

# Submission file\_Turnitin

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1 **Parent involvement in preschool science activities: What**  
2 **do parents think about it?**

3 **NOVELTY**

4 In this study, determination of parents' views and parent involvement in science education  
5 in the preschool period will shed light on researches on parent involvement in preschool  
6 science education. In this study, unlike the literature, it was found that there was no  
7 significant difference between the education levels of parents and parents' views of  
8 science and parent involvement in preschool science activities. According to the findings,  
9 it was concluded that parents were aware of the importance of preschool science  
10 education, participated in science activities at home with their children. They were aware  
11 of science activities at school through their children and that they were waiting for an  
12 invitation from the preschool teacher to participate in science activities at school.

13 **ABSTRACT**

14 This study aimed to investigate parents' views about science and parent involvement in  
15 preschool science activities. The study was conducted according to the sequential  
16 explanatory mixed-method design from Cresswell's designs. The participants were  
17 composed of parents of 39 children (60-72 months) who studied in two different  
18 classrooms, there were 20 children in one of the classrooms, and there were 19 children  
19 in the other classroom at a public preschool in Ankara/Turkey in 2015-2016 school year.  
20 The Parents' Views about Science and Preschool Science Activities Scale and semi-  
21 structured interview were used as data collecting tools. Semi-structured interviews were  
22 conducted with three volunteer parents, one each from the parents who got high, medium,  
23 and low average scores from the scale. Thus, parents' views about science and parent  
24 involvement in preschool science activities were examined in detail. According to the  
25 results of this study, it was determined that the parents who participated in this study had

positive views on science and science education in preschool, realized the importance of science activities in preschool, were eager to participate in science activities in preschool. This study suggests that teachers and parents should be informed that parents' involvement is essential for doing science activities in preschool.

#### **Keywords**

Parent Involvement, Science Education, Science, Early Childhood Education, Preschool

### **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, p.12).

<sup>2</sup> 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 given for teaching science in the early years as follows:

- Young children are interested in science, and they want to know about the world.

- 1 • Science is interesting for children and gives young children a better
- 2 understanding of their world.
- 3 • Children are introduced to scientific methods, techniques, and concepts.
- 4 • Children's vocabulary develops with the scientific terms they learn.
- 5 • Science is strongly associated with other areas of the curriculum.

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

10 In the early years, parents play an essential role in helping the child acquire the  
11 first knowledge of life and science and gaining experience at home/out-of-school. Paulu  
12 and Martin (1992) stated that parents are crucial for the child's science learning, and  
13 parents' enthusiasm and encouragement can spark the child's interest in science. They also  
14 said that they have scientific knowledge is cumulative; the child should start learning it  
15 early, so the more the child's curiosity about science is encouraged by their parents, the  
16 better it will be. Therefore, we can say that parent participation studies in early childhood  
17 education are essential in science education.

### 18 **1.1. Parent involvement in early childhood education**

19 Parent <sup>17</sup>involvement (we use the terms parent involvement, family involvement,  
20 and parental involvement interchangeably in this study) <sup>17</sup>is an essential component of early  
21 childhood education. <sup>7</sup>According to the structure-process model (Figure 1), quality in early  
22 childhood education consists of four main parts. Each component views individually, but  
23 together <sup>7</sup>all four components influence the development of children and their families.  
24 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, p. 29). DeLoatche et al. (2015) have described parent involvement as recommended strategy in engaging parents in children’s educational experiences.

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 et al. (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 peer/sibling interaction and the influence of parents’ expectations as well as monitoring Epstein’s category, “student learning at home”. 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

1 volunteering. Students and community/school environment dimensions include the  
2 interactions among school officials and teachers with students in their specific community  
3 contexts. Thus, Epstein's category of community collaboration has been integrated.  
4 However, three new categories have been added to draw attention to the importance of  
5 connecting school curriculum to students' everyday lives, the realities of the community  
6 in which they live, and their sense of agency (Rodriguez et al., 2013).

7 Parent involvement is known to have many benefits. Accordingly, parent  
8 involvement activities positively affect children's cognitive development, communication  
9 skills, literacy development, pre-literacy skills, pre-writing skills, knowledge of print,  
10 vocabulary growth, expressive language development, comprehension skills, interaction  
11 with peers and adults, and learning (DeLoatch et al., 2015; Fantuzzo et al., 2004;  
12 Harvard Family Research Project, 2006; Powell et al., 2010). Parent involvement is also  
13 essential for academic development and social-emotional development in early childhood  
14 and later (Cohen & Anders, 2019; Fasina, 2011). Arnold et al. (2008) found that pre-  
15 literacy developed in children as parent participation increased in preschool education.  
16 Research has shown that parent involvement in early childhood education affects not only  
17 children's academic achievement but also their personal development (Camlibel Cakmak,  
18 2010; Celenk, 2003; Daniel, 2015; Keceli Kaysılı, 2008; Sahin & Kalburan, 2009). Parent  
19 involvement in early childhood programs helps children succeed in their transition to  
20 kindergarten and elementary school (Carter, 2002, p.9). It is believed that it is imperative  
21 to know what is necessary for parent involvement and understand the impact of parent  
22 involvement in early childhood programs (Hilado et al., 2011).

1     **1.2. Parent involvement in science education: Why important?**

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

6             Parents are their children's first teachers, and the home environment is essentially  
7 a giant science laboratory for preschool children (Aktas Arnas et al., 2012). In this  
8 laboratory, children may find answers to their numerous questions by working with their  
9 parents (Flannagan & Rockenbaugh, 2010). Hence, parent involvement in science  
10 education will help bridge the home and school environment and children's early  
11 development.

12             <sup>12</sup> The National Science Teachers Association (NSTA) strongly advocates parent  
13 involvement in science education. Also, Tekerci (2020) stated that parent involvement in  
14 early childhood science activities plays an essential role in children's science literacy.  
15             <sup>4</sup> Because parents encourage the daily use of science concepts and process skills to enhance  
16 their child's ability to learn the skills necessary for success (NSTA, 1994). Parent  
17 involvement in science education can be at home, in out-of-school learning environments,  
18 or in school.

19             At home with the child, cooking, doing household chores, repairing a household  
20 object, reading science books, watching science-related television programs, examining  
21 online or computer-based resources, playing with science materials can be given as  
22 examples of participation in science education (NSTA, 2009). Out-of-school learning  
23 environments (zoo, science museum, science center, planetarium, aquarium etc.) are  
24 critical in science education in early childhood; Uludag and Erkan (in press) determined

1 that the use of out-of-school learning environments in science education positively affects  
2 the science process skills of young children. Also, parents' involvement in science  
3 education provides opportunities to spend time together conducting fun activities, such  
4 as visiting the zoo, planetarium, botanical gardens, nature walks, and so on (Alisinanoglu  
5 et al., 2015; Fler & Rillero, 1999; Hofstein & Rosenfeld, 1996, NSTA, 2009).  
6 Participating in school trips and participating in science activities at school are examples  
7 of parent involvement in science education (NSTA, 2009). In school, parents can  
8 experiment with children, share information about their profession with children,  
9 participate in the drama, help children in growing plants, and care for an animal in the  
10 schoolyard and participate in science projects. According to Wasik et al. (2002), having  
11 parents more involved with school activities can also improve parent and school  
12 communication and cooperation. Sahin et al. (2010) stated that parents should be involved  
13 in the process at school and home for effective science education in early childhood, and  
14 they need attention and support for it.

15 The benefits of parent participation in science education for children have been  
16 demonstrated in various research. Parent involvement positively affects children's science  
17 achievement and attitudes (Fler & Rillero, 1999). Atci (2003) has mentioned that  
18 children's interest in science starts in the family, and there is <sup>3</sup> a positive relationship  
19 between parent involvement and children's success in science. Salli et al. (2013) have  
20 developed a project-based parent involvement program for 60-72-month-old children,  
21 and this project has been designed to provide the permanence of the recycling concept.  
22 <sup>2</sup> As a result of the research, it has been found that this program has been effective. Sackes  
23 (2014) has revealed that early childhood teachers have a less tendency to teach science  
24 compare to teach the other fields, which is compatible with the science teaching



1 preferences of parents. Sahin et al. (2010) have examined the relationship between  
2 primary school 7th-grade students' science achievement and their parents' science literacy  
3 levels. As a result of the study, it has been determined that the science literacy levels of  
4 mother and father have been influential on students' achievement positively; also, the  
5 mother's science literacy level has been found to be more effective than the father's  
6 science literacy level on students' achievement. Aksu and Karacop (2015) have examined  
7 parents' involvement in home-based learning activities in 5th, 6th, 7th, and 8th-grade  
8 science lessons. Consequently, they have determined that parents are aware of their  
9 responsibility for their children's home-based learning activities. However, they have also  
10 determined that parents' lack of scientific knowledge and self-confidence has negatively  
11 affected their direct active participation in home-based learning science activities. So it is  
12 imperative to discuss the things to promote parent involvement.

13 Accordingly, starting from early childhood education, parent involvement in  
14 science education is an essential and necessary issue at other education levels. Therefore,  
15 we argue that it is essential to promote a good attitude toward science amongst parents  
16 and increase their science knowledge. Then, the question is, "How can educators promote  
17 parents' active involvement in the science education of their children?" Because parents  
18 often may have low confidence in their knowledge of science, they may not be sure about  
19 supporting teachers at school. It is essential that educators better inform parents and  
20 provide strategies for them to become more <sup>16</sup>involved in their children's education at home  
21 and school. In this study, we sought to investigate parents' views on science and how they  
22 commonly engaged with their preschool children in science-related activities outside of  
23 school. Firstly, determining parents' views about science and parent involvement in  
24 preschool science activities is considered a need to explore a way to train parents to be

1 more involved in doing science with their children and encourage parents to participate  
2 more in science activities. In this context, the aim of this study was to investigate parents'  
3 views about science and parent involvement in preschool science activities.

#### 4 Sub-problems

- 5 1. Do parents' views of science and preschool science activities differ  
6 significantly according to their gender?
- 7 2. Do parents' views of science and parent involvement in preschool science  
8 activities differ significantly according to their educational stage?
- 9 3. Do parents' views of science and preschool science activities differ  
10 significantly according to the factors of the scale?
- 11 4. What are the views of parents who got high, medium, and low mean scores  
12 on the scale about parent involvement in preschool science activities?

### 13 **2. Method**

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

#### 16 **2.1. Research design**

17 This study was conducted according to the sequential explanatory (quantitative-  
18 qualitative) mixed-method design from Cresswell's designs. Qualitative data were  
19 collected after collecting and analyzing quantitative data in a sequential explanatory  
20 mixed-method design. In this design, quantitative data are dominant and qualitative data  
21 supports quantitative data. Firstly, the researcher collects and analyzes the quantitative  
22 data. Secondly, the researcher collects the qualitative data and analyzes it. Qualitative  
23 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, it requires an approach that expands and narrows the field of view. This study's sample participants include the selection of probabilistic and purposeful sampling strategies (quantitative-qualitative) respectively for sequential mixed method research (Teddle & Yu, 2007). In the study, first of all (N=39), the parents of the students studying in an independent were determined randomly to collect quantitative data. Parents participated in the research voluntarily. Quantitative data were analyzed after data were obtained. According to the quantitative data analysis results, semi-structured interviews were conducted with three volunteer parents, one each from the parents who got high, medium, and low average scores from the scale. With a semi-structured interview, parents' views about science and parent involvement in preschool science activities were examined in detail. 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 located in Etimesgut, Ankara/Turkey in 2015-2016 school year. Demographic characteristics of parents are presented in Table 1.

When Table 1 was examined, it was seen that mothers filled out the scale generally. 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 ( $N_{\text{Mother}}=13$ ;  $N_{\text{Father}}=3$ ) was bachelor's degree,

1 the educational stage of 2 parents was the master's degree, and the educational stage of 1  
2 parent was doctorate degree.

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

11 P1 is 33 years old and she is a preschool teacher. She did not study any course  
12 related to science education but was touched on some science issues in some courses at  
13 the undergraduate education process. P1 said that followed developments related to  
14 science and technology through television, internet, book etc. P2 is 33 years old, and she  
15 is a public official. She said that she studied science education but it wasn't enough. P2  
16 said that she didn't follow developments related to science and technology but watched  
17 health programs. Also, her husband interested in science and technology. P3 is 32 years  
18 old, and she is a housewife. She said that she studied science education but it wasn't  
19 enough. P3 said that she didn't follow developments related to science and technology  
20 and didn't know issues related to science and technology. Also, she said that she watched  
21 health programs.

### 22 23 **2.3. Data Collection Tools**

24 In this study, a scale and semi-structured interview were used as data collecting  
25 tools. Data were collected in March 2016. The scale was filled out by all parents (N=39).

1 Semi-structured interviews were conducted with three of the volunteer parents who  
2 scored high, medium, and low on the scale.

3 The scale for determining parents' views about science and preschool science  
4 activities was used for the quantitative data gathering. This scale has been developed by  
5 Sahin et al. (2018). This was a Likert scale which is instructed to select one of these five  
6 responses: strongly agree, agree, neutral, disagree, or strongly disagree [Strongly  
7 disagree: 1 point, disagree: 2 points, neutral: 3 points, agree: 4 points, strongly agree: 5  
8 points]. The scale was composed of two parts: the first part includes demographic  
9 information, and the second part contains five factors for assessing parents' views about  
10 science and preschool science activities. The results of the confirmatory factor analysis  
11 and item analysis have revealed that within the scope of five-factors structure, which are  
12 (1) Science and Preschool Science Activities, (2) Life Sciences Activities in Preschool  
13 Education, (3) Physical Sciences Activities in Preschool Education, (4) Earth and Space  
14 Sciences Activities in Preschool Education and (5) Applied Science Activities in  
15 Preschool Education, construct validity has been high for target characteristics to be  
16 measured. The correlation between scale factors has ranged from .711 to .837. Cronbach's  
17 alpha reliability coefficient of the scale has been calculated to be .935. The Cronbach  
18 alpha reliability coefficient of the scale factors has varied between .734 and .913 (Sahin  
19 et al., 2018). These results indicate that the scale has validity and reliability.

20 A semi-structured interview was conducted to collect qualitative data in the study.  
21 In the semi-structured interview form, there are ten questions. For the interview questions,  
22 the opinions of 3 experts, one of which is science education and two of them preschool  
23 education, were consulted. Questions of the semi-structured interview form were  
24 presented in Appendix1. Interviews were conducted in March 2016 and were recorded

1 with the knowledge and consent of the parents. Each interview lasted approximately 35-  
2 40 minutes.

#### 3 **2.4. Data Analysis**

4 To test the conformity of the data obtained from the scale to normal distribution,  
5 mean, median, Skewness, Kurtosis coefficients, and Shapiro-Wilk normality test p values  
6 of the scale were calculated. If the sample group is less than 50 people, the Shapiro-Wilks  
7 test is used to test the compliance of the data to a normal distribution (Büyüköztürk, 2012,  
8 p. 42). Quantitative <sup>13</sup> data were analyzed independent t-test and one-way ANOVA test.

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

#### 22 **3. Result**

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

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

4           When Table 3 was examined, it was seen that the p-value was more significant  
5   than 0.05 according to the Shapiro-Wilk test, so the scale data meet the normality  
6   assumption ( $p > .05$ ). In addition, when the mean and median values of the scale were  
7   examined, the fact that these values were close to each other supports that the scale data  
8   meet the normality assumption. The fact that skewness and Kurtosis values were between  
9   -1 and +1 indicates that the scale data were typically distributed. Therefore, parametric  
10   tests were used in the analysis of the scale data.

### 11   **3.1. Do parents' views of science and preschool science activities differ significantly** 12   **according to their gender?**

13           Results from independent t-test comparison of parents' mean scores of the scale  
14   and its factors were presented in Table 4.

15  
16           Table 4 shows the findings obtained from the independent t-test comparison of  
17   the scale's mean scores and its factors. Accordingly, when the average scores of the  
18   parents for the factors of the scale are compared, it was seen that the mothers' average  
19   scores were higher than the fathers' average scores. However, there was no significant  
20   difference between the parents' average scores ( $p > .05$ ). For example, in the "Science and  
21   Preschool Science Activities" factor, when the parents' average scores were compared,  
22   the mothers' mean scores <sup>2</sup>were higher than the average scores of the fathers, and there  
23   was no significant difference between the average scores. ( $\chi_{\text{mother}} = 3,9496$ ,  $\chi_{\text{father}} = 3,4844$ ,  
24    $t = 1,854$ ,  $p > .05$ ,  $r = .085$ ).

1   **3.2. Do parents' views of science and parent involvement in preschool science**  
2   **activities differ significantly according to their educational stage?**

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

5  
6           When the results of one-way ANOVA are examined in Table 5, it was seen that  
7   the average scores of the parents obtained from the scale did not show a statistically  
8   significant difference according to their education level [ $F(6) = 2.226, p > .05$ ]. Eta  
9   squared value ( $\eta^2 = .294$ ) also supports this situation.

10   **3.3. Do parents' views of science and preschool science activities differ significantly**  
11   **according to the factors of the scale?**

12           Findings from the one-way ANOVA comparison of the mean scores of the scale  
13   and scale factors were presented in Table 6.

14           When the results of one-way ANOVA were examined in Table 6, it was seen that  
15   there was no statistically significant difference between the total mean score of the scale  
16   and the average scores of its factors ( $F(5) = 1.105, p > .05$ ). It can be said that the averages  
17   of parents in all science branches in the preschool period were close to each other. Eta  
18   squared value ( $\eta^2 = .024$ ) also supported this situation.

19   **3.4. What are the views of parents who got high, medium, and low mean scores on**  
20   **the scale about parent involvement in preschool science activities?**

21           Semi-structured interviews were conducted to reveal parents' views on  
22   involvement in preschool science activities. Codes and themes were formed from the data  
23   obtained from the semi-structured interviews made with P1, P2, and P3. Themes were  
24   “The importance of science education in preschool education,” “Cases of parents doing  
25   science activities with their children,” and “Parents' awareness on science activities done



1 at school and their involvement in these activities.” Results obtained from semi-structured  
2 interviews were presented in Table 7.

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

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

13 “*Because this education will contribute in the future times namely the education*  
14 *life after preschool education. Science education is not like a geography course in which*  
15 *a child can learn listening or is not like a mathematic course that puzzles a child's brains.*  
16 *The child learns something by wondering in a science course (P2)*”.

17 Just P2 stated her views on “It provides sensitivity to the environment,” “It  
18 provides sensitivity to lives,” and “It provides identification of nature” codes. The quote  
19 of P2 was presented below.

20 “*When we look to our environment, plants, animals, everything is related to*  
21 *science. Previously my son and I put the chickpea into the cotton at our home, and we*  
22 *waited for the germination for days. We have a home in the village; my son is spudding*  
23 *up land there with his grandfather, growing tomatoes. He eats and picks up tomatoes*

1 *from the tomato branch. These both aroused my son's curiosity and encouraged my son*  
2 *more to be interested in plants, environment, and animals (P2)".*

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

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

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

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

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

13 When Table 7 was examined, it was seen that the "cases of parents doing science  
14 activities with their children" theme were involved. P1's expressions on "doing kitchen  
15 experiments," "asking questions related to science," and "growing plant" codes  
16 demonstrated that parents carried out various science activities." A quote of the P1 was  
17 presented below.

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

1 P2 mentioned her views on the “activities given as homework” code related to  
2 science activities which P2 does together with her child. The quote of P2 was presented  
3 below.

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

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

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

13 When Table 7 was examined, it was seen that “parents' awareness on science  
14 activities done in the school and their involvement to these activities” themes were  
15 involved. Three parents said that they were aware of explaining the science activity done  
16 at school by children to their parents. Quotes of parents were presented below:

17 *“My son explains (P1).”*

18 *“My son explains to us things he does about science in school; he says, “we do it*  
19 *like this (P2).”*

20 *“My daughter explains about things that are interesting and remembered (P3).”*

21 Parents' quotes on the “Worksheets sent home by teachers” codes were presented  
22 below.

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

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

3           *“The teacher sends us worksheet (P3).”*

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

6           P1 mentioned her views in the “no time” and “no teacher’s invitation” codes, P2  
7 mentioned her views in the “no time” code, P3 parent mentioned her views on “no  
8 teacher’s invitation” and “disinterested in science activities” codes. Quotes from parents’  
9 views related to why parents cannot participate in science activities were presented below.

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

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

16          *“Teacher did not invite to us for parent involvement activity. We did not wonder*  
17 *and go (P3).”*

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

#### 22   **4. Discussion and Conclusion**

23          When the mean scores of the parents for the factors of the scale were compared,  
24 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 preschool period did not differ significantly according to gender. This may be the result of parents' equal interest in preschool science education of their children. This situation is promising for parent involvement studies in preschool science education.

Parents' views do not differ significantly according to their educational stage. Contrary to this study, Kılıc and Unal (2020) found that parents' views on science and science activities in preschool 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. 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 education levels of the parents 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 preschool period.

According to the scale's factors, parents' views do not differ significantly. It may result from parents having similar views in all science-related disciplines. It is seen that the average scores obtained by the parents from the scale and the factors of the scale are generally at the agree level (4 points). This situation indicates that the parents' views are generally positive.

1           As a result of this study, it was determined that parents did not involve actively in  
2 science activities at school. However, they did science experiments with their children at  
3 their homes and listened to their children's views on school science activities. This result  
4 supported that parents had higher average scores toward the "Applied Science Activities  
5 in Preschool Education" factor of the scale. According to this result, it can be said that  
6 parents' involvement in science education is limited to home, but parents considered it  
7 essential to do science activities with their children. Parents "Science and Preschool  
8 Science Activities," "Life Sciences," "Physical Sciences," "Earth and Space Sciences,"  
9 "Activities in Preschool Education" and "Applied Science Activities in Preschool  
10 Education" factors of the average scale score supported this case. Parents got an average  
11 score between "agree" and "strongly agree". The scale results indicated that parents had  
12 positive views about science and science activities in preschool. However, this result did  
13 not provide enough information about parents' involvement in science activities in  
14 preschool. So, three volunteer parents (P1, P2, and P3) were interviewed who were  
15 determined to get high, medium, and low average scores from the scale. The results of  
16 the semi-structured interviews demonstrated that each of these three parents has positive  
17 views on science education in preschool education. However, it was identified that P1  
18 and P2 expressed more positive views than P3 in the "the importance of science education  
19 in preschool education" theme. This result demonstrated that the scale results supported  
20 the results of the semi-structured interviews. In other words, the parents who got high and  
21 medium average scores expressed more positive views than the parent who got a low  
22 average score from the scale. Parent involvement is necessary and essential in preschool  
23 science education, as in all early childhood education. In a study, Kiraz and Aytac (2015)  
24 developed Family Education through Science Activities (FETSA) practices for the

1 parents of five-years-old children receiving preschool education and thus aimed to  
2 investigate the effect of parents on school participation and the academic achievement of  
3 children. During their study, parents and their children did 17 science activities at home.  
4 At the end of the study, it was determined that the academic success of children who  
5 received preschool education and whose parents participated in the FETSA practices  
6 increased. Accordingly, it is possible to say that parents' positive views about preschool  
7 science education and various practices will have positive effects on children.

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

21         Parent involvement in early childhood has been linked with stronger pre-literacy  
22 skills, acquisition of basic skills in mathematics and science, well-developed social skills,  
23 early reading skills, language skills, and positive attitudes toward school (Jeffries, 2012;  
24 Powell et al., 2010; Marcon, 1999). Therefore, parent participation in science activities

1 should be considered. However, as a result of the research, it was seen that the parents  
2 interviewed did not get involved in science activities at school for various reasons. P1 and  
3 P3 said that the preschool teacher did not invite them to school activities. Therefore, it  
4 can be deduced that if the teacher invites the parents to the school, they will participate  
5 in the school activities. It can be said that the teacher's approach to parent involvement  
6 draws attention here. It is essential that teachers encourage parents for parent involvement  
7 activities, plan and practice these activities. According to the result of Baeck's research  
8 (2015), although many teachers acknowledge the importance of parent involvement and  
9 home-school cooperation, they do not care about parent involvement due to lack of time  
10 and resources. Also, P3 said that she did not participate in science activities because she  
11 is irrelevant to science. P1 said that she could not be involved because she could not find  
12 time because of work. In a study by Preston, MacPhee and O'Keefe (2018), kindergarten  
13 teachers stated that many parents have an intense work schedule. Therefore, it is difficult  
14 for them to participate in activities during school hours. Erkan et al. (2016) determined  
15 that parents think that the fundamental factors preventing their involvement in school-  
16 based activities are the school's management, which does not adequately support parents'  
17 involvement activities, time insufficiency, and intensity working life, parents'  
18 indifference, and reluctance.

19 Also, in the results of Atakan's (2010) research, it has been determined that  
20 parents have expressed that teachers are reluctant to involve parents in classroom  
21 activities. Unuvar (2010) has stated that the purpose of research on parent involvement  
22 has not been reached, the teachers' efforts are either on paper or in files, and the parent  
23 does not notice the purpose of parent involvement. In conjunction with in-service  
24 education, opportunities should be provided to the teacher to encourage parent



1 involvement research and ensure that teachers can provide quality guidance for parents  
2 in participating in preschool science activities. Similarly, Sackes (2014) has demonstrated  
3 that parental preferences align well with preschool teachers' views to teach less science  
4 than other content areas. It can be interpreted that teacher is a predictive factor qualifying  
5 parent involvement. The parents must be guided by teachers effectively and correctly.  
6 Parents should be encouraged to observe science in their environment and do science  
7 activities together with their children (Veziroglu, 2011).

8 In summary, in this study, it was determined that the parents who participated in  
9 this study had positive views on science and science education in preschool and realized  
10 the importance of science activities in preschool. <sup>21</sup> According to the results of this study,  
11 parents generally had positive views about science and parent involvement in preschool  
12 science activities. Results obtained from the scale and semi-structured interviews  
13 supported each other. It is understood from the statements in the semi-structured  
14 interviews that parents have a positive perception about their participation in science  
15 activities. These positive views are promising in enabling parent involvement in science  
16 education in preschool and supporting learning environments with parent involvement.

17 There are some limitations to this study. It is limited to the views of 39 parents  
18 and three parents who were semi-structured interviewed voluntarily. It was not ensured  
19 that <sup>22</sup> the number of parents who volunteered to participate in this study was equal  
20 according to their education level. Also, the numbers of mothers and fathers participating  
21 in this study are not equal. Fathers did not participate for the semi-structured interview.  
22 These situations stated in future research should be tried to be eliminated. Similar studies  
23 can be done with larger sample groups. This study shows that preschool teachers and  
24 parents should be informed that parent involvement is essential for doing science

activities. 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 in-service training be prepared for preschool teachers to support parent involvement in preschool 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 research. 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.

## Table Lists

**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\*

Parents	$\bar{X}$	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					√

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

5 **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

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

The Scale Factors	Parent	N	$\bar{\chi}$	SS	df	t	p	r ( $\eta^2$ )
Science and Preschool	Mother	31	3.9496	.61691	37	1.854	.072	.085
Science Activities	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	Mother	31	3.9677	.75697	37	.891	.379	.793
Activities	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 mean	Mother	31	3.9839	.58208	37	1.348	.186	.047
	Father	8	3.6778	.52897				

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

Educational stage	N	$\bar{\chi}$	SS	Df	F	p	r ( $\eta^2$ )	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
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1

2 **Table 6** Findings from the one-way ANOVA comparison of the mean scores of the scale  
3 and scale factors

Factor	N	$\bar{x}$	SS	Df	F	p	r ( $\eta^2$ )	Significant Difference
Science and Preschool Science Activities	39	3.8542	.65289	5	1.105	.358	.024	No
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					

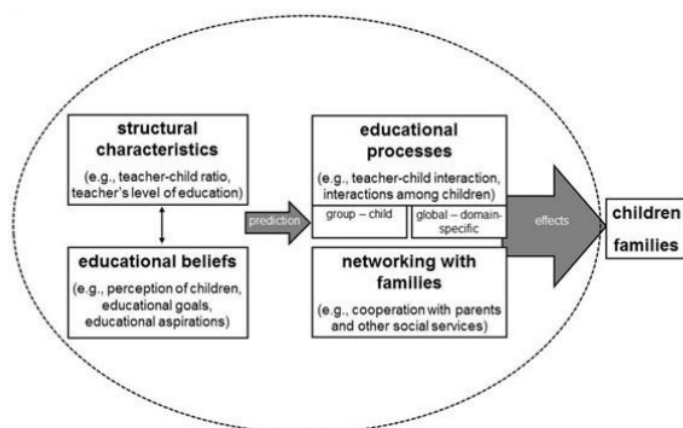
4 **Table 7** Results obtained from semi-structured interviews

Themes	Codes	Parents		
		P1	P2	P3
The importance of science education in preschool 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	Explanation of the science activity done at school by children to their parents	+	+	+

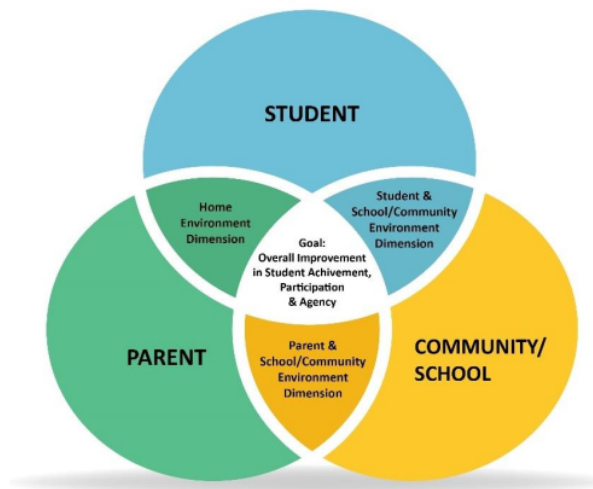
at school and their involvement in these activities	Worksheets sent home by teachers	+	+	+
	No time	+	+	-
	No teacher's invitation	+	-	+
	No interest in science activities	-	-	+

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

**Figure Lists**



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



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

#### Highlights

- It was found that there was no significant difference between the education levels of parents and parents' views of science and parent involvement in preschool science activities.
- According to results, it can be said that parents' involvement in science education is limited to home, but parents considered it essential to do science activities with their children.
- Parents are aware of the importance of science education in preschool period.
- Parents have done science activities at home with their children and awaited an invitation from the teacher to participate in science activities at school. So, teacher's guidance is important.

#### 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 content of the training 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 science activities at your child's school?  
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, by getting information from the teacher, by following the education program, etc.)
9. Does your child share science activities at school with you? How?
10. Do you involvement in science activities at school? Yes No ( )
  - i. If the answer is yes; How? ..... .. (eg by providing materials, participating in school etc.)
  - ii. If the answer is No; Why don't you involve?





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