Indonesian Society for Science Educators
Journal of Science Learning
journal homepage: ejournal.upi.edu/index.php/jslearning

Parent Involvement in Pre-school Science Activities: What Do Parents Think About It?

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ABSTRACT This study aimed to investigate parents' views about science and parent involvement in pre-school science activities. According to Cresswell's designs' sequential explanatory mixed-method design, the study was conducted. The participants were composed of parents of 39 children (60-72 months) who studied in two different classrooms, there were 20 children in one of the classrooms, and there were 19 children in the other classroom at a public pre-school in Ankara/Turkey in 2015-2016 school year. The Parents' Views about Science and Preschool Science Activities Scale and semi-structured interviews were used to collect data. In addition, semi-structured interviews were conducted with three volunteer parents, each from the parents who got high, medium, and low average scores from the scale. Thus, parents' views about science and parent involvement in pre-school science activities were examined in detail. According to the results of this study, it was determined that the parents who participated in this study had positive views on science and science education in pre-school, realized the importance of science activities in pre-school, were eager to participate in pre-school science activities. Therefore, this study suggests that teachers and parents should be informed that parents' involvement is essential for doing science activities in pre-school.

Keywords Parent Involvement, Science Education, Science, Early Childhood Education, Pre-school

1. INTRODUCTION

"Why is the sky blue? How do seeds grow? What makes sound and music?..." Young children ask their parents or teachers hundreds of questions like these, so we use science to answer them (Paulu & Martin, 1992). Science is a systematic process for discovering knowledge or uncovering general truths based on observation and experimentation (Sawah & Clark, 2015).

Children are born with a natural sense of curiosity and exploration, and daily life experiences offer children numerous opportunities to perceive, know and make sense of the world. These experiences are also an opportunity for children to understand science. According to Eliason and Jenkins (2003), science is part of our daily life, so science education should be meaningful for young children and associated with everyday life.

The primary purpose of science education in early childhood education is to deepen children's views on the world and their experimental studies and increase children's knowledge through new conceptual perceptions. Kelly (2015) lists the reasons for teaching science in the early years as follows:

- Young children are interested in science and want to know about the world.
- Science is interesting for children and gives young children a better understanding of their world.
- Children are introduced to scientific methods, techniques, and concepts.
- Children's vocabulary develops with the scientific terms they learn.
- Science is strongly associated with other areas of the curriculum.

Science education in early childhood is essential for supporting children's curiosity towards nature and science and informing their children with scientific knowledge without getting bored of their children's questions about nature and science (Lehr, 2005).

In the early years, parents play an essential role in helping the child acquire the first knowledge of life and science and gaining experience at home/out-of-school. Paulu and Martin (1992) stated that parents are crucial for

Received: 30 April 2021
Revised: 15 August 2021
Published: 1 March 2022

the child's science learning, and parents' enthusiasm and encouragement can spark the child's interest in science. They also said that scientific knowledge is cumulative; the child should start learning it early, so the more the child's curiosity about science is encouraged by their parents, the better it will be. Therefore, we can say that parent involvement studies in early childhood education are essential in science education.

1.1. Parent involvement in early childhood education

Parent involvement (we use the terms parent involvement, family involvement, and parental involvement interchangeably in this study) is an essential component of early childhood education. According to the structure-process model (Figure 1), quality in early childhood education consists of four main parts. Each component views individually, but together all four components influence the development of children and their families. Also, this model assumes that quality is quantifiable/measurable (Kluczniok & Roßbach, 2014). It is seen that interaction with the parent is also included in the model as a component.

In its most traditional definition, parent involvement refers to participating in activities at home and the child's school (Martinez, 2015). Parent involvement "has been operationally defined as parental aspirations for their children's academic achievement, parents' communication with their children about education and school matters, parents' participation in school activities, parents' communication with teachers about their children, and parental supervision at home" (Fan, 2001). DeLoatche, Bradley Klug, Ogg, Kromrey, and Sundman Wheat (2015) have described parent involvement as recommended strategy in engaging parents in children's educational experiences. Parent involvement is parents' contribution to children's learning at home, at school, and in the community (Marin & Bocoş, 2017).

A wide typology to account for different levels of parent involvement in education was suggested by Epstein (Fan & Chen, 2001). Epstein (1987a; 1987b; 1990; 1995; 2011) has included parent involvement in her various works. Epstein's typology is based on the following six types: (1) parenting, (2) communicating, (3) volunteering, (4) student learning at home, (5) decision making, (6) collaborating with the community (Epstein, 2011). Rodriguez, Collins-Parks, and Garza (2013) proposed a revision to Epstein's typology. The proposed model (Figure 2) organizes various categories of parent involvement at school into three dynamic dimensions: home environment (parents and students), parents and school/community, and students and school/community. The home environment (parents and students) dimension has been expanded to include

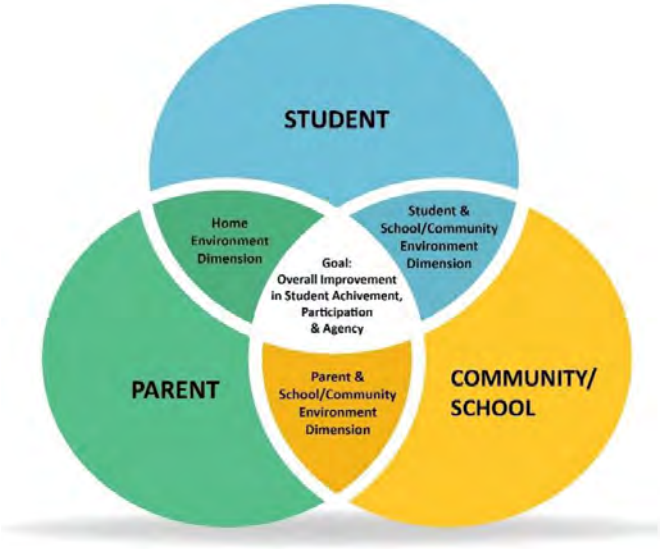

Figure 2 Dynamic dimensions of the parent, school/ community, and student involvement (cf. Authors' illustration based on Rodriguez et al., 2013)

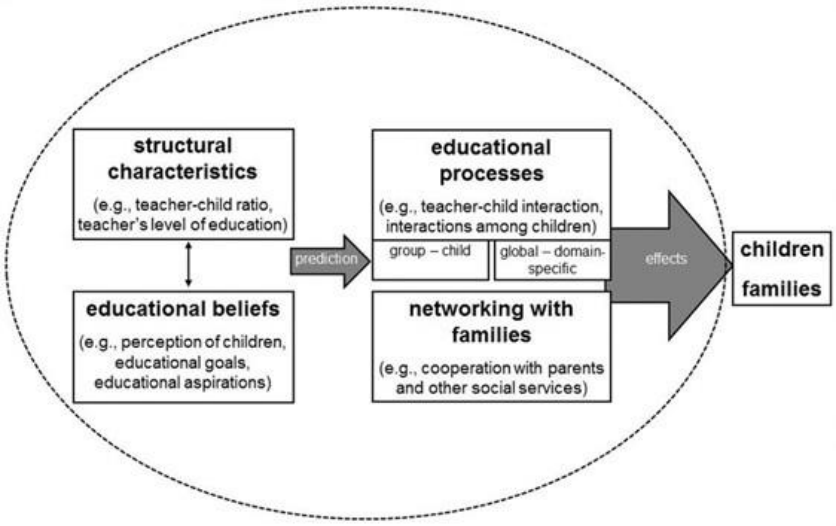

Figure 1 The conception of educational quality: Structure-process model of quality (Kluczniok & Roßbach, 2014, p.147)

peer/sibling interaction and the influence of parents' expectations and monitoring Epstein's category, "student learning at home". The parents and school/community dimension involves the school's relationship and relevant community agencies with parents and includes Epstein's categories of parent support/training, communication, participation in decisions, and volunteering. Students and community/school environment dimensions include the interactions among school officials and teachers with students in their specific community contexts. Thus, Epstein's category of community collaboration has been integrated. However, three new categories have been added to draw attention to the importance of connecting school curriculum to students' everyday lives, the realities of the community in which they live, and their sense of agency (Rodriguez et al., 2013).

Parent involvement is known to have many benefits. Accordingly, parent involvement activities positively affect children's cognitive development, communication skills, literacy development, pre-literacy skills, pre-writing skills, knowledge of print, vocabulary growth, expressive language development, comprehension skills, interaction with peers and adults, and learning (DeLoatche et al., 2015; Fantuzzo, McWayne, Perry, & Childs, 2004; Harvard Family Research Project, 2006; Powell, Son, File, & San Juan, 2010). Parent involvement is also essential for academic and social-emotional development in early childhood and later (Cohen & Anders, 2019; Fasina, 2011; Handayani, Wirabrata, & Magta, 2020). Arnold, Zeljo, Doctoroff, and Ortiz (2008) found that pre-literacy developed in children as parent involvement increased in pre-school education. Research has shown that parent involvement in early childhood education affects children's academic achievement and personal development (Camlıbel Cakmak, 2010; Celenk, 2003; Daniel, 2015; Keceli Kaysılı, 2008; Sahin & Kalburan, 2009). Parent involvement in early childhood programs helps children succeed in kindergarten and elementary school (Carter, 2002). It is believed that it is imperative to know what is necessary for parent involvement and understand its impact in early childhood programs (Hilado, Kallemeyn, Leow, Lundy, & Israel, 2011).

1.2. Parent involvement in science education: Why important?

Children will most likely experience their first formal education on how everyday life and science are connected during early childhood. This first formal encounter with science knowledge could be strongly reinforced at home if parents participated as resources to contribute to their children's science education.

Parents are their children's first teachers, and the home environment is essentially a giant science laboratory for pre-school children (Aktas Arnas, Aslan, & Günay Bilaloglu, 2012). Children may answer numerous questions in this laboratory by working with their parents (Flannagan & Rockenbaugh, 2010). Hence, parent involvement in science education will help bridge the home and school environment and children's early development.

The National Science Teachers Association (NSTA) strongly advocates parent involvement in science education. Also, parent involvement in early childhood science activities plays an essential role in children's science literacy (Tekerci, 2020). Parents encourage the daily use of science concepts and process skills to enhance their child's ability to learn the skills necessary for success (NSTA, 1994). Parent involvement in science education can be at home, out-of-school learning environments, or school.

At home with the child, cooking, doing household chores, repairing a household object, reading science books, watching science-related television programs, examining online or computer-based resources, playing with science materials can be given as examples of involvement in science education (NSTA, 2009). Out-of-school learning environments (zoo, science museum, science center, planetarium, aquarium, etc.) are critical in science education in early childhood. Uludag and Erkan (in press) determined that the use of out-of-school learning environments in science education positively affects the science process skills of young children. Similarly, Cui, Zhang, and Leung (2021) reported that visiting science and technology museums, aquariums, botanical gardens, or planetariums with their parents positively affected their science achievement. Also, parents involvement in science education provides opportunities to spend time together conducting fun activities, such as visiting the zoo, planetarium, botanical gardens, nature walks, and so on (Alisinanoglu, Ozbey, & Kahveci, 2015; Fleer & Rillero, 1999; Hofstein & Rosenfeld, 1996, NSTA, 2009). Participating in school trips and participating in science activities are examples of parent involvement in science education (NSTA, 2009). In school, parents can experiment with children, share information about their profession with children, participate in the drama, help children grow plants, care for an animal in the schoolyard, and participate in science projects. According to Wasik, Bond, and Hindman (2002), having parents more involved with school activities can improve parent and school communication and cooperation. Sahin (2019) stated that parents should be involved in the process at school and home for effective science education in early childhood, and they need attention and support for it.

The benefits of parent involvement in science education for children have been demonstrated in various research. Parent involvement positively affects children's science achievement and attitudes (Fleer & Rillero, 1999). Atci (2003) has mentioned that children's interest in science starts in the family, and there is a positive relationship between parent involvement and children's success in science. Salli, Dagal, Kucukoglu, Niran, and Tezcan (2013) have developed a project-based parent involvement

program for 60-72-month-old children, and this project has been designed to provide the permanence of the recycling concept. As a result of the research, it has been found that this program has been effective. Sackes (2014) has revealed that early childhood teachers tend to teach science compared to other fields, which is compatible with the science teaching preferences of parents. Sahin (2019) has examined the relationship between primary school 7th-grade students' science achievement and their parents' science literacy levels. As a result of the study, it has been determined that the science literacy levels of mother and father have positively influenced students' achievement. Also, the mother's science literacy level is more effective than the father's science literacy level on students' achievement. Aksu and Karaçöp (2015) have examined parents' involvement in home-based learning activities in 5th, 6th, 7th, and 8th-grade science lessons.

Consequently, they have determined that parents are aware of their responsibility for their children's home-based learning activities. However, they have also determined that parents' lack of scientific knowledge and self-confidence has negatively affected their active involvement in home-based learning science activities. So, it is imperative to discuss the things to promote parent involvement.

Starting from early childhood education, parent involvement in science education is necessary at other education levels. Therefore, we argue that it is essential to promote a good attitude toward science amongst parents and increase their science knowledge. Then, the question is, "How can educators promote parents' active involvement in the science education of their children?" Because parents often may have low confidence in their science knowledge, they may not be sure about supporting teachers at pre-school. Therefore, it is essential that educators better inform parents and provide strategies to become more involved in their children's education at home and pre-school. In this study, we sought to investigate parents' views on science and how they commonly engaged with their pre-school children in science-related activities outside of school. Firstly, determining parents' views about science and parent involvement in pre-school science activities is a need to explore a way to train parents to be more involved in doing science with their children and encourage parents to participate more in science activities. In this context, this study aimed to investigate parents' views about science and parent involvement in pre-school science activities.

Sub-problems:

1. Do parents' views of science and pre-school science activities differ significantly according to their gender?
2. Do parents 'views of science and parent involvement in pre-school science activities differ significantly according to their educational stage?
3. What is the average score of the parents' views on science and pre-school science activities according to the scale factors?
4. What are the views of parents who got high, medium, and low mean scores on the scale about parent involvement in pre-school science activities?

2. METHOD

The research design, participants, data collection tools, data collection, and data analysis were discussed in this part.

2.1. Research design

This study was conducted according to Cresswell's designs' sequential explanatory (quantitative-qualitative) mixed-method design. Qualitative data were collected after collecting and analyzing quantitative data in a sequential explanatory mixed-method design. In this design, quantitative data are dominant and qualitative data supports quantitative data. Firstly, the researcher collects and analyzes the quantitative data. Secondly, the researcher collects the qualitative data and analyzes it. Qualitative data help explain, or elaborate on, the quantitative results obtained in the first phase. Quantitative and qualitative data are analyzed separately and combined in the comment and discussion section (Ivankova, Creswell & Stick, 2006).

2.2. Participants

While determining the sample in sequential mixed method research requires an approach that expands and narrows the field of view. This study's participants include selecting probabilistic and purposeful sampling strategies (quantitative-qualitative) for sequential mixed method research (Teddlie & Yu, 2007). In the study, first of all (n = 39), the parents of the students studying in a public pre-school were determined randomly to collect quantitative data. Parents participated in the research voluntarily. The participants of this study were composed of parents of 39 children (60-72 months) who studied in two different classrooms, there were 20 children in one of the classrooms, and there were 19 children in the other classroom at a public pre-school located in Etimesgut, Ankara/Turkey in 2015-2016 school year. The pre-school in the study group was randomly selected among the schools that the researchers had easy access to and the pre-school administration allowed.

A standard program prepared by the Republic of Turkey Ministry of National Education is used in public pre-schools in Turkey. Science activities are also included in the program, but the teachers plan the frequency of application of these activities. The teachers of the classes in the study group stated that they applied science activities twice a week. Demographic characteristics of parents are presented in Table 1.

Quantitative data were analyzed after data were obtained. According to the quantitative data analysis results, semi-structured interviews were conducted with three volunteer parents, each from the parents who got

Table 1 Participating parents' educational stage

Educational stage	PS	MS	HS	AD	BD	MD	DD
Mother (n = 31)	2	1	6	6	13	2	1
Father (n = 8)	-	1	3	1	3	-	-

PS: Primary school, MS: Middle school, HS: High School, AD: Associate degree, BD: Bachelor's degree, MD: Master's degree, DD: Doctorate degree

Table 2 Demographic characteristics of parents who were semi-structured interviewed*

Parent	$\bar{X}$	Age	ES	Ways parents use to follow developments related to science.				
				Tv	Internet	Book	Trip-Observation	Uninterested
P1	5	33	BD	√	√	√	√	
P2	3.95	33	HS					√
P3	2.79	32	MS					√

* P1 = Parent had a High-Level Average Scale Score, P2 = Parent had a Medium Level Average Scale Score, P3 = Parent had a Low-Level Average Scale Score, BD: Bachelor's degree, HS: High school, MS: Middle school, ES: Educational Stage

high, medium, and low average scores from the scale. In addition, parents' views about science and parent involvement in pre-school science activities were examined in detail with a semi-structured interview.

When Table 1 was examined, it was seen that mothers filled out the scale voluntarily. When parents' educational stage was reviewed, it was seen that their educational stage was primarily high school, associate degree, and bachelor's degree. Also, the educational stage of 16 parents (n_{Mother} = 13; n_{Father} = 3) was bachelor's degree, the educational stage of 2 parents was the master's degree, and the educational stage of 1 parent was doctorate.

Three voluntary parents were selected with high, medium, and low scale scores to collect the qualitative data. Moreover, the voluntary participation of parents in the semi-structured interview was adopted. The maximum average score of the scale was five, and the scale's minimum average score was one. The parent with a high-level average scale score was coded as Parent 1 (P1). The parent with a medium-level average scale score was coded as Parent 2 (P2), and the parent with a low-level average scale score was coded as Parent 3 (P3). Demographic characteristics of parents are presented in Table 2.

P1 is 33 years old, and she is a pre-school teacher. She did not study any course related to science education but was touched on some science issues in some courses during the undergraduate education process. P1 said that followed developments related to science and technology through television, the internet, book, etc. P2 is 33 years old, and she is a public official. She said that she studied science education, but it was not enough. P2 said that she did not follow developments related to science and technology but watched health programs. Also, her husband is interested in science and technology. P3 is 32 years old, and she is a housewife. She said that she studied science education, but it was not enough. P3 said that she did not follow developments related to science and technology and did not know issues related to science and technology. Also, she said that she watched health programs.

2.3. Data collection tools

A scale and semi-structured interview were used as data collecting tools in this study. Data were collected in March 2016. The scale was filled out by all parents (n = 39). Semi-structured interviews were conducted with three volunteer parents who scored high, medium, and low on the scale.

The scale for determining parents' views about science and pre-school science activities was used to gather quantitative data. This scale has been developed by Sahin, Uludag, Gedikli, and Karakaya (2018). This was a Likert scale which is instructed to select one of these five responses: strongly agree, agree, neutral, disagree, or strongly disagree [Strongly disagree: 1 point, disagree: 2 points, neutral: 3 points, agree: 4 points, strongly agree: 5 points]. The scale was composed of two parts: the first part includes demographic information, and the second part contains five factors for assessing parents' views about science and pre-school science activities. The results of the Confirmatory Factor Analysis (CFA) and item analysis have revealed that within the scope of five-factors structure, which are (1) Science and Preschool Science Activities, (2) Life Sciences Activities in Preschool Education, (3) Physical Sciences Activities in Preschool Education, (4) Earth and Space Sciences Activities in Preschool Education and (5) Applied Science Activities in Preschool Education, construct validity has been high for target characteristics to be measured. CMIN/DF (χ^2/sd = 2.092), Chi-Square Goodness, CMIN (χ^2 = 2437.116), Goodness of Fit Index, (GFI = .540), Adjusted Goodness of Fit Index (AGFI = .497), Comparative Fit Index (CFI = .610), Root Mean Square Residuals, (RMR = .078) and Root Mean Square Error of Approximation (RMSEA =

.105) indices were examined with the CFA. These fit indices indicate the suitability of the scale items. In addition, the CFA data are significant ($p < .000$). The estimated load values of the items in each scale factor were examined. In addition, the results of the item analysis for the construct validity of the scale can be interpreted as the validity of the items in the scale is high, the items in the factors distinguish the parents in the lower and upper groups, and the items in the factors are items intended to measure the same behavior. The correlation between scale factors has ranged from .711 to .837. Cronbach's alpha reliability coefficient of the scale has been calculated to be .935. The Cronbach alpha reliability coefficient of the scale factors has varied between .734 and .913 (Sahin et al., 2018). These results indicate that the scale has validity and reliability.

The semi-structured interviews were conducted to collect qualitative data in the study. There are ten questions in the semi-structured interview form used for interviews. Nine questions were prepared in the first draft of the form. For the interview questions, the opinions of 3 experts, one of which is science education and two of them pre-school education, were consulted. One of the pre-school education experts and the science education expert stated that all the questions in the draft form were suitable for the study and could be used as they are. One of the pre-school education experts stated that in addition to the questions in the draft form, whether the child shares the science activities at pre-school with their parents may be essential. The researchers also found this suggestion necessary, and thus, it was added to the interview form. The questions in the form in terms of language and intelligibility were directed to two mothers who were not included in the study. One of the mothers had difficulty answering a question (Do you have any information about science activities at your child's pre-school?), so various examples (by sharing the child with bulletins, by getting information from the teacher, by following the education program, etc.) were given to make the question understandable. Questions of the semi-structured interview form were presented in Appendix1. Interviews were conducted in March 2016 and were recorded with the knowledge and consent of the parents. Each interview lasted approximately 35-40 minutes.

2.4. Data analysis

To test the conformity of the data obtained from the scale to normal distribution, mean, median, Skewness, Kurtosis coefficients, and Shapiro-Wilk normality test p values were calculated. If the sample group is less than 50 people, the Shapiro-Wilks test is used to test the compliance of the data to a normal distribution (Büyüköztürk, 2004). In addition, quantitative data were analyzed Independent-Samples t-Test, one-way ANOVA test, and descriptive statistical.

The data obtained from semi-structured interviews were analyzed contently according to qualitative data analysis. Data were coded, and themes were created from codes. Researchers created initial codes and themes independently to provide credibility for data analysis. A matrix was then developed to compare and contrast the codes/themes across by researchers. This implementation allowed for the triangulation of scale findings. Researchers coded data by re-reading the transcripts, combining, excluding, redefining, identifying emergent codes and themes, and discussing with the other researchers to provide credibility for data analysis. So, researchers decided on standard codes and themes together. Data obtained from the scale and semi-structured interviews form were analyzed separately, but these data were discussed by being compared with each other. Method triangulation controls the consistency of findings reached by different data collection tools (Patton, 2014). Also, quotes from three parents' statements were presented to provide data credibility.

3. RESULT

In this section, the findings obtained for the research sub-problems were presented.

The conformity findings to normality distribution of the data obtained regarding which tests to be used in the SPSS 22.0 statistical package program used in the analysis of the data were presented in Table 3.

When Table 3 was examined, it was seen that the p-value was more significant than 0.05 according to the Shapiro-Wilk test, so the scale data met the normality assumption ($p > .05$). In addition, when the mean and median values of the scale were examined, the fact that these values were close to each other supports that the scale data meet the normality assumption. The skewness and Kurtosis values were between -1 and +1 indicates that the scale data were typically distributed. Therefore, parametric tests were used in the analysis of the scale data.

3.1. Do parents' views of science, and pre-school science activities differ significantly according to their gender?

Results from the Independent-Samples t-Test comparison of parents' mean scores of the scale and its factors were presented in Table 4.

Table 3 Normality test results of data obtained from the scale

Test	n	$\bar{\chi}$	Median	Skewness	Kurtosis	Shapiro-Wilk Test p
Normality Test	39	3.9211	3.8988	-.010	-.242	.382

Table 4 Results from independent-samples t-test comparison of parents' mean scores of the scale and its factors

The Scale Factors	Parent	n	$\bar{\chi}$	SD	df	t	p	r (η^2)
Science and Pre-school Science Activities	Mother	31	3.9496	.61691	37	1.854	.072	.085
	Father	8	3.4844	.69737				
Life Sciences Activities	Mother	31	4.0115	.50477	37	1.120	.270	.033
	Father	8	3.7857	.52350				
Physical Sciences Activities	Mother	31	3.8065	.76447	37	.512	.611	.007
	Father	8	3.6607	.46409				
Earth and Space Sciences Activities	Mother	31	3.9677	.75697	37	.891	.379	.793
	Father	8	3.7083	.62836				
Applied Science Activities	Mother	31	4.1843	.57522	37	1.829	.075	.021
	Father	8	3.7500	.69042				
The scale means	Mother	31	3.9839	.58208	37	1.348	.186	.047
	Father	8	3.6778	.52897				

Table 4 shows the findings obtained from the Independent-Samples t-Test comparison of the scale's mean scores and its factors. Accordingly, when the average scores of the parents for scale factors are compared, it was seen that the mothers' average scores were higher than the fathers' average scores. However, there was no significant difference between the parents' average scores (p >, 05). For example, in the "Science and Preschool Science Activities" factor, when the parents' average scores were compared, the mothers' mean scores were higher than the average scores of the fathers, and there was no significant difference between the average scores. (χ_{mother} = 3.9496, χ_{father} = 3.4844, t = 1.854, p > .05, r = .085).

3.2. Do parents' views of science and parent involvement in pre-school science activities differ significantly according to their educational stage?

Findings from the one-way ANOVA comparison of the average scores of parents obtained from the scale according to their educational stage were presented in Table 5.

When the results of one-way ANOVA are examined in Table 5, it was seen that the average scores of the parents obtained from the scale did not show a statistically significant difference according to their education level [F(6) = 2.226, p > .05]. Eta squared value (r = .294) also supports this situation.

3.3. Do parents' views of science, and pre-school science activities differ significantly according to scale factors?

Findings from the descriptive statistics are presented in Table 6. Table 6 shows the parents' mean scores and standard deviation results from the scale and scale factors. Parents' scale average score is 3.9211. This case indicates that parents' views and parent involvement in science education in pre-school are in the "agree" category of the five-point Likert-type scale, and therefore parents have positive opinions. Similarly, it is seen that the average scores of the scale factors, which are science and pre-school science activities, life sciences activities, physical sciences activities, earth and space sciences activities, and

Table 6 Descriptive statistical findings of the scale and its factors

Factor	n	$\bar{\chi}$	SD
Science and Pre-school Science Activities	39	3.8542	.65289
Life Sciences Activities	39	3.9652	.51007
Physical Sciences Activities	39	3.7766	.71036
Earth and Space Sciences Activities	39	3.9145	.73237
Applied Science Activities	39	4.0952	.61692
The scale average scores	39	3.9211	.57854

Table 5 Findings from the one-way anova comparison of the average scores of parents obtained from the scale according to their educational stage

Educational stage	n	$\bar{\chi}$	SD	Df	F	p	r (η^2)	Significant Difference
Primary school	2	4.2955	.48361	6	2.226	.066	.294	No
Middle School	2	2.8824	.13090					
High school	9	3.7907	.57734					
Associate degree	7	3.7986	.58115					
Bachelor's degree	16	4.0555	.49787					
Master's degree	2	4.5375	.55811					
Doctorate degree	1	3.8988	.					
Total	39	3.9211	.57854					

applied science activities are in the "agree" category. In the light of these results, it can be said that parents' views and parent involvement in science education in pre-school are positive.

3.4. What are the views of parents who got high, medium, and low mean scores on the scale about parent involvement in pre-school science activities?

Semi-structured interviews were conducted to reveal parents' views on involvement in pre-school science activities. Codes and themes were formed from the data obtained from the semi-structured interviews made with P1, P2, and P3. The themes were "The importance of science education in pre-school education," "Cases of parents doing science activities with their children," and "Parents' awareness on science activities done at pre-school and their involvement in these activities." Results obtained from semi-structured interviews are presented in Table 7.

According to Table 7, it was seen that there are seven codes in the theme of "the importance of science education in pre-school education. "*Should science education take place in pre-school period? Why?*" question was asked to parents, both P1 and P2 stated their ideas related to "necessity for science education in future and "arouse curiosity" codes on "The importance of science education in pre-school education" themes. Quotes of parents are presented below.

"*I believe that he will study science education in the future years, but if he starts at an early age, it will be so good. For example, "Is the air temperature measured?" I asked. He gave very reasonable answers. I saw that science-related subjects aroused curiosity in my child* (P1)".

"*Because this education will contribute in the future times namely the education life after pre-school education. Science education is not like a geography course in which a child can learn listening or is not like a mathematic course that puzzles a child's brain. The child learns something by wondering in a science course* (P2)".

Just P2 stated her views on "It provides sensitivity to the environment," "It provides sensitivity to lives," and "It provides identification of nature" codes. The quote of P2 is presented below.

"*When we look to our environment, plants, animals, everything is related to science. Previously my son and I put the chickpea into the cotton at our home, and we waited for the germination for days. We have a home in the village; my son is spudding up land there with his grandfather, growing tomatoes. He eats and picks up tomatoes from the tomato branch. These both aroused my son's curiosity and encouraged my son more to be interested in plants, environment, and animals* (P2)".

P1 stated her views on the "It encourages talking science" code. Quote of P1 was presented below.

"*Issues related to science attract the interest of my child, and He can talk to us on these issues. For example, yesterday, he asked me a different question about science. I do not know the answer to this question. I said that if you want you can learn from your teacher. So, he was more curious* (P1)."

Both P1 and P3 expressed their views on the "Science is in our life" code. Quotes of P1 and P3 parents were presented below.

"*Science is a field that exists in all areas of our lives* (P1)."

"*Science is related to everyday life. Science is the life itself* (P3)."

When Table 7 was examined, it was seen that the "cases of parents doing science activities with their children"

Table 7 Results obtained from semi-structured interviews

Themes	Codes	Parents		
		P1	P2	P3
The importance of science education in pre-school education	It encourages talking about science	+	-	-
	It is required for future science learning.	+	+	-
	It arouses curiosity	+	+	-
	It provides sensitivity to the environment.	-	+	-
	It provides sensitivity to lives.	-	+	-
	It provides identification of nature.	-	+	-
	Science is in our life.	+	-	+
Cases of parents doing science activities with their children	Doing kitchen experiments	+	-	-
	Asking question-related to science	+	-	-
	Not doing a science activity.	-	+	-
	Making science activities given as homework	-	+	-
	Growing plant	-	-	+
Parents' awareness of science activities done at school and their involvement in these activities	Explanation of the science activity done at school by children to their parents	+	+	+
	Worksheets sent home by teachers.	+	+	+
	No time	+	+	-
	No teacher's invitation	+	-	+
	No interest in science activities	-	-	+

+: Commented on code
-: No idea about code.

theme were involved. P1's expressions on "doing kitchen experiments," "asking questions related to science," and "growing plant" codes demonstrated that parents carried out various science activities." A quote of the P1 was presented below.

"*I love growing flowers at home. I gave tasks to my child related to it. For example, I asked him to water these flowers together; I asked why the flowers' leaves turned yellow, and they were laid. He does not hurt flowers because he owns the flowers. He likes kitchen activities, and when I was cooking, I allow him to participate in the cooking process. We examine science journals that we subscribe to together. I ask him questions* (P1)".

P2 mentioned her views on the "activities given as homework" code related to science activities which P2 does together with her child. The quote of P2 is presented below.

"*We do homework that our teacher sometimes gives related to science. For example, as I mentioned in the examples, chickpea germination and tomato growing* (P2)."

P3 did not mention her view related to this issue. Because she said that she did not know about doing science activities and could not teach her child something she did not know.

According to these findings, it was seen that P1 and P2 did various science activities with their children, and they offered learning opportunities for their children at home/out-of-school.

When Table 7 was examined, it was seen that "parents' awareness on science activities done at the pre-school and their involvement to these activities" themes were involved. For example, three parents said they were aware of explaining the science activity done at pre-school by children to their parents. Quotes of parents were presented below:

"*My son explains* (P1)."

"*My son explains to us things he does about science at the pre-school; he says, "we do it like this* (P2)."

"*My daughter explains about things that are interesting and remembered* (P3)."

Parents' quotes on the "Worksheets sent home by teachers" codes were presented below.

"*Our teacher sends weekly worksheets; if there are activities related to learned science issues, we do them* (P1)."

"*The teacher usually provides weekly information programs and gives homework; also, I am trying to do these with my son* (P2)".

"*The teacher sends us worksheet* (P3)."

According to these findings, teachers use worksheets for parents' awareness about science issues and activities studied in the pre-school.

P1 mentioned her views in the "no time" and "no teacher's invitation" codes, P2 mentioned her views in the "no time" code, P3 parent mentioned her views on "no teacher's invitation" and "disinterested in science activities" codes. In addition, quotes from parents' views on why parents cannot participate in science activities are presented below.

"The *teacher of my son invited to class for parent involvement activity, but She did not invite for a science activity. This will be the first time I will participate in a science activity in my son's class. I am a teacher. My son and I will be in pre-school afternoon; even if there is such involvement activity it is tough to join, I have no time* (P1)."

"*I have no time because I have a baby. This activity is the first involvement activity for me (P2).*"

"*Teacher did not invite to us for parent involvement activity. We did not wonder and go* (P3)."

P1 could not involve in the education process because she is working, and P2 could not apply in the education process because she looked after her baby. However, P3 could not apply in the education process because the teacher did not invite her, and she had no interest in science.

4. DISCUSSION

Parenting is one of the primary influences on children's development. Parents are instrumental in facilitating their children's early experiences because these experiences have a lasting impact on children's ability to learn and succeed, both at school and in life (Prieto, 2018).

Parent involvement refers to the different activities and actions that families can do to support their offspring in education (Camarero-Figuerola, Dueñas, & Renta-Davids, 2020). It is known and accepted worldwide that parent involvement has positive educational and behavioral outcomes and positively supports the child's development (Ahmetoglu, Acar, Sezer, & Akşin Yavuz, 2018). Parent involvement in early science education is also crucial in many ways because education is also a collaborative process. Collaboration for learning and teaching is essential in helping children acquire 21st-century skills. So much so that parents are one of the collaborating stakeholders in OECD The Future of Education and Skills 2030 Project (OECD, 2018), which aims to create a shared understanding of the knowledge, skills, attitudes, and values to be gained by children. The results of this study, which aims to investigate parents' views about science and parent involvement in pre-school science activities where parents are an essential stakeholder, are discussed below.

When the mean scores of the parents for scale factors were compared, it was seen that the mothers' averages were higher than the fathers' averages. However, there was no significant difference between the parents' mean scores ($p > .05$). Similarly, Kılıc and Unal (2020) and Dere and Unlu (2020) found that parents' views on science activities in the science and pre-school period did not differ significantly according to gender. This may result from parents' equal interest in the pre-school science education of their children. This situation is promising for parent involvement studies in pre-school science education. Furthermore, parents' views do not differ significantly

according to their educational stage. Contrary to this study, Kılıc and Unal (2020) found that parents' views on pre-school science and science activities differ significantly according to their educational stage. Also, it has been determined that the direction of this difference favors parents who are high school, undergraduate, and graduate graduates. Dere and Unlu (2020) stated that the higher the educational stage, the better parents could contribute to their children's science education. However, it was not ensured that the number of parents who volunteered to participate in this study was equal according to their education level. Perhaps, the fact that there was no significant difference found in this study according to the parents' education levels may be due to this situation. However, regardless of the education level, it is considered very important for parents to support their children's science education in the pre-school period.

It is seen that the average scores obtained by the parents from the scale and the scale factors are generally at the agreed level (4 points) (Table 6). This situation indicates that the parents' views are generally positive. This finding is promising. Because, according to Perera (2014), parents' attitudes towards science have a significant positive effect on their children's science achievement.

As a result of this study, it was determined that parents did not actively involve in science activities at pre-school. However, they did science experiments with their children at their homes and listened to their children's views on pre-school science activities. This result supported parents with higher average scores toward the "Applied Science Activities in Preschool Education" factor of the scale. According to this result, it can be said that parents' involvement in science education is limited to home, but parents consider it essential to do science activities with their children. Parents "Science and Preschool Science Activities," "Life Sciences," "Physical Sciences," "Earth and Space Sciences," "Activities in Preschool Education", and "Applied Science Activities in Preschool Education" factors of the average scale score supported this case. Parents got an average score between "agree" and "strongly agree". The scale results indicated that parents had positive views about pre-school science and science activities. However, this result did not provide enough information about parents' involvement in science activities in pre-school. So, three volunteer parents (P1, P2, and P3) were interviewed who were determined to get high, medium, and low average scores from the scale. The results of the semi-structured interviews demonstrated that each of these three parents has positive views on science education in pre-school education. However, it was identified that P1 and P2 expressed more positive views than P3 in the "the importance of science education in pre-school education" theme. This result demonstrated that the scale results supported the results of the semi-structured interviews. In other words, the parents who got high and medium average scores expressed more positive views than the parent who got a low average score from the scale. Parent involvement is essential in pre-school science education, as in all early childhood education. In a study, Kiraz and Aytac (2020) developed Family Education through Science Activities (FETSA) practices for the parents of five-year-old children receiving pre-school education. They thus aimed to investigate the effect of parents on school involvement and children's academic achievement. Parents and their children did 17 science activities at home during their studies. At the end of the study, it was determined that the academic success of children who received pre-school education and whose parents participated in the FETSA practices increased. Accordingly, it is possible to say that parents' positive views about pre-school science education and various practices will positively affect children.

However, P3 was aware of the importance of science in pre-school education. She said that "Science is in our life." Also, semi-structured interview results showed that P1 was involved in various science activities with her child. P2 just helped her child's science activities given as homework by the pre-school teacher. P3 stated that she was growing plants with her child as a science activity. According to semi-structured interview results, it can be noted that P1 was aware of science activities such as "doing kitchen experiments" and "asking a question related to science." As a result of the interviews, it is seen that the parents give examples of science activities at home and school. In Gross et al.'s (2020) research, pre-k and kindergarten parents gave similar examples as behavioral indicators of parent involvement (helping with homework, talking about school, etc.). However, in this study, examples of involvement at pre-school are limited, and involvement barriers are included in the codes of the "Parents' awareness of science activities done at school and their involvement in these activities" theme.

Parent involvement in early childhood has been linked with stronger pre-literacy skills, acquisition of basic skills in mathematics and science, well-developed social skills, early reading skills, language skills, and positive attitudes toward school (Hu, Zou, & Ren, 2020; Jeffries, 2012; Powell et al., 2010; Marcon, 1999). Also, Adair (2020) stated that new research suggests that secondary students' science knowledge and achievement can be predicted from their science knowledge as early as pre-school. In addition, he emphasized the importance of considering the roles of the parent and the teacher, and the child in early childhood. In other words, parent involvement in science activities should be considered. However, as a result of the study, it was seen that the parents interviewed did not get involved in science activities at pre-school for various reasons. P1 and P3 said that the pre-school teacher did not invite them to school activities. Therefore, it can be deduced that if the teacher invites the parents to the school, they will participate in the school activities. It can be said that the

teacher's approach to parent involvement draws attention here. Teachers must encourage parents to plan and practice parent involvement activities. According to the result of Baeck's research (2015), although many teachers acknowledge the importance of parent involvement and home-school cooperation, they do not care about parent involvement due to a lack of time and resources. Also, P3 said that she did not participate in science activities because she is irrelevant. P1 said she could not be involved because she could not find time because of work. In Preston, MacPhee, and O'Keefe's (2018) study, kindergarten teachers stated that many parents have an intense work schedule. Therefore, it is difficult for them to participate in school hours. Erkan, Uludag, and Dereli (2016) determined that parents think that the fundamental factors preventing their involvement in school-based activities are the school's management, which does not adequately support parents' involvement activities, time insufficiency, and intensity working life, parents' indifference, and reluctance.

Also, in the results of Atakan's (2010) research, it has been determined that parents have expressed that teachers are reluctant to involve parents in classroom activities. Unuvar (2010) has stated that the purpose of research on parent involvement has not been reached, the teachers' efforts are either on paper or in files, and the parent does not notice the purpose of parent involvement. In conjunction with in-service education, the teacher should provide opportunities to encourage parent involvement research and ensure that teachers can provide quality guidance for parents in participating in pre-school science activities. Similarly, Sackes (2014) has demonstrated that parental preferences align well with pre-school teachers' views to teach less science than other content areas. It can be interpreted that teacher is a predictive factor qualifying parent involvement. The parents must be guided by teachers effectively and correctly. Parents should be encouraged to observe science in their environment and do science activities with their children (Veziroglu, 2011).

CONCLUSION

In summary, this study determined that the parents who participated in this study had positive views on science and science education in pre-school and realized the importance of science activities in pre-school. According to the results of this study, parents generally had positive views about science and parent involvement in pre-school science activities. Results obtained from the scale and semi-structured interviews supported each other. It is understood from the statements in the semi-structured interviews that parents have a positive perception about their involvement in science activities. These positive views promise parent involvement in science education in pre-school and supporting learning environments with parent involvement.

There are some limitations to this study. It is limited to the views of 39 parents and three parents who were semi-structured interviewed voluntarily. It was not ensured that the number of parents who volunteered to participate in this study was equal according to their education level. Also, the numbers of mothers and fathers participating in this study are not equal. Fathers did not participate in the semi-structured interview. These situations stated in future research should be tried to be eliminated. Similar studies can be done with larger sample groups. This study shows that pre-school teachers and parents should be informed that parent involvement is essential for science activities. However, mothers volunteered to participate in both the scale in the study and the interviews. Therefore, it can be suggested to develop policies and practices that will encourage fathers' active participation in parent involvement activities in science education and pre-school education. Both school and out-of-school science activities should be supported with parent involvement because parent involvement is critical for improving a positive attitude to science education in early childhood education. It is suggested that pre-school teachers prepare in-service training to support parent involvement in pre-school science education. Parent involvement in science activities can be examined with qualitatively focused research.

ACKNOWLEDGMENT

There is no conflict of interest between the authors in this study. The authors contributed equally to the study. During this study, scientific research and publication ethics were followed by researchers. Ethical rules have been followed. We thank the parents who voluntarily participated in this study for their contribution. And a part of this study was presented as an oral presentation at the 7th International Conference on New Horizons in Education which was performed in Vienna/Austria, 13-15 July 2016.

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Appendix 1. Semi-Structured Interview Questions

Parent in the interview: Mother () Father ()
Mother/Father's age: …… Child's age: …… (in months)
Education status (for mother): Educational status (for father):
1. Have you received Science Education throughout your education life? Yes No ( )
2. Do you think that the Science Education you received is sufficient? Yes No ( )
3. If the answer is Yes, what was the training content you received? Due to which feature do you think the science education you received is sufficient?
4. Do you think science education is necessary? Why is that?
5. Do you follow the developments/news about science and technology? Why?
6. Do you think your child should have a science education? Why is that?
7. Do you do science activities with your child? Yes No ( )
i. If the answer is yes; Can you give an example? .....
ii. If the answer is no; Why is that? ……
8. Do you have any information about your child's pre-school science activities?
Yes No ( )
i. If the answer is yes; What kinds of activities are held? Can you give an example?
ii. If the answer is yes; How do you get information about these events?
(by sharing the child with bulletins, getting information from the teacher, following the education program, etc.)
9. Does your child share science activities at pre-school with you? How?
10. Do you involvement in science activities at pre-school? Yes No ( )
i. If the answer is yes; How? …… .. (e.g., providing materials, participating in school, etc.)
ii. If the answer is No; Why don't you involve?