyzed, 14 studies were conducted in 2016, 23 studies in 2017, 38 studies in 2018 and 13 studies in 2019. The distribution of the authors of the analyzed studies according to the affiliations is given in Table 3.

Table 3. *The distribution of the authors of the analyzed studies according to the affiliations*

University	Total		University	Total	
	f	%		f	%
Gazi University	13	6.16	Dumlupinar University	2	0.95
Kastamonu University	12	5.69	Hakkari University	2	0.95
Agri Ibrahim Cecen University	12	5.69	Kirklareli University	2	0.95
Hacettepe University	11	5.21	Mehmet Akif Ersoy University	2	0.95
Marmara University	10	4.74	Private Nursery/ School	2	0.95
MoNE	10	4.74	Sakarya University	2	0.95
Trabzon University (KTU)	10	4.74	Pamukkale University	2	0.95
Ege University	8	3.79	Aksaray University	1	0.47
Giresun University	6	2.84	Anadolu University	1	0.47
Hitit University	6	2.84	Cumhuriyet University	1	0.47
MTA	5	2.37	Dogu Akdeniz University	1	0.47
Ondokuz Mayis University	5	2.37	Duzce University	1	0.47
Trakya University	5	2.37	Ege University	1	0.47
Amasya University	4	1.90	Eskisehir Osmangazi University	1	0.47
Ankara University	4	1.90	Girne Amerikan University	1	0.47
Bartin University	4	1.90	Hasan Kalyoncu University	1	0.47
No working	4	1.90	Hospital	1	0.47
Erzincan Binali Yildirim University	4	1.90	Istanbul Aydin University	1	0.47
Kafkas University	4	1.90	Istanbul Technical University	1	0.47
Nevsehir Haci Bektas Veli University	4	1.90	Istanbul University	1	0.47
Abant Izzet Baysal University	3	1.42	Karamanglu Mehmet Bey University	1	0.47
Bilecik Seyh Edebali University	3	1.42	Karatay University	1	0.47
Firat University	3	1.42	Kocaeli University	1	0.47
Kilis 7 Aralik University	3	1.42	NC State University	1	0.47
Mersin University	3	1.42	Mugla Sitki Kocman University	1	0.47
Mus Alparslan University	3	1.42	Necmettin Erbakan University	1	0.47
METU	3	1.42	Suleyman Demirel University	1	0.47
Recep Tayyip Erdogan University	3	1.42	Okan University	1	0.47
Afyon Kocatepe University	2	0.95	Sinop University	1	0.47
Balıkesir University	2	0.95	Usak University	1	0.47
Canakkale Onsekiz Mart University	2	0.95	Yozgat Bozok University	1	0.47
Dokuz Eylul University	2	0.95			
Total	211	100.0			

When we look at Table 3, it was seen that the authors work in various institutions and organizations. It can be said that the 6.16% of the authors work at Gazi University, 5.69% of them work at Kastamonu University or Ağrı İbrahim Çeçen University, and 5.21% of them work at Hacettepe University.

In the content part, which is the second part of the matrix used in the study, the aim, method, universe-sample/working group size and level characteristics, data collection tools, subjects, results and suggestion information are included. The obtained data were analyzed by using descriptive and content analysis method. Descriptive analysis was generally used in the method part and content analysis was used in the purpose and result sections. In the content analysis process, first of all, the data obtained from the studies were transformed into codes, the appropriate codes were brought together into categories and, if necessary, categories were brought together to create themes. Frequency and percentage values were calculated for the generated codes and themes.

FINDINGS

In this part of the study, findings are given that related to the content characteristics of the articles examined within the scope of the research. In this context, the obtained findings are placed about the aim, method, sample/working group, data collection tools, subject, results and findings of the studies.

1. What are the purposes of the conducted studies d in the field of preschool science education?

The distribution of the analyzed studies according to their aims is presented in Table 4.

Table 4. *The distribution of the analyzed studies according to their aims*

Theme	Category	Code	f	%	f	%
Situation Analysis	Situation analysis related in science education	Determination of science activities in classrooms	5	5.38	24	25.81
		Investigation of perceptions/opinions about science education	5	5.38		
		Investigation of self-confidence/self-efficacy towards science teaching	3	3.23		
		Determination of attitudes towards science teaching	3	3.23		
		Examination of the views on science centers	3	3.23		
		Determination of views on science applications	2	2.15		
		Examination of the relationship between attitude towards science teaching and self-efficacy	1	1.08		
		Examination of exam anxiety for science course	1	1.08		
		Examination of the relationship between science teaching and creativity	1	1.08		
	Situation analysis related in science concepts	Determination of ideas/knowledge about science concepts	8	8.60	16	17.20
		Determination of the understanding of the nature of science	2	2.15		
		Determination of views on sexual education	2	2.15		
		Determination of perceptions of scientists	2	2.15		
		Examination of metaphoric perceptions on science concepts	1	1.08		
		To evaluate the relationship between healthy food and activity choices and nutritional status	1	1.08		
	Situation analysis towards environment or nature	Determination of environmental behavior/awareness	2	2.15	15	16.13
		Examination of knowledge levels related to environmental problems	2	2.15		
		Determination of attitudes on environmental problems	2	2.15		
		Determination of ecological citizenship levels	2	2.15		
		Determination of perceptions/tendencies on nature	2	2.15		
		Examination of water awareness	1	1.08		
		Determining the contribution of parents to environmental awareness of children	1	1.08		
		Examination of the relationship between child rearing attitude and consumption behavior of children	1	1.08		
		Determination of views on environmental education	1	1.08		
		Examination of eco and non-echo pre-school education institutions	1	1.08		
	Situation analysis on	Determination of the opinions about outdoor learning environment	2	2.15	10	10.75

	science education approaches	Determination of science question types	2	2.15		
		Determining the creative drama use situation	1	1.08		
		Determination of views on blended learning	1	1.08		
		Examining the awareness of STEM	1	1.08		
		Determination of opinions about science notebook	1	1.08		
		Examination of how scientific concepts and graphics are used	1	1.08		
		Evaluation of the level of analogy method in preschool science education	1	1.08		
	Field specific situation analysis	Examination of basic science/environment concepts in illustrated children's books	3	3.23	6	6.45
		Examination of programs in terms of health/sexual education concept	2	2.15		
		Examination of pre-school science and nature education studies	1	1.08		
Application Analysis	Ecology education	Examining the effect of language development for children	1	1.08	16	17.20
		Investigation of environmental knowledge levels of children	1	1.08		
		Determination of the contribution of children to the formation of awareness on aquaculture	1	1.08		
		Introduction of renewable energy sources	1	1.08		
	Drama/Creative drama	Determination of the effects on environmental awareness of children	1	1.08		
		Determination of the effects on social skills of children	1	1.08		
	Research, Inquiry based activities	Determination of the effects on children's understanding	1	1.08		
		Investigation of the effect on scientific process skills of children	1	1.08		
	Outdoor activities	Investigation of the effect on scientific process skills of children	1	1.08		
	Computer and tablet activities	Determination of the effects on academic achievement of children	1	1.08		
	Sense based education	Investigation of the effect on scientific process skills of children	1	1.08		
	Constructivist approach	Examining the effect on scientific process skills of their children	1	1.08		
	Creative science program	Investigation of the effectiveness on science learning and taking point of view skills of children	1	1.08		
	Teacher candidates	Determination of the effects of environmental ethics approaches on critical thinking tendencies	1	1.08		
		Determination of the effect of STEM activities based on Montessori approach on creativity skills	1	1.08		
		Determining the effects of active learning-based instruction on environmental ethics awareness, environmental behaviors and self-efficacy of environmental education	1	1.08		
Material Development	Scale development	Developing environmental awareness assessment scale for children	1	1.08	6	6.45
		Development of ecological footprint awareness scale for children	1	1.08		
		Development of scientific process skills test for children	1	1.08		
		Developing tools for teachers to measure self-efficacy beliefs in the surrounding of science teaching or science activities	1	1.08		
		Developing a scale to determine parents' views on	1	1.08		

		science				
	Activity development	Creating activities through using drama in teaching science subjects	1	1.08		
Total			93	100.0	93	100.0

* Since some of the studies have more than one objective, the total number is different.

When Table 4 is examined, in the studies conducted on pre-school science education; The main objective was to determine the situation with a frequency of 76.34%, to examine effectiveness with a frequency of 17.20% and to develop material with a frequency of 6.45%. In the examined studies, it was aimed to determine the science activities in classrooms with a frequency of 5.38%, to determine the perceptions/opinions about science education with a frequency of 5.38%, to determine the ideas/information related to science concepts with a frequency of 8.60%, and to examine the basic science/environment concepts in the picture books with a frequency of 3.23%. However, 4.32% of them on environmental education, 2.15% of them on drama/creative drama and 2.15% of them on the research-inquiry-based applications on different variables were examined in the analyzed studies. In addition, it was understood that 5.38% of them on the examined studies investigated the scale or test development related to pre-school science education.

2. What are the methods, samples and data collection tools of the studies conducted in the field of pre-school science education?

The distribution of the analyzed studies according to their methods is as in Table 5.

Table 5. *Distribution of investigations by methods*

Method	Total	
	f	%
Survey method	13	14.77
Case study	13	14.77
Qualitative research	10	11.36
Descriptive research/survey	8	9.09
Phenomenological research	7	7.96
Mixed research	6	6.82
Relational survey model	3	3.41
Developmental/cross-sectional research	3	3.41
Qualitative research - document review	3	3.41
Quasi-experimental design	3	3.41
Experimental design	3	3.41
Scale development	2	2.27
Single subject experimental design	1	1.14
Mixed experimental design	1	1.14
Cross-sectional survey model	1	1.14
Quantitative and qualitative research	1	1.14
Survey-document analysis	1	1.14
Descriptive-document analysis	1	1.14
Undefined	8	9.09
Total	88	100.0

As shown in Table 5, survey method was used in 13 of the studies conducted in preschool science education and case study was preferred in 13 of them. However, 10 of the analyzed studies were conducted through qualitative research, 8 of them were descriptive research/survey and 7 of them were used as case study. In the examined studies on pre-school science education, it can be said that the majority method is expressed in general. For example, although case study method was preferred 13 of the analyzed studies, only one case study was reported to be single case embedded design. Another example, although the mixed

method was used in the six examined studies, the adopted techniques of the mixed method was not identified any study. In addition, it was found that the research method was not included in the eight analyzed studies. Table 6 presents the sample/study group characteristics of the studies on pre-school science education and Table 7 presents the findings related to their sample/study group size.

Table 6. *Distribution of studies in terms of study group/sample characteristics*

Characteristics of Study Group/Sample		f	%	Total f	Total %
Teacher/Teacher candidate	Pre-school teacher	26	28.26	49	53.26
	Preschool teacher candidate	15	16.30		
	Teacher candidates in different departments	5	5.44		
	Teachers from different disciplines	2	2.17		
	Students of the Department of Child Development	1	1.09		
Child	60-72 months old child	7	7.61	31	33.70
	48-72 months old child	4	4.35		
	Five-year-old child	4	4.35		
	Child in kindergarten/nursery	4	4.35		
	60-66-month-old child	3	3.26		
	Six age group of children	3	3.26		
	Students at different levels	2	2.17		
	24-36-month-old child	1	1.09		
	55-72-month-old child	1	1.09		
	Four age group of children	1	1.09		
	3-7 age group children	1	1.09		
Document	Children's book	3	3.26	7	7.61
	Programs	2	2.17		
	Article	1	1.09		
	Activity	1	1.09		
Parent/Administrator	Parent	4	4.35	5	5.44
	School administrator	1	1.09		
Total		92	100.0	92	100.0

* In some of the studies, the total number was different since there was more than one group.

When we look at Table 6, the analyzed data were collected from teachers or prospective teachers with 53.26% frequency, from children with 33.7% frequency, from documents with 7.61% frequency and from family or administrators with 5.44% frequency. It was understood that the analyzed studies in preschool science education were conducted with preschool teachers with a frequency of 28.26%, preschool teacher candidates with a frequency of 16.30% and teacher candidates other than the preschool teachers in the faculty of education with a frequency of 5.44%. Different age groups were preferred in the studies conducted with children, and the most of the researches were conducted with 60-72 months old children (7.61%). However, children's books (3.26%), programs (2.17%) and parents (4.35%) were preferred as the study group in the analyzed studies.

When Table 7 is examined, it is understood that the analyzed studies were performed with 31-50 people in 20.46%, 11-30 people in 18.18%, 101-200 people in 18.18% and 51-70 people in 11.36% of the studies.

Table 7. *Distribution of analyzed studies in terms of number of work group/sample*

Number of Study Group/Sample	Total	
	f	%
0-10	8	9.09
11-30	16	18.18
31-50	18	20.46
51-70	10	11.36
71-100	6	6.82
101-200	16	18.18
201-300	3	3.41
301-400	6	6.82
401-700	3	3.41
701 and more	2	2.27
Total	88	100.0

The findings about the data collection tools used in the studies on pre-school science education is shown in Table 8.

Table 8. *Distribution of studies in terms of data collection tools*

Data Collection Tools	Total		Data Collection Tools	Total	
	f	%		f	%
Scale (Likert type)	20	14.71	Feedback form	3	2.21
Personal information form	15	11.03	Activities / plans	3	2.21
Semi-structured interview	14	10.29	Control List	3	2.21
Test	11	8.09	Metaphor	2	1.47
Interview	10	7.35	Picture	2	1.47
Observation	9	6.62	Unstructured conversation	1	0.74
Drawing	7	5.15	Structured interview	1	0.74
Survey (open ended)	7	5.15	Audio recordings	1	0.74
Survey	5	3.68	Field notes	1	0.74
Question form	5	3.68	Evaluation form	1	0.74
Scale	5	3.68	Article	1	0.74
Focus group meeting	4	2.94	Book	1	0.74
Document	4	2.94			
Total	136	100.0			

In Table 8, data are given on data collection tools used in the examined studies in pre-school science education. 14.71% of them on scale (Likert type), 11.03% of them on frequency personal information form, 10.29% of them on semi-structured interview, 8.09% of them on test, 7.35% of them on interview and 6.62% of them on observation were used in the analyzed studies.

3. What are the subjects in the studies conducted in the field of pre-school science education?

Frequency and percentage values related to the distribution of the examined studies in pre-school science education according to subjects are as shown in Table 9.

As can be seen in Table 9, while 61.36% of the analyzed studies were on general subjects, 35.23% of them were conducted on a single science concept. The studies analyzed in pre-school science education were conducted on the concept of science with 36.36% frequency and environmental concept with 21.59% frequency. These studies did not focus on the concept of a single science or environment concept; either variables such as attitudes, self-efficacy were investigated or studies were conducted in a combination of many concepts. On the other hand, 4.55% of them on ecology/ecological footprint, 3.41% of them on astronomy/space, 3.41% of them on nutrition/nutrients, 3.41% of them on sexual

development/education and 3.41% of them on animals were investigated in the examined studies.

Table 9. *Distribution of analyzed studies by subject*

Category	Code	f	%	f	%
General Concept	Science	32	36.36	54	61.36
	Environment	19	21.59		
	STEM	2	2.27		
	Health	1	1.14		
Single Concept	Ecology/Ecological Footprint	4	4.55	31	35.23
	Astronomy/Space	3	3.41		
	Nutrition/Foods	3	3.41		
	Sexual development/education	3	3.41		
	Animals	3	3.41		
	The nature of science	2	2.27		
	Scientific process skills	2	2.27		
	Scientist	2	2.27		
	Light	2	2.27		
	Aquaculture/Water	2	2.27		
	Science notebooks	1	1.14		
	Science centers	1	1.14		
	Weather events	1	1.14		
	Human anatomy	1	1.14		
	Density	1	1.14		
None		3	3.41	3	3.41
Total		88	100.0	88	100.0

4. What are the results of the studies conducted in the field of pre-school science education?

The findings obtained from the examined studies in the field of pre-school science education are given in Table 10.

Table 10. *Distribution of studies in terms of results*

Category	Code	f	%	f	%
Positive effect	Open inquiry-based science activities/constructivist approach/ sense-based education increase children's scientific process skills	4	4.49	17	19.10
	Drama/active learning/environmental education positively affects children's environmental knowledge/self-efficacy	4	4.49		
	Inquiry/technology/graphic use positively affected children's success	3	3.37		
	Parent participation environmental education program has an impact on children's language development	1	1.12		
	Fisheries education is effective in raising awareness among children	1	1.12		
	Drama method increases children's social skills	1	1.12		
	Blended learning has advantages	1	1.12		
	STEM activities based on Montessori approach improve creativity skills	1	1.12		
	Creative science education program has an impact on children's science learning and perspectives	1	1.12		
Usage situation	Experiments are the most preferred among science activities	3	3.37	17	19.10
	Environmental education activities were provided	3	3.37		
	Participants were able to design drama activities/nature activities for science subjects	2	2.25		
	Effective studies are carried out in order to gain skills for learning areas in outdoor learning settings	2	2.25		
	Issues related to daily life and nature are preferred in science subjects	1	1.12		

	In science studies, activities on books and journals were preferred most	1	1.12		
	Participants provide science activities once a week	1	1.12		
	Teachers included science activities	1	1.12		
	Teacher candidates have traditional approach	1	1.12		
	Parents consider sexual education necessary for children	1	1.12		
	In the educational environment, arrangements can be made in accordance with the developmental characteristics of children	1	1.12		
Situation about concepts	They have different mental models related to the concept of space	2	2.25	14	15.73
	The male figure dominates the scientist	2	2.25		
	A scientist is seen as a person working in a laboratory, wearing a lab coat and glasses	1	1.12		
	There are false and alternative concepts related to light	1	1.12		
	One of the most curious astronomy concepts are the concepts such as the world, the sun, the moon, stars, astronaut, space	1	1.12		
	The connotation in minds about the concept of light is that they artificial and natural light sources	1	1.12		
	Nature is defined as a remote environment outside of human life, where animals and plants are found	1	1.12		
	Science notebook are expressed as a notebook that reinforces the curiosity of children using	1	1.12		
	Have enough information about sexual development	1	1.12		
	Children often produce metaphors such as lions, dogs, rabbits and cats	1	1.12		
	They have false information about weather events	1	1.12		
	They have insufficient knowledge about the nature of science and misconceptions	1	1.12		
Science education	The participants believe that the importance/necessity of science education	3	3.37	13	14.61
	Participants' attitudes towards science education were positive	2	2.25		
	Participants' self-efficacy perceptions towards science education were high	2	2.25		
	Participants loved and interested in science education	2	2.25		
	It is appropriate to give science education at an early age	2	2.25		
	Participants feel comfortable while doing science activities	1	1.12		
	Participants' perceptions about biology were more positive than physics and chemistry perceptions	1	1.12		
Relation definition	There was no significant change in the views on the nature of science as the grade level progressed	1	1.12	9	10.11
	It was found out that male students were more aware of the impact of STEM on the lesson than female students	1	1.12		
	Sustainable environmental behaviors differ according to gender and the university they attend	1	1.12		
	It was observed that the elementary and science teacher candidates had higher knowledge about environmental problems than the preschool teacher candidates	1	1.12		
	The analytical dimension of critical thinking dispositions has a predictive effect on all three approaches to environmental ethics	1	1.12		
	The attitudes of the pre-service teachers who had ecology courses were more positive about environmental problems	1	1.12		
	The teacher's creativity significantly predicted children's science learning	1	1.12		
	There was a significant difference in the consumption behavior of children among mothers' parenting attitudes	1	1.12		
	There was a positive and weak relationship between participants' attitudes towards science education and self-efficacy perceptions	1	1.12		
General situation	The scale/test was valid and reliable	5	5.62	9	10.11
	Increasing awareness of children about the efficient use of water	1	1.12		
	Teachers have a medium level of nutritional knowledge	1	1.12		
	The materials in the science centers are not enough	1	1.12		

	Most children have normal weight	1	1.12		
Ecology	Parents contribute to children's environmental awareness	1	1.12	5	5.62
	Teachers working in eco schools have a high level of time and frequency allocated to sustainability practices	1	1.12		
	Participants are intermediate ecological citizens	1	1.12		
	Participants had high levels of susceptibility to nature	1	1.12		
	Ecological footprints of the participants were similar to each other	1	1.12		
Program/ book	The program refers to physical health	1	1.12	5	5.62
	The program is not included the analogy method	1	1.12		
	Basic science concepts are not much included in the books	1	1.12		
	In addition to positive natural environmental messages in the books they give negative natural environmental messages	1	1.12		
	41 different types of animals are mentioned in the books	1	1.12		
Total		89	100.0	89	100.0

When Table 10 is examined, the results of the analyzed studies were about positive effect, use (19.10%), related to concept (15.73%), science education (14.61%), relationship determination (10.11%), general condition (10.11%), environment (5.62%) and program/book (5.62%). In the examined studies, it was concluded that 4.49% of them found that open inquiry-based science activities/constructivist approach/sense-based education increased children's scientific process skills, 4.49% of them stated that drama/active learning/environmental education positively affected children's environmental knowledge/self-efficacy and 3.37% of them emphasized that the use of inquiry/technology/graphics positively affected the success of children. In addition, in the analyzed studies, it was found that 3.37% of them stated that experiments were mostly preferred in science activities, 3.37% of them emphasized that included environmental education activities and 3.37% of them mentioned that the participants believed in the importance/necessity of science education. However, in the examined studies in preschool science education, it was concluded that the 5.62% of the studies revealed that scale/test developed was valid and reliable.

5. What are the implications in the studies conducted in the field of pre-school science education?

In the study, the obtained findings from the suggestions of the analyzed studies are given in Table 11.

Table 11. *Distribution of the examined studies according to the implications*

Category	Code	f	%	f	%
Future studies	The study should be repeated with a larger/different sample group	11	12.50	28	31.82
	Further/comprehensive studies	7	7.96		
	New studies should be done	5	5.68		
	Experimental studies should be done	3	3.41		
	Similar studies should be done on other science subjects	1	1.14		
	Comparative studies should be done	1	1.14		
Teaching process	Science center should be established	3	3.41	15	17.05
	Drama-based teaching should be included in science/ environmental education	2	2.27		
	Include outdoor learning activities	2	2.27		
	The issues about scientist should be more included	1	1.14		
	Sexual education should be given to children	1	1.14		
	Various activities related to ecological footprint should be included	1	1.14		
	Courses should be taught in line with the structuralist approach	1	1.14		
	Activities related to environmental problems should be realized	1	1.14		
	Questions that require high-level thinking skills should be included more often	1	1.14		

	More concepts should be included in illustrated children's books	1	1.14		
	Books should be given examples of analogy method	1	1.14		
Inservice education	Teachers should receive training on material development and application	4	4.55	12	13.64
	Teachers should be given training for outdoor applications	2	2.27		
	Teachers should be given periodic trainings on science education practices	2	2.27		
	Education should be given on environmental education	1	1.14		
	Teachers should be given inquiry training	1	1.14		
	Training should be provided on sexual education for teachers	1	1.14		
	Families should be informed about the growth and development of children by specialist health personnel	1	1.14		
Under graduate program	Applied science education and environmental education courses should be added in undergraduate programs	4	4.55	10	11.36
	Programs should be organized in a way to gain the relevant qualifications	1	1.14		
	A more qualified science education should be given during the undergraduate education	1	1.14		
	Courses for the nature and teaching of science should be added to the undergraduate program	1	1.14		
	Course contents should be developed	1	1.14		
	STEM related courses should be added	1	1.14		
	A training program should be planned to support competences for science	1	1.14		
Preschool education program	The program should include basic science courses	2	2.27	9	10.23
	The number of astronomy activities in the program should be increased	1	1.14		
	Outdoor nature activities should be added to the program	1	1.14		
	More activities should take place	1	1.14		
	Program should be supported with environmental education program	1	1.14		
	The course contents should be prepared in a way to ensure conceptual structuring	1	1.14		
	The program should include activities for the use of technology	1	1.14		
	The program should be planned to cover scientific process skills	1	1.14		
Participants	Teachers should have sufficient knowledge of nutrition/ environment	2	2.27	6	6.82
	Children's awareness should be increased with scientific knowledge about the concept of light	1	1.14		
	Appropriate professional development opportunities should be provided for teachers and prospective teachers	1	1.14		
	Focus should be on the training of well-equipped teachers	1	1.14		
	Introduction of books should be provided to prospective teachers and teachers	1	1.14		
Undefined		8	9.09	8	9.09
Total		88	100.0	88	100.0

When Table 11 is analyzed, it was found that 31.82% of the studies suggested for future studies, 17.05% of them for the teaching process, 13.64% of them for the in-service training, 11.36% of them for the undergraduate program, 10.23% of them for the preschool education program and 6.82% of them for the participants. In the examined studies in pre-school science education, it was included suggestions as the study should be repeated with a wider/different sample group (12.50%), advanced/comprehensive studies should be done (7.96%), new studies should be done (5.68%) and experimental studies should be done (3.41%). However, in the analyzed studies, suggestions were given to establish a science center with a frequency of 3.41%, teachers to receive material development and practice training with a frequency of 4.55%, and the inclusion of applied science and environmental education courses in

undergraduate programs with a frequency of 4.55%. In addition, it was found that no implementations were included in the eight analyzed studies.

DISCUSSION and CONCLUSION

According to the findings, it was found that the most of the studies in preschool science education were published in Kastamonu Education Journal (Akyol & Konur, 2018; Kinik, Okyay & Aydogan, 2016; Turkoglu, 2017) and Mersin University Faculty of Education Journal (Kahriman-Pamuk & Olgan, 2018; Yilmaz & Olgan, 2017). When the scope of journals is examined, it is seen that the journals publishes the studies in different fields from preschool to higher education in the field of educational sciences. In this context, the publication of these studies in these journals is considered as normal. When we look at the analyzed studies, it was found that more than half of the studies were published in journals indexed by Ulakbim and almost half of them were published in journals in other indexes. In addition, there was only one study in the journals in the field indexes, while any study was found in the journals within the scope of SSCI. This result is thought to be caused by two situations. These are seen as the small number of SSCI journals in the scope of DergiPark where the survey is conducted or the absence of studies conducted in SSCI journals in preschool science education. At this point, considering that there will be SSCI journal which is not covered by DergiPark, it is thought that SSCI has been published in pre-school science education in our country since 2016, but it can be said that these studies are few.

38 studies (Ayvaci, Bulbul, Ozbek & Unal, 2018; Ayvaci & Candas, 2018; Bozyigit & Madran, 2018; Ursavas & Aytar, 2018) were conducted in 2018 and 23 studies (Balat, Kilic, Degirmenci & Unsal, 2017; Yorusun, Kocyigit, Icer, Bozkurt & Koksal, 2017) were conducted in 2017 on pre-school science education. In addition, 14 studies (Ayvaci, Atik & Urey, 2016; Kilinc, Atalay, Kara, Ilkyaz, Bayhan & Hekimoglu, 2016; Sonmez & Seyhen, 2016) were conducted in 2016 and 13 studies (Kosker, 2019) were conducted in 2019. Since the study does not cover all the studies conducted in 2019, the number in 2019 is small. In this context, it can be said that preschool science education has been gaining importance and there is a significant increase in the number of studies conducted in each year. It can be said that the studies on preschool science education will be important for the literature.

When we look at the aims of the articles about science education in preschool period, determination of ideas/knowledge about science concepts (Akcay, Halmatov & Ekin, 2018; Kucuk & Lacin Simsek, 2017; Songur, Gorgel, Unludag & Cakiroglu, 2017) and determination of the effects of science activities in classrooms (Ultay, Ultay & Cilingir, 2018; Yildiz & Tukel, 2018) are the most common aims. In addition, determination of perceptions/ opinions about science education (Akyol & Konur, 2018; Babaroglu & Okur Metwalley, 2018a) and scale or test development studies (Gokceli & Kandir, 2016; Gozum, & Gunes, 2018) are frequently encountered in pre-school science education. At this point, it is understood that the majority of the studies conducted in the field of pre-school science education are on situation analysis. However, in order to achieve a develop in an area, it is thought that experimental studies should be carried out after situation analysis studies. In the analyzed studies, the effectiveness of environmental education (Kinik, Okyay & Aydogan, 2016), drama/creative drama (Aydin & Aykac, 2016) and research-inquiry based applications (Alabay & Ozdogan, 2018; Kabatas Memis & Cakan Akkas, 2016) was investigated on different variables. However, it can be stated that the rate of these studies remains low. At this point, it can be said that experimental studies should be conducted rather than case studies in preschool science education studies.

In the study, it was understood that the most preferred methods in the analyzed articles were survey (Halmatov & Ekin, 2017; Sahin, Uludag, Gedikli & Karakaya, 2018; Seker & Cavus, 2017; Uyanik, 2017) and case study (Cabuk, Bas & Teke, 2017; Kardes & South

Karaman, 2018; Kartal & Ada, 2018; Yilmaz, Cimen, Karakaya & Ucuncu, 2018). In addition, qualitative research (Alabay, 2017; Sackes & Trundle, 2017), descriptive research/ survey (Tukel & Yildiz, 2018) and phenomenology (Harman & Cokelez, 2017; Kiziltas, Halmatov & Ertor, 2017) were used as methods in the analyzed studies in pre-school science education. Similar results were obtained in the analysis studies conducted by Gunes (2018) in the literature. In line with the aims of the studies, it is expected that survey and case studies are the most preferred methods. However, it is understood that research methods are expressed in general and which technique or type is used very rarely described in the method section in the analyzed studies. For example, mixed researches were explained by different researchers and their varieties were expressed in the literature. However, in the analyzed studies, only the mixed method was mentioned but the type was not specified. Considering that there is a different aim and levels in each mixed research model, it is not enough to state that only mixed research is used in the studies, it is thought that more detailed information should be given. At this point, it can be said that paying attention to this situation will be important for the quality of the study.

According to the findings, examined studies were done with preschool teachers (Babaroglu & Okur Metwalley, 2018a; Orhan, 2019), preschool teacher candidates (Turk, Yildirim, Bolat & Iskeleli, 2018; Yilmaz, 2018) and 60-72 months children (Cakir & Uludag, 2019). In this context, data were collected mostly from teachers or prospective teachers, later children, and some studies were collected from documents and parents or administrators. At this point, it is a good result to collect data from teachers and children who are most active in the field. In the same line, the results of this study indicate that all participants in the field have been reached since they were conducted with teacher candidates, documents, families, etc. Only the number of studies with parents was very small. Considering that parents have an important role especially in preschool period, it was thought that increasing the studies on this issue will be important for literature. In addition, in the analyzed studies in pre-school science education, the maximum participant size was 31-50 people (Akcay, Halmatov & Macun, 2017; Dilli, Dumenci & Sicim, 2016). It was determined that the analyzed studies were 11-30 people (Dilli, Dumenci & Turgut Kesebir, 2018; Clean & Karaarslan Semiz, 2019), 101-200 people (Tuncer, Simsek, Dikmen, Akmence & Bahadir, 2019) or 51-70 people (Olcer & Gungor Aytar, 2019).

In the study; scale (likert type) (Karademir, Uludag & Cingi, 2017; Olcer & Ozdemir, 2018), personal information form (Simsar, Dogan & Yalcin, 2017; Tekerci & Kandir, 2017), semi-structured interview (Akman, Gangal & Kardes, 2017; Ocak & Korkmaz, 2018) and testing (Uyanik, 2016) are frequently used data collection tools in the analyzed articles in pre-school science education. When the studies are considered to be based on screening or situation analysis, the scale, personal information form and interviews are among the tools that can be used in the conducted studies. In the analyzed articles, general topics were focused on such as science (Aksan & Celiker, 2016; Male, 2019; Kucukaydin & Sagir, 2018; Sahin, 2016), environment (Kara, Yilmaz & Sengul, 2018; Koseoglu, Gokbulut, Pehlivanoglu & Mercan, 2016; Saka, 2016). In some of these studies, concepts were investigated such as attitude towards science/environment and self-efficacy, while more than one subject or concept was investigated simultaneously in others. However, ecology/ecological footprint (Agac & Yalcin, 2018), astronomy/space (Turk, 2018), nutrition/nutrients (Kara & Aslan, 2018), sexual development / education (Deniz & Yildiz, 2018; Isler & Gursimsek, 2018) and animals (Peker & Ahi, 2019) were among the investigated issues in the examined articles. At this point, it is thought that detailed studies on other concepts which are among the science subjects will contribute to the literature.

In the examined articles within the scope of the study, it was found that the developed scale/test was valid and reliable (Gungor & Kalburan, 2018; Sahin, Yildirim, Surmeli &

Guven, 2018), open inquiry-based science activities/constructivist approach/sense-based education increased the scientific process skills of the children (Civelek & Akamca, 2018; Günsen, Fazlioglu & Bayir, 2018), drama/active learning/environmental education positively affected children's environmental knowledge/self-efficacy (Cabuk & Cabuk, 2017). In addition, it was found that science experiments were preferred most (Akcanca, Gurler & Alkan, 2017; Tahan & Ucar, 2017) and environmental education activities were included in the analyzed studies (Ozkan, 2017). In this context, it can be said that the positive effects of the teaching methods used are related to the results of the use of science education according to the results obtained from the analyzed studies. Considering that the findings obtained from the studies are generally positive, the importance and value of preschool science education emerges.

In the studies analyzed in pre-school science education, implications were offered such as should be repeated with a wider/different sample group (Cakir, Yalcin & Yalcin, 2019; Uysal, Cengi, Ozgul, Gencer & Akman, 2016), advanced/comprehensive studies should be done (Gunes, 2018; Kaygisiz, Benzer & Eren, 2019) and future studies should be prerformed (Karatekin, Salman & Uysal, 2019). In this context, it can be said that the analyzed studies generally make implications for future studies. In addition to this, implications was made such as teachers should receive material development and application training (Babaroglu & Okur Metwalley, 2018b; Buyuktaskapu Soydan, 2019) and applied science education and environmental education courses should be added in undergraduate programs (Unlu & Dere, 2019; Uyanik Balat, Akman & Gunsen, 2018). In this context, it can be stated that the implications are frequently included related to education programs, especially undergraduate programs.

IMPLICATIONS

The analysis of the studies on preschool science education is presented within the scope of the study. Considering the fact that the examined studies have increased over the years, it is thought that new studies on pre-school science education will be important for the literature.

In these studies, it is seen that survey and situation analysis studies are generally performed. In addition, it is thought that in-depth studies involving teachers and children will be of great importance in terms of literature. In this way, the number of studies in the well-known journals and indexes in the field is expected to increase.

This study was included only the journals covered by DergiPark journals in Turkey. In addition, trends can be identified by examining the studies on preschool science education published in international indexes. It is considered that the situation analysis can be done in international context through the comparison of the obtained results with our country.

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