

Teachers' Role and Responsibility in Improving Preschool Students' Mathematical Skills*

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ABSTRACT

There is an increasing tendency to early childhood education in the world. In the context of mathematics education, children begin early childhood education with their informal mathematical skills. The aim of this research was to determine the role and the responsibilities of preschool teachers in improving children's mathematical skills. The study was done in Ağrı Province during 2013-2014 academic year as a case study. Participants were 27 preschool teachers who were selected with convenient sampling method. In order to collect data from preschool teachers, Delphi technique was applied and participants were compromised in four stages of the delphi technique. As the results of the research, the responsibilities of preschool teachers were found as considering children's ages and individual differences, making math fun, preparing a safe environment and choosing colored materials. As the roles of preschool teachers in improving students' mathematical skills, participants have agreed upon guidance and didactic roles of teachers.

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Mathematical skills, preschool teacher, role, responsibility, perception.

Introduction

Preschool education begins at birth, continues to the age of compulsory education and takes into account children's development characteristics, individual differences and talents. It is an educational process which gives importance to children's physical, emotional, language, social and mental development. Likewise, Yılmaz-Bolat (2011) mentioned preschool education is a critical period in which the bases of development, knowledge, skills, qualifications and habits are occurred. In this period, the child's active involvement to environment is also achieved. Preschool education has important duties on the development of children. In this regard, it has a significant role on child's life, growth, development and care.

According to Shonkoff and Phillips (2000), 50% of mental development is occurred up to four years of age and 30% is occurred between 4 and 8 years of age. These ages coincide with the years of preschool education. In definitions of preschool education and in the expressions related to this period, education during preschool years and even in the following years should be given in accordance with the interests and the needs of a child as stated by Kandır (1999).

The success of preschool education, which corresponds to an important and critical period in the life of children, is based on teacher, physical conditions, educational environment, family, institution, curriculum, the materials used and the rich stimuli presented to the child, the methods and techniques used in the teaching learning process and the evaluation of the child (Durmuşoğlu, 2013). Among these factors,

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teacher is the most important one affecting the quality of the teaching process. As well, teachers have strong and lasting influence on their students. There is a direct effect of teachers on how pupils learn, what they learn, how much they learn, and the situations in which they interact with the world (Stronge, 2007). When considered mathematically, adults have significant roles and responsibilities in mathematics education and should try to make math fun for children (Seo and Ginsburg, 2004). Hence, teachers have a key role here and they have important responsibilities.

Mathematics is considered difficult, complex, and abstract by many. In addition, mathematics is seen by people as a door to a good life and a good career (Stafslie, 2001). Sarama and Clements (2006) have argued that 'children are born to deal with mathematics' (p.15). Similarly, the National Council of Teachers Mathematics [NCTM] (2008) stated that children are beginning to learn mathematics at birth and continue to learn mathematics till they begin school. As mentioned earlier, the teacher characteristics are one of the most fundamental determinants affecting the quality of preschool education and the development of the child (Milli Eğitim Bakanlığı [MEB], 2013). In this context, NCTM (2000) emphasizes that teachers' attitudes and beliefs play a significant role in improving children's understanding of mathematical concepts. NCTM (2000) summarizes the responsibilities of teachers for an effective mathematics education as; creating an environment which supports children's mathematics learning, determining goals, and selecting and creating mathematical activities in order to achieve these goals, encouraging children to speak and express ideas in order to show their understanding in mathematical activities, and finally organizing their teaching decisions which includes analyzing children's learning, the learning environment and the mathematical activities.

Preschool Education in Turkey

Recently, there is an increasing attention to early mathematics education. When the current situation regarding preschool education in Turkey is taken into consideration; according to the Basic Law of National Education (MEB, 1973), preschool education covers the education of children who have not come to the age of compulsory primary education, and this education depends on demand. Current early childhood education curriculum has been in use since 2013-2014 academic year. In the early childhood education program, specific objectives and indicators have been determined considering the developmental characteristics of each age group. These objectives and indicators are expressed separately for each age group (36-48, 48-60, and 60-72 month old children). Besides, they are presented under cognitive, language, social and emotional, psychomotor and self-care skills developmental areas. Mathematics related objectives are covered under the domain of cognitive developmental area. The basic mathematical skills are comparing, classification, matching, sorting, numbering and counting, operation, geometry, measurement and graphic dimensions (Kumtepe, 2011). The research was carried out within these mathematical skills.

In the current literature there are various researches regarding early childhood education. The purposes of these researches are determining the factors that affect preschool children's mathematical learning (e.g., Choi, 2011; Kilday, 2010), investigating mathematical concept development in children (e.g., Kesicioğlu, Alisinanoğlu, and Tuncer, 2011; Olkun, Fidan, and Babacan Özer, 2013), determining the effects of early childhood education in mathematics related situations in further years (e.g., Dursun, 2009; Polat Unutkan, 2007), investigating mathematics related issues in early childhood curriculum (e.g., Çalışkan Dedeoğlu and Alat, 2012), etc. In this study, on the other hand, it was tried to find out teachers' perceptions about their roles and responsibilities in improving preschool students' mathematical skills. First, there are some factors that are effective in the preschoolers' success in mathematics. In Kilday (2010) study, he investigated the factors affecting the success of the preschool students in mathematics. In this study, the use of mathematical concepts in social interaction positively influenced the success of children in mathematics. A similar study has been carried out by Klibanoff, Levine, Huttenlocher, Vasilyeva and Hedges (2006) and they have found that mathematics-related learning is also advanced in preschool institutions.

Another issue that is being studied in preschool mathematics education is the thoughts of preschool teachers. McMullen, Elicker, Goetze, Huang, Lee, Mathers and Yang (2006) compared participant preschool teachers' thoughts and practices with the help of observations, interviews, and learning products. The researchers stated that it was not easy to explain the complex relationships between these situations. They also reported that it was important to understand preschool teachers' thoughts in order to improve the quality of preschool education. Güven, Öztürk, Karataş, Arslan and Şahin (2012) aimed to picture preschool

teachers' beliefs by observing their activities in their classrooms. They found out from the teachers' statements that children regarded the mathematics learning process as an active structuring process and their roles in this process were guidance. Although, there are increasing number of studies regarding early childhood mathematics education in various aspects, there is still a need to determine preschool teachers' roles and responsibilities in improving preschool students' mathematical skills. Therefore, in this study the following question is investigated;

- What are the perceptions of preschool teachers about the roles and responsibilities of teachers in improving preschoolers' mathematical skills?

Method

This study was a case study which enabled the researcher intensive, holistic description and analysis of a single instance, phenomenon, or social unit (Merriam, 2013). Similarly, Creswell (2007) defined case study as a qualitative approach in which the researcher deeply scrutinized one or more of the situations limited by time with data collection tools containing multiple sources and defining situations and contextual themes. So, this study is appropriate for a case study and it was carried out as a qualitative research. As known, qualitative research is useful in gathering realistic and holistic data on perceptions and events (Yıldırım and Şimşek, 2008). In this study participant preschool teachers' perceptions about teachers' role and responsibilities in improving preschool students' mathematical skills were gathered.

Sample of This Study

This study was carried out in seven different preschools and limited with preschool teachers working in Ağrı Province during 2013-2014 academic year. At the beginning of the study, there were 29 participants, but two of them didn't participate further phases of the Delphi technique. In selection of participants, convenient sampling method was used. This method is useful in selection of participants which are close and easy to access and is relatively less costly and can be perceived as practical and easy for some researchers (Yıldırım and Şimşek, 2008).

Participants in the Delphi technique are selected according to their specific expertise (Hatcher and Colton, 2007), and experts who have background knowledge about research questions are selected on purpose (Skulmoski, Hartman and Krahn, 2007). The participants of this study were preschool teachers who were supposed to have necessary background knowledge. Besides, in literature there is no consensus on the number of participants in Delphi technique. However, the number of participants depends on the purpose of the study and the diversity of the target population (Williams and Webb, 1994). According to Sahin (2001), the ideal group size is 10-20. This study involved at least 27 preschool teachers. This number was thought as enough and appropriate to current literature (e.g. Sahin, 2001; William and Webb, 1994).

Data Collection Tool and Analysis

Delphi technique includes four stages. In the first stage of Delphi technique, a semi-structured questionnaire including open ended questions was used. These questions covered mathematical skills that should be included in preschool education, the issues preschool teachers should consider during preparation, implementation and evaluation parts of mathematical activities, teachers' responsibilities during these parts of activities, how they define teachers' role in improving students' mathematical skills, and lastly which issues they would like to share about research topic. In preparation of these questions in data gathering tools, the researchers took advantage of current literature and five experts' opinion. But in this article, only the results about participant perceptions in teachers' role and responsibilities in improving students' mathematical skills were shared.

In this first stage of Delphi technique, participants were asked to fill these questionnaires in a month. Findings were collected under five themes; mathematical skills, significant issues that a teacher should consider during mathematical activities, teachers' responsibilities during mathematical activities, teachers' role during mathematical activities, and miscellaneous issues. However, in this manuscript, as mentioned above only data regarding teachers' responsibilities and roles during mathematical activities themes are presented.

In further stages of Delphi, questionnaires having likert type of questions were applied. The questionnaire helped the researcher to collect systematic and standard data (Armağan, 1983). In detail, in the second stage of Delphi technique, data gathered were analyzed and converted to a questionnaire including likert type of questions. Besides, participants were asked to fill questionnaires and to write whether they defend their previous ideas or want to share other ideas. In the third stage of the Delphi technique, participant teachers' ideas gathered in the previous stage were included to the questionnaire and they were distributed to participants again. Participants were given a week to send back the questionnaires. In addition, in the last stage of Delphi technique, the questionnaire was rearranged and third stage statistics were included. In this stage, participants again were given a week again to examine and fill in the questionnaire again. The results of the last stage were found the same as the third one. Therefore, reconciliation between participants were gathered. The results regarding teachers' responsibilities and roles during mathematical activities are presented in the following sections.

In preparation of these tools, they were presented to five different experts. These experts were an associate professor doctor, an assistant professor doctor, a lecturer, and two research assistants. They were all studying mathematics education and had studies about the research topic. By presenting the data gathering tools to experts, it was aimed to get content and face validities. In order to ensure the internal validity of the questionnaire including open ended questions used in the first stage of the Delphi technique, the pilot study of each data collection tool was carried out with four preschool teachers.

Results

Teachers' Responsibilities in Improving Preschool Students' Mathematical Skills

Participants' perceptions were grouped under six categories; preschoolers' mathematical readiness and interests, content of mathematical activities and implementation process, teachers in mathematics activities, environment used in mathematics activities, materials used in mathematical activities, and lastly family participation in mathematics activities. In the rating of the items, 'definitely have this responsibility, DHR, (1-1.80),' 'have this responsibility, HR, (1.81-2.60),' 'undecided, U, (2.61-3.40),' 'have no responsibility, HNR, (3.41-4.20)' and 'definitely not have this responsibility, DHNR, (4.21-5.00)' were used. The mean and standard deviation of the data gathered are shown in Table 1.

Table 1. Teachers' responsibilities in improving preschoolers' mathematical skills

Categories	Responsibilities	2. Stage \bar{X}	3./4. Stages \bar{X}	\bar{X} Level	SD
Preschoolers' mathematical readiness and interests	1. Considering appropriateness to cognitive development levels	1.15	1.15	DHR	.362
	2. Considering individual differences	1.15	1.15	DHR	.362
	3. Considering appropriateness to age	1.11	1.11	DHR	.320
	4. Considering appropriateness to psychomotor skills	1.19	1.19	DHR	.483
	5. Being aware of mathematical learning needs	1.19	1.19	DHR	.396
	6. Giving attention to interests	1.26	1.26	DHR	.447
	7. Considering readiness levels	1.15	1.15	DHR	.456
	8. Paying attention to success levels	1.33	1.33	DHR	.734

Table 1. Teachers' responsibilities in improving preschoolers' mathematical skills (continued)

Categories	Responsibilities	2. Stage \bar{X}	3. /4. Stages \bar{X}	\bar{X} Level	SD
	9. Considering cultural differences	2.74	2.85	U	1.322
	10. Considering children not to be afraid of mathematics	1.44	1.33	DHR	.555
	11. Considering children's attention span	1.19	1.19	DHR	.396
	12. Helping to learn mathematical concepts	1.26	1.22	DHR	.506
	13. Creating relevant awareness in mathematics	1.33	1.37	DHR	.492
	14. Preparing children to primary education	1.33	1.30	DHR	.609
	15. Encouraging children to learn mathematics	1.30	1.30	DHR	.465
	16. Considering children's math learning needs	1.44	1.37	DHR	.492
Content of mathematical activities and implementation process	1. Including mathematics to different activities	1.44	1.41	DHR	.572
	2. Taking children's attention to mathematics	1.22	1.22	DHR	.424
	3. Integrating mathematics and real life	1.37	1.37	DHR	.565
	4. Not forcing children during their mathematics learning process	1.37	1.37	DHR	.565
	5. Paying attention to communicating with children in the mathematics learning process	1.19	1.19	DHR	.396
	6. Ensuring that children are active in mathematical activities	1.30	1.30	DHR	.465
	7. Not bothering children in mathematical activities	1.48	1.44	DHR	.577
	8. Giving children equal opportunities in mathematical activities	1.26	1.26	DHR	.526
	9. Considering to take care of children individually	1.41	1.37	DHR	.629
	10. Keeping children happy in mathematics activities	1.22	1.22	DHR	.424
	11. Giving children opportunities to be creative	1.26	1.26	DHR	.526

Table 1. Teachers' responsibilities in improving preschoolers' mathematical skills (continued)

Categories	Responsibilities	2.	3. /4.	\bar{X}	SD
		Stage \bar{X}	Stages \bar{X}	Level	
Content of mathematical activities and implementation process	12. Making children ready to learn mathematics cognitively	1.15	1.15	DHR	.362
	13. Being aware of the consequences of previous mathematics activities	1.52	1.44	DHR	.577
	14. Preparing different mathematics activities	1.22	1.22	DHR	.424
	15. Being careful about the fact that children see mathematics activities enjoyable	1.07	1.07	DHR	.267
	16. Determining teaching methods appropriate to mathematical activities	1.26	1.26	DHR	.526
	17. Implementing mathematical learning process without making children aware of it	1.26	1.26	DHR	.447
	18. Preparing mathematical games	1.37	1.41	DHR	.694
	19. Using game method during mathematical learning process	1.25	1.15	DHR	.362
	20. Using worksheets	1.30	1.30	DHR	.465
	21. Using questioning technique	1.33	1.33	DHR	.480
	22. Preparing questions appropriate to children's cognitive characteristics	1.48	1.44	DHR	.577
	23. Preparing reinforcements	1.22	1.26	DHR	.447
	24. Repeating mathematical topics constantly	1.26	1.26	DHR	.656
	25. Preparing homework assignments	1.70	1.70	DHR	.993
	26. Being careful to finish the mathematics activities successfully	1.33	1.33	DHR	.555
	27. Choosing appropriate assessment methods for children's cognitive characteristics	1.41	1.41	DHR	.747
	28. Making evaluations in different mathematical activities	1.33	1.33	DHR	.555
	29. Using rubrics	1.74	1.67	DHR	.784

Table 1. Teachers' responsibilities in improving preschoolers' mathematical skills (continued)

Categories	Responsibilities	2. Stage \bar{X}	3. /4. Stages \bar{X}	\bar{X} Level	SD
	30. Preparing mathematical activities that will allow children to explore	1.30	1.30	DHR	.542
	31. Keeping portfolios about children's mathematics learning process	1.56	1.48	DHR	.643
Teachers in Mathematics Activities	1. Giving attention to self-improvement	1.19	1.19	DHR	.396
	2. Being creative	1.15	1.19	DHR	.396
	3. Paying attention to have an alternative plan	1.44	1.30	DHR	.542
	4. Being a good observer	1.11	1.11	DHR	.320
	5. Teacher's being a researcher	1.30	1.30	DHR	.542
	6. Attention to teacher's being readiness	1.07	1.07	DHR	.267
	7. Teacher's attention to planning mathematics learning process	1.22	1.19	DHR	.396
Environment Used in Mathematics Activities	1. Preparing learning environment appropriate to mathematical activity.	1.07	1.07	DHR	.267
	2. Creating a relaxing learning environment for children	1.19	1.19	DHR	.396
	3. Using learning environment correctly	1.11	1.15	DHR	.362
Materials used in Mathematical Activities	1. Preparing visual materials	1.07	1.11	DHR	.320
	2. Choosing colorful materials	1.04	1.07	DHR	.267
	3. Choosing easy-to-use materials	1.30	1.30	DHR	.542
	4. Preparing evaluation material in advance	1.67	1.48	DHR	.753
	5. Choosing children's favorite materials	1.19	1.19	DHR	.396
	6. Choosing materials that will not harm children	1.04	1.11	DHR	.320

Table 1. Teachers' responsibilities in improving preschoolers' mathematical skills (continued)

Categories	Responsibilities	2. Stage \bar{X}	3./4. Stages \bar{X}	\bar{X} Level	SD
	7. Choosing different materials that are not existed in the class beforehand	1.67	1.67	DHR	.877
	8. Teacher's giving attention to creating materials	1.63	1.63	DHR	.926
	9. Choosing materials from everyday life	1.07	1.11	DHR	.320
Family Participation in Mathematics Activities	1. Being able to direct family members correctly	1.89	1.89	HR	1.050
	2. Getting support from parents	1.81	1.81	HR	.834
	3. Inviting parents to participate mathematical activities	2.81	2.89	U	1.281
	4. Getting parent support for repetition of topic issue	1.44	1.44	DHR	.641
	5. Informing parents about shortcomings of children	1.44	1.44	DHR	.577
	6. Getting help from parents on reinforcement	2.04	2.04	HR	.940
	7. Encouraging parents to have productive time with their children	1.78	1.78	DHR	.698
	8. Sending children's homework to the parents	1.52	1.52	DHR	1.087
	9. Being in communication with parents	1.19	1.19	DHR	.396

When participant teachers' perceptions are examined, participants had the same level of consensus in the second stage as well as at the end of the study. This indicates that the participants have agreed on these items. There are minor differences about the level of agreement. Differences are seen especially in five items. 'Being able to direct family members correctly,' 'getting support from parents,' and 'getting help from parents on reinforcement' are three items that participants' agreement level is 'have this responsibility.' About two items 'considering cultural differences' and 'inviting parents to participate mathematical activities,' participants' agreement level is 'undecided.'

Teachers' Role in Improving Preschool Students' Mathematical Skills

Participants were asked how they perceived the role/roles of the teacher in improving preschool students' mathematical skills. Perceptions under this theme are presented under three categories. These categories are presented as the learning process, the environment, and finally the students. In rating of the role descriptions, 'definitely have this role, DHR, (1-1.80),' 'have this role, HR, (1.81-2.60),' 'undecided, U, (2.61-3.40),' 'not have this role, NHR, (3.41-4.20)' and 'definitely not have this role, DNHR, (4.21-5.00)' were used. The average, mean level and standard deviation of the perceptions gathered are presented in Table 2.

When examining perceptions about the role of teacher, it appears that the participants have reached a consensus in all role categories. Only in relation to the authoritative role of the teacher ($\bar{X}=1.78$), unlike the second stage, the average in this stage has to be changed and finally named as 'definitely have this role.'

Table 2. Teachers' role in improving preschool students' mathematical skills

Categories	Roles	2. Stage \bar{X}	3. /4. Stages \bar{X}	\bar{X} Level	SD
In terms of Learning Process	1. Instructive	1.56	1.52	DHR	1.087
	2. Learning process planner	1.26	1.26	DHR	.526
	3. Practioner in learning process	1.44	1.44	DHR	.847
	4. Evaluativer in learning process	1.44	1.41	DHR	.931
	5. Authoritative	1.81	1.78	DHR	1.121
	6. Resultant in learning process	1.63	1.63	DHR	.839
	7. Making learning process fun	1.30	1.30	DHR	.542
	8. Alternative planner	1.41	1.41	DHR	.694
	9. Observer	1.15	1.15	DHR	.362
	10. Educator	1.19	1.19	DHR	.396
In terms of Learning Environment	1. Preparing learning environment	1.15	1.15	DHR	.456
	2. Leader of learning environment	1.74	1.63	DHR	1.115
	3. Providing security of learning environment	1.15	1.15	DHR	.362
	4. Helping children enjoy learning environment	1.15	1.15	DHR	.362
In terms of students	1. Guide	1.19	1.19	DHR	.396
	2. Role model	1.26	1.26	DHR	.526
	3. Leading children	1.37	1.37	DHR	.792
	4. Everything	1.81	1.81	HR	1.302
	5. Researcher	1.37	1.41	DHR	.694
	6. Helper	1.33	1.33	DHR	.832
	7. Advisor	1.22	1.22	DHR	.641
	8. Making children like math	1.48	1.44	DHR	.698
	9. Preparing primary education	1.41	1.37	DHR	.839
	10. Making children active	1.30	1.30	DHR	.542
	11. Parents	1.85	1.85	HR	1.134
	12. Friend	1.63	1.63	DHR	1.115

Discussion and Conclusion

The positive and negative behaviors teachers exhibited in the teaching process give an idea about both teachers' effectiveness and students' success (Stronge, 2007). Among the factors related with school, the

quality of the teacher is the most important one affecting the success of children (Rice, 2003). In this study, perceptions about teacher responsibilities and roles in improving preschoolers' mathematical skills were asked to preschool teachers.

Preschool teachers' perceptions in the first stages are about preparing children for primary school, paying attention to their individual differences, ensuring children not afraid of mathematics, and paying attention to children's ages. Among all the perceptions gathered, considering children's cognitive development levels, individual differences, their ages and readiness levels are more frequently expressed than others in the last stage of Delphi technique. Kirova and Bhargava (2002), like the perceptions found in this study, have emphasized the possibility of planning appropriate learning experiences for children and taking into account their developmental levels. Arnas Aktaş (2009) also mentioned the importance of determining children's development levels and the activities that are appropriate for these development levels. She also emphasized the importance of assessing teaching opportunities according to their readiness to learn. It is seen that the findings of the study from this respect are consistent with Arnas Aktaş's (2009) and Kirova and Bhargava's (2002) studies. In addition, according to current early childhood education curriculum's properties preschool teachers have chance to be flexible in implementation of curriculum (MoNE, 2013). In this way, teachers can act according to children's individual differences and developmental levels. Hence, preschool teachers' perceptions determined in this study are parallel to current early childhood education curriculum's properties.

Preschool teachers have emphasized the responsibilities of teachers as preparing and performing repetitions in the teaching process, using play as a teaching method, asking questions, and preparing reinforcements for children under content of mathematical activities and implementation process category. However, at the last stage of Delphi technique, the participants highlighted their responsibilities as preparing children cognitively to learn and making sure that children see math activities fun. In this case, it can be considered that participant preschool teachers expressed their responsibilities as in the development areas of Preschool Teachers' Special Proficiency Areas in relation to the field of competence (MoNE, 2008). The field of competence includes the process of planning the teaching learning process (MONE, 2008). While planning teaching learning process, preschool teachers should consider children's cognitive preparedness as well as preparing math activities that are fun for children. Therefore, findings of this study coincide with the field of competence mentioned in Preschool Teachers' Special Proficiency Field document.

Under teachers in mathematics activities category, participant preschool teachers pointed out that the teachers being creative, being a good observer and being prepared as their responsibilities. Being creative responsibility is related with creativity and aesthetics competence in Preschool Teachers' Special Proficiency Areas (MONE, 2008) and responsibility for being a good observer is related with assessment competence in the same document (MoNE, 2008). These findings also coincide with this document.

Under environment used in mathematics activities category, preschool teachers reached consensus in paying attention to make the environment suitable for the activity and in using the environment correctly. Arnas Aktaş (2009) also stated that preschool teachers should prepare suitable environments for children to express their thoughts. About learning environment, Kirova and Bhargava (2002) stated that teachers should try to integrate their learning experiences in a context that encourages children to make connections within mathematical concepts and to construct them. At the same time, preparing learning environment appropriate to activities and using the learning environment correctly are teachers' responsibilities, and these are expressed in competence developmental areas in the Preschool Teachers' Special Proficiency Areas (MoNE, 2008). Therefore, the findings of this study support this document.

Selection of easy-to-use materials, preparation of visual materials, and choosing different materials that do not exist in the classroom are frequently expressed by participants and are also related to the field of competence developmental area (MoNE, 2008). Later on, consensus between participants has been reached in selecting materials from everyday life, preparing visual materials, choosing colored materials, and selecting safe materials as teachers' responsibilities in the last stage of Delphi technique. About materials, Oktay (1999) stated that qualified preschool teachers should be able to provide and prepare many educational materials. DeVries et al. (2002) mentioned the importance of providing interesting materials for children. Similarly, the findings of this study also revealed the possibility of selecting and providing

materials with the features mentioned in the research findings (e.g. DeVries et al., 2002; Oktay, 1999) as teacher responsibilities.

The families are effective in children's education according to current early childhood education curriculum (MoNE, 2013). About family participation in mathematics activities category, being in communication with parents, sending children's homework to parents, and getting parent support for repetition of a topic are frequently mentioned by participants. At a later stage, they agreed on the point of being in communication with parents. When these perceptions are examined in general, participants' perceptions are like in family participation and family education competence area of Preschool Teachers' Special Proficiency Areas (MoNE, 2008). One of the basic principles of early childhood education curriculum emphasizes active participation of family to their children's educational process (MoNE, 2013). In Özsırkıntı, Akay and Yılmaz Bolat's (2014) teacher definition, the teacher is defined as a person who will provide family participation. Similarly, Oktay (1999) emphasizes that qualified preschool teachers should cooperate with their families. Therefore, it is seen that the results of the research support the existing literature.

In sociology, the role concept (Erdoğan, 2008) is defined as a set of behaviors and attitudes that are given to the status of rights, obligations and social position and can be understood as status behavior in a sense. Similarly, Akyüz (2001) defined role as a state of particular status or place in a group or social situation built on specific rights and duties. In this study, the concept of role was taken as the behaviors expected from teachers about their profession. Sünbül (1996) stated that a teacher's success and failure in the teaching process is mostly related to his/her roles and responsibilities and how s/he uses his/her power. In this study, preschool teachers were also asked about teachers' roles in improving children's mathematical skills. Similar to the results of this study, Amidon and Hunler (1969, as cited in Demirci, 1993) mentioned the teachers' roles as planning class activities and giving information to the students about class activities. In Çelikten, Şanal and Yeni's (2005) descriptions of teacher, they discussed instructive role of teachers. Participant preschool teachers' perceptions are considered to be about teachers' expertise and teachers' particular knowledge of mathematics education. However, Çelikten, Şanal and Yeni (2005) defined instructive role of teacher as preparing plans and programs in which learners can learn effectively.

About "in terms of learning environment category," preschool teachers have emphasized the role of preparing the learning environment. Havighursl and Ncu-Gartcn (1967, as cited in Sünbül, 1996) associated teacher roles with pupils and mentioned the role of classroom management in organizing classroom physical environment. From this point of view, it is seen that the findings gathered in the research are consistent with the role descriptions of Havighursl and Ncu-Gartcn (1967, as cited in Sünbül, 1996). Başar (1999) defined learning environment as combination of physical, behavioral and teaching environments. In a sense, as Bozaslan, Young, Kaya and Merter (2012) pointed out that the educational environment is the one in which teaching and learning activities, educational communication and interaction take place. Therefore, it can be assumed that the participants are concerned with this important element.

Finally, about "in terms of student category," preschool teachers have focused on the roles of guide, role model, facilitator and everything. The role of being a guide has been defined by Kuzgun (1991) as a systematic and professional helping process for the individual to understand himself, to define the possibilities in the environment and to make the right decisions. It can be considered that the participants wanted to help children in the learning process and to make the children realize themselves in learning mathematics by focusing on the guiding role of teachers. Similar to the findings of this research, it is seen that in the current literature focuses on the teachers' role of guidance (Bela, 1969, as cited in Sünbül, 1996; Koç, 2006).

In the last stage of Delphi technique, preschool teachers have agreed on the role of observer and instructor about "in terms of learning process category," the role of preparing the learning environment providing security and liking the school environment "in terms of learning environment category," and finally the guiding role about "in terms of student category." These role descriptions that preschool teachers have agreed upon may be clarified with Cohen, Manion and Morrison's (1996) role definitions for teachers in elementary school classes. The observer role is likewise perceived as a person who carefully examines the interactions and existing reactions of children in the classroom. About the guiding role of the teacher, Cohen et al. (1996) stated that teacher is a person who gives advice on many problems and in any case. Role

modeling is a learning process in which individuals view their behaviors by observing the behaviors of others and Köse and Demir (2014) have reached the conclusion that the teachers in the study carried out by middle and high school students have left serious traces on the student as role models. In this study, a similar perception has emerged in the same way. When these perceived perceptions are examined in general, it can be said that participants have a common perception in their roles of preparing and guiding the environment. Thus, the current literature (Bozaslan et al., 2012; Cohen et al., 1996; Çelikten et al., 2005; Sünbül, 1996) supports the research findings.

In this study, preschool teachers' roles and responsibilities in improving preschool students' mathematical skills were determined from the participants' perceptions. For enriching the findings of this study, in further studies observations in participant preschool teachers' classrooms during a term could be done. Besides, in selection of participants in this study convenient sampling method was used. This is a limitation for the study. So, in further studies another sampling method could be selected for achieving generalization of the findings. The findings of the study are very rich in itself, these could be used for constituting a questionnaire and this questionnaire could be used for reaching more preschool teachers. Finally, the last suggestion could be that further researches could also be done in different cities across Turkey.

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