

*Full Length Research Paper*

# Observation of the effectiveness of drama method in helping to acquire the addition- subtraction skills by children at preschool phase

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Principal aim of this study is to show the effectiveness of the program prepared by researchers in order to enable 6 year-old children attending pre-school educational institutions to effectively gain addition-subtraction skills through a drama-related method. The work group in the research comprised of 80 kids who continued their education in kindergarten at the province of Konya during 2011 to 2012 academic year. Shopping method was applied to 40 of the children (18 girls, 22 boys) and conventional method to the other 40 children (19 girls, 21 boys). A general store, birthday preparations, toy store, market place, bookstore, and clothing store was established in the dramatic learning centre of the classroom. Every centre was exhibited for a period of two weeks within the classroom. Within that period, dramas through which children used their operation skills while shopping at the organized centre were carried out. The education programme lasted for 12 weeks in total. Data were collected with the "Operation Skill Scale for Kids (6 years old) at Preschool Phase" developed by Soydan. Dependent t-test was used in comparing the pre-test/post-test point averages of the experiment and control groups and independent t-test was used in determining the differences of success between the groups. According to the result of the research, statistically a significant difference at a level of 0.05 between the Operation Skill Scale for Kids (6 years old) at Preschool Phase point average of children within the experiment group who were trained with the shopping method and children within the control group who participated in the conventional education programme was observed. The score of experiment group was recorded higher than of the control group. This result puts forth that the education programme with which operation skills are taught through shopping method to children who still attend to preschool educational institution is effective in teaching children operation skills.

**Key words:** Preschool mathematics education, addition-subtraction skills-drama method.

## INTRODUCTION

All of the social relations which the child is a part of, stimulant materials around him, the child's sufficient interaction with these materials and the quality education he receives is quite effective to his early academic skills. Early academic skills education which comprises literacy skills and mathematical skills both increases the children's

readiness to primary education and also help the children to be more successful in future academic skills (Uyanik and Kandır, 2010: 118). For the children not to fear mathematics, liking mathematics and developing a positive attitude towards mathematics is directly proportional to their mathematical experience in their early

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childhood (Erdoğan, 2006). In addition to the aforesaid, the effectiveness of the quality of the preschool education programmes and the used method and techniques are important in the development of mathematical proficiency of children during the primary school years where they face formal mathematics education (Charlesworth and Lind, 2003; Dearing et al., 2009; National Research Council, 2001; NMAP, 2008; Klein et al., 2004; Botha et al., 2005; Wolfgang et al., 2003). Thus, as a result of a study conducted, it was detected that children from age group of 6 who received preschool education are more competent in mathematical skills when compared to the group who did not (Polat Unutkan, 2007). For that matter some other studies showed that to receive education in mathematics during preschool period positively affects the students' success in mathematics throughout primary and secondary school (Wolfgang et al., 2003; Güven, 2006; Dağlı, 2007). These findings of the said researches are important in terms of showing that to teach basic mathematical skills to children at preschool phase contributes to their future academic success.

However, the success of children in mathematics and which direction will their attitude towards mathematics develop on a large scale depends on the importance given by their teacher to activities related with mathematics. Practices which are carried out with figures drawn on a paper by making the children in this phase sit in a stationary, quiet and calm manner limit the curiosity, excitement and enthusiasm of these children towards the applied subject. For that matter the concepts regarding mathematics must firstly be taught to children with their daily life experience, by means of games and in a fun manner with real materials (Uyanık and Kandır, 2010; Seo and Ginsburg, 2004). As a matter of fact Tarım and Bulut (2006) determined that 85.7% of preschool teachers liked to make the children play games related to mathematics and that 78.7% of these teachers felt comfortable when making use of games while teaching mathematics.

However, the content of the games that the children play and the social interaction established during this process are important for the development of their mathematical skills. Children are affected by the constraints they experience while learning new mathematical concepts and social interaction plays a key role by affecting the children's activities and goals (Sophian, 1998). It was detected in the studies carried out that children who are socially interactive with their peers and play games concertedly are more successful in learning activities within the class (Coolahan et al., 2000; Fantuzzo et al., 2005; Mendez et al., 2002; Fantuzzo et al., 2004; Zigler and Bishop-Josef, 2006). This is because the social interaction in peer games creates opportunities to expand, support and set an example for each other's mathematical skills (Mendez and Fogle, 2002; Nicolopoulou et al., 2006). In addition even though the free time games develop informal mathematical

concepts, the goal oriented social interaction helps children to expand and consolidate the concepts (Starkey and Klein, 2008). For this reason the social interaction applications, which positively effects the academic success of children, must be prepared goal-oriented and be subject to a schedule.

The education method which offers the children various learning types such as to create social interaction, discuss, discover, establish cooperation all together is drama (Meşeci et al., 2012). Drama; individuals within a group work giving a meaning and animating with game like processes, in which old cognitive patterns are reviewed, to an experience, incident, idea, education unit or even sometimes an abstract concept or behaviour by making use of theatre or drama techniques such as improvisation and role playing (Karadağ and Çalışkan, 2006; Kahyaoğlu et al., 2010; Kaba and Şimşek, 2012). Animation develops through the imitation of life and as a child generally perceives animation activity as a game, he focuses his attention and energy to the activities just like he does when he is playing which provides children to learn by discovering (Tanrıseven et al., 2010). Children, during animation activities, gain new knowledge, concepts and experience through the character that he animates. These dramatic plays, planned with proper roles and arrangement, help to develop mathematical skills of children. For example, a child playing the role of a grocer or shopkeeper can learn addition and subtraction.

It is hard for children in preschool phase to learn addition and subtraction which is a simple operation in mathematics and comprehend their meaning. For that reason in order to increase the mathematical comprehension of small children, the association between old knowledge and new knowledge must be established (Akman, 2002). This, in mathematics education, can occur with the child gaining meaningful experiences while playing games through drama technique. Moreover, since children can do addition and subtraction with the help of concrete objects, concrete experiences must be presented (Charlesworth, 2005; Charlesworth and Lind, 2003; Butterworth, 2005; Peker and Mirasyedioğlu, 2008; Tucker et al. 2002), processes which help children to have fun, be interested and excited while learning mathematics should be provided (Poyraz and Turhan, 2006). As a matter of fact the drama method amongst the other effective methods which create the opportunity for children to have fun while learning mathematics with concrete objects has been ascertained that it is being used for 6 year olds (Sezer, 2008; Erdoğan and Baran, 2009), 2<sup>nd</sup> graders (Moreover and Omniewski, 1999) 3<sup>rd</sup> graders (Kayhan, 2004; Soner, 2005), 4<sup>th</sup> graders (Fleming et al., 2004; Kariuki and Humphrey, 2006; Sözer, 2006), 5<sup>th</sup> graders (Hatipoğlu, 2006; Tanrıseven Üredi et al., 2010), 6<sup>th</sup> graders (Saab, 1987; Şenol Özyiğit, 2011) 7<sup>th</sup> graders (Geçim, 2012; Debreli, 2012; Yenilmez and Uygan, 2010; Karapınarlı, 2007; Duatepe-Paksu and Ubuz, 2009) and 8<sup>th</sup> graders (Özsoy, 2003;

**Table 1.** Independent t-test results regarding the comparison of pre-test scores concerning the operation skills of groups (n=80).

Operation skill	Group	n	$\bar{x}$	SD	t	P
Addition	Experimental	40	8.92	3.39	1.07	0.28
	Control	40	8.20	2.50		
Subtraction	Experimental	40	6.30	2.75	1.71	0.09
	Control	40	5.33	2.22		

Şengül and Ekinözü, 2006; Örnek, 2007) and that it increases their level of learning. However, it is observed that the number of researches conducted towards children in preschool phase on the affectivity of drama method for mathematics education is quite insufficient.

For that reason, in this research, in order for children, 6 years of age, to effectively acquire operation skills, education programme prepared by researchers while using shopping technique within the dramatic activities was applied to children who continue their education in preschool education institutions and its effect on operation skills was examined.

## METHODOLOGY

### Model

As the program prepared is a novel and different program, its effectiveness was tried to be analyzed and determined by comparing it to traditional programs and training methods. To enable controlled determination of the existing situation a trial model with "pretest-final test control group" from real trial models was employed. Dependent variable in the design was "Addition-subtraction skills" of the 6 year old children attending nursery class and the independent variable examined was "Addition-subtraction program delivered via the drama-related method". In addition to their normal life, Training Program Supporting the Addition-Subtraction Skills was applied to the experimental group by the researchers while control group was delivered only traditional (daily) training program by their teachers.

### Sample group

A total of 80 kids who attended kindergarten in the province of Konya during the 2011-2012 academic year, participated to the research as work group, 40 of whom were experimental group (18 girls, 22 boys) and the remaining 40 were control group (19 girls, 21 boys). Factors such as proximity of socioeconomic levels, similarity of school success and opportunities, easy transportation and time were taken into consideration in determining the schools which comprise the work group. In determining the classrooms, on the other hand, teacher opinions, classroom structure and student characteristics were taken into consideration. In line with these data, current existing classrooms were selected without disrupting the classroom structures by using the cluster sampling method. In addition to the aforesaid, which group would be the experimental or the control group was determined by impartial appointment. In the course of collection of the research data necessary permits were

taken and the aim of the study was explained by arranging interviews with schools. In order to determine whether input behaviours of groups showed any differences in terms of operation skills or not, "Operation Skill Scale for Kids (6 years old) at Preschool Phase" was applied as the pre-test. Independent t-test results regarding the comparison of pre-test scores of groups are provided in Table 1.

As it can also be understood from the examination of Table 1, there is no significant difference between the averages of pre-test scores of groups ( $p>0.05$ ). According to this result, it can be considered that the groups are balanced. In other words, if the independent variables that cannot be controlled are assumed that they may effect the experimental and control group in the same manner, it can be stated that the differences in the acquisition of operation skills of children may depend on the operations carried out within the experimental and control group.

### Assessment instrument

This research is used developed by the Soydan "Addition Subtraction Skills Questionnaire". The literature relating to the addition and subtraction skills that preschool-age children are expected to have was reviewed and a 20-article report was prepared by the researchers. In addition, benchmark materials were determined. For the benchmark, a millipede toy made of magnetized beads, number and symbol cards were prepared. Each question in the benchmark was asked to children by using the toy "Millipede Koki". Validity of the benchmark was analyzed through the expert opinions and exploratory factor analysis.

The data obtained after the application of the benchmark to the experimental group was uploaded to the software "SPSS 16" to analyze the validity and reliability of the benchmark statistically. The results of the analyses made suggest that KMO value of the scale is .95 and also Barlett Test is meaningful (Ki-square=4.12, df=19,  $p=0.00$ ,  $p<0.05$ ). These results indicate that data are suitable for carrying out a factor analysis. Varimax Rotation and Rotated Component Matrix that was carried out indicate that loadings in addition skill sub-scale of Operational Skill Scale of Children in Preschool Age varies between .72-.81; and its loadings subtraction skill sub-scale vary between .54 to .83. Examining total variance obtained as a result of Components Analysis, 2 factors which explain 72.66 % of total variance was obtained. The findings indicate that the first factor explains 39.68% of total variance while the second factor explains 32.98% of total variance. These results show that the scale developed to determine operational skills of 60 to 72 month-old children fully assessed this structure and achieved the goal. Inter sub-benchmark correlation coefficient of the benchmark is 0.84. Reliability results of the scale suggest that Spearman Brown reliability coefficient is .91; Guttman Split-Half value is .91; and Cronbach's alpha reliability coefficient is .97. Accordingly, it can be said that the scale has internal consistency. T-test, as an indication of reliability of the scale, was carried out on

the meaningfulness of the difference between bottom and top 27%. The statistical analysis made suggests that the difference between bottom and top 27% is meaningful by .001. The analysis made for item discrimination indicate that for the first factor item, factor correlation coefficients vary between 0.78 and 0.85; and for the second factor they vary between 0.64 and 0.81. Each item is in a positive and meaningful relationship with the general of the factor ( $p < 0.001$ ). These coefficients indicate the factor's level to serve its general objective. Mean distinguishing power of the benchmark is 79. For the item strength of the benchmark, varied between 0.74 and 0.89 for the first factor and between 0.50 and 0.84 for the second factor, mean item strength of the benchmark is 0.72. In addition, overall mean of the correlation between the items of the benchmark (inter-item correlation) is 0.73.

### Procedure

Literature regarding preschool mathematics education and pre-school drama was scanned by the researchers before the addition-subtraction education programmes provided with shopping method was prepared. During the literature research, firstly theoretical basis concerning the acquisition process of operation skills of children who are 60 to 72 months old. In the sources within the literature, it is mentioned that children in preschool age could achieve addition and subtraction operations related with verbal problem cases with tangible objects between numbers 1 to 10 which were presented to them as "I had two balls and I bought another one, now how many balls do I have in total?" instead of asking "What is two plus one?" (Kamii and Housmann, 2000; Diaz et al., 2009; Barth et al., 2005; Jeanne et al., 2009; Greenberg 1994, Lansdell 1999, Butterworth, 2005; Zhou and Wang, 2004; Gilmore and Braynt, 2006; Ktoridou et al., 2005; Artut and Tarım, 2006; Tucker et al., 2002; Zur and Gelman, 2004; Barth et al., 2005; Griffin, 2004; Gifford, 2005; Avcı and Dere, 2002; MEB, 2012; Aktaş Arnas, 2012; Tarım and Deretarla, 2003). In the course of researches into addition-subtraction operations with children, it is advised that the meanings of symbols such as "+" "-" "=" should be explained (Nair and Pool, 1991; Aktaş, Arnas, 2012; Orton and Frobisher, 1996; Baykul, 1999); that the teacher should urge the children to realize the order of numbers after adding one to the total number of given object group, and afterwards to carry out operations of adding zero (0) to the total number where the children should be made to realize that adding zero does not change value of total number; and the fact that changing places of numbers which are added to each other does not affect the result ( $2+3=5$ ,  $3+2=5$  etc.) should be also indicated (Butterworth, 2005).

It was determined that there are 4 different problems cases suitable for subtracting operation with children in preschool age. These can be listed as problems of casting, equalizing, separating and comparing (Troutman and Lichtenberg, 1991; Kamii and Housmann, 2000; Busbridge and Womack, 1991; Hatfield et al., 1997). Also, in Ministry of National Education, Preschool Training Programme booklet, operational skills that 60 to 72 month-old children in preschool period should acquire are stated as "doing simple addition and subtraction operations using objects" (MEB, 2012).

In the light of this information, an education programme which will be provided by the shopping method was prepared by the researchers. A programme, which allows children to make addition-subtraction with numbers between 1 and 10, was designed. General store, birthday preparations, toy store, market place, bookstore, clothing store were prepared as dramatic learning centres in the classroom within the scope of the programme. Every centre was exhibited for a period of two weeks. Within this period, dramas where children used their operation skills while shopping were animated in the prepared centre. It was also assumed that children will also learn about basic consumer skills apart from only

acquiring knowledge on operation during the drama activities which comprises different shopping environments (general store, toy store, market place, bookstore, clothing store, etc.). For that reason, children applied purchasing behaviours such as making a list of items to be purchased before going out for shopping, giving money at the cashier and receiving remainder by counting it, trying clothes before buying them, examining the organisation of aisle which consists different product groups in the general store, comparing similar products with different price and components. Then it is expected for the child to practise, by experiencing, both his operational knowledge and consumer skills while spending money with adults during shopping. Thus, it is aimed to be a preparation in order that children will be able to understand the adult life, which they consider complicated, and adopt them to it. Moreover, the child will learn the money concept as he will perform his operation knowledge with round cardboards designed to be used as coins during all these consumer activities.

A special program is not prepared for the class in which conventional education programme is run and the activities done by the class teacher are not interfered. The prepared education programme was applied as 2 days a week for 12 weeks during the second half of 2011 to 2012 academic years. The children in the group were applied the "Operational Ability Scale for Pre-School Children (Aged 6)" before and right after the application of education programme by the researchers individually.

### FINDINGS

The findings regarding the effects of the programme aiming to improve the operational abilities (addition-subtraction) of 6-year-old children having pre-school education is presented as follows in 3 different sub-hypotheses. The first hypothesis handled in the research is that "*the achievement points for the operational ability of the experimental group children participating in the addition-subtraction education programme given via shopping technique will increase significantly.*" In order to prove this hypothesis, the children in the experimental group were applied the addition-subtraction education programme given via shopping technique for 12 weeks and their achievement points were calculated by measuring their operational abilities before and after the application (pre-test – post-test). In Table 2, dependent t-test results of the dependant groups regarding the achievement points of the experimental group are given.

As it may be understood from the analysis of Table 2, the average of pre-test – post-test grades for the operational abilities of the experimental group children has increased significantly ( $p < 0.001$ ). This finding means that the addition-subtraction education programme given via shopping technique causes a significant increase in children's achievement points for their operational abilities. According to this result, it can be said that the changes in the operational skills of children is due to the addition-subtraction education programme given via shopping technique, and the children acquired the behaviours of operational ability.

The second hypothesis handled in the research is that "*the achievement points for the operational ability of the control group children participating in the conventional education programme will increase significantly.*" In order

**Table 2.** Dependent t-test results of the dependant groups for the comparison of the achievement points of the experimental group children (n=40).

Operation skill	Group	$\bar{x}$	SD	t	P
Addition	Pre-test	8.92	3.39	-9.6	0.000*
	Post-test	15.92	3.01		
Subtraction	Pre-test	6.30	2.75	-10.8	0.000*
	Post-test	13.87	3.39		

**Table 3.** Dependent t-test results of the dependant groups for the comparison of the achievement points (pre-test – post-test) of the control group children (n= 40).

Operation skill	Group	$\bar{x}$	SD	t	P
Addition	Pre-test	8.10	2.56	-6.0	0.000*
	Post-test	12.84	4.22		
Subtraction	Pre-test	5.30	2.20	-8.6	0.000*
	Post-test	11.15	3.63		

**Table 4.** The t-test results of independent groups regarding the comparison of the operational ability (post-test) grades of children in experimental and control groups (n= 80).

Operation skill	Group	n	$\bar{x}$	SD	t	P
Addition	Experimental	40	16.02	3.04	3.84	0.000*
	Control	40	12.84	4.22		
Subtraction	Experimental	40	14.02	3.48	3.58	0.000*
	Control	40	11.15	3.63		

to prove this hypothesis, the children in the control group were given conventional education programme given at a pre-school for 12 weeks and their achievement points were calculated by measuring their operational abilities before and after the application (pre-test – post-test). In Table 3, t-test results of the dependant groups regarding the achievement points of the control group are given.

According to Table 3, the average of pre-test – post-test grades for the operational abilities of the control group children has increased significantly ( $p < 0.001$ ). This finding expresses that the activities which are about operational ability involving conventional education applications causes a significant increase in the achievement points of the children. Therefore, it can be said that the changes occurred in the children's operational ability is caused by the activities of the control group and that the children's behaviours about their operational ability has improved.

The third hypothesis handled in the research is that *“the addition-subtraction education programme given via shopping technique (experiment) may cause a remarkable increase the success (post-test) rates of the kids when*

*compared to conventional (control) education”*. Pre-test and post-test (success) rates of the children in both experimental and control groups are compared after the education programmes in order to test this hypothesis. In Table 4, the t-test results of some independent groups regarding the comparison of the success (post-test) grades of children in experimental and control groups are given.

In Table 4, it is clearly seen that the average post-test grades of the experimental group children regarding both addition and subtraction abilities is significantly higher than that of the control group ( $p < 0.001$ ). The average addition post-test grades of the experimental group is  $\bar{x} = 16.02$  while the average addition post-test grades of the control group is  $\bar{x} = 12.84$ . The average subtraction post-test grades of the experimental group is  $\bar{x} = 14.02$  while the average subtraction post-test grades of the control group is  $\bar{x} = 11.15$ . An increase in the success rate of the experimental group is observed when compared to the control group. This may be interpreted as that the addition-subtraction education programme given via shopping technique provides a significant increase in

the success rates of children when compared to the conventional programme, and that the operation abilities of the children participating the experimental group is higher than that of those who attend pre-school but not supportive education programme. According to this result, it may be said that the addition-subtraction education programme given via shopping technique has a positive effect on children's operational abilities and makes them more successful.

## CONCLUSION

This research basically proves that children at preschool phase can acquire addition-subtraction operation skills which is one of the basic mathematic skills from as early as preschool years and that a successful preschool mathematics programme can be prepared by using shopping technique, one of the drama activities, in order to develop operation skills. According to the results achieved within the research children, acquires the operation skills on a higher rate through drama method when compared to the conventional education. Researches, within which mathematic programmes that use drama method towards the acquisition of mathematics skills support the results achieved in this research.

For example, similarly in studies of Erdoğan and Baran (2009), it was detected that mathematics education given to children under the age of six through the drama method is more effective than the education provided without the drama method and that at the end of the education there was an important difference with regard to scores in favour of the experimental group between the experimental and control groups. Sezer (2008), in his research studying the effect of drama method in teaching number and operation concepts to children under the age of five who receive preschool education, applied his education programme three days a week for six weeks. According to the result of the research, it was observed that the drama method has a significant effect in teaching children the number and operation concepts and supporting these concepts.

On the other hand, the result of the research contains similar findings with other researches conducted on different levels of education (Moreover and Omniewski, 1999; Kariuki and Humphrey, 2006; Saab, 1987; Şenol, 2011; Geçim, 2012; Debreli, 2012; Yenilmez and Uygan, 2010; Sözer, 2006; Soner, 2005; Fleming et al., 2004; Jackson, 1997; Duatepe, 2004; Duatepe and Akkus, 2006; Duatepe and Ubuz, 2009; Ekinözü and Şengül, 2007; Hatipoğlu, 2006; Kale, 2007; Karapınarlı, 2007; Kayhan, 2004; Kayhan and Argün, 2009; Korkmaz and Karadağ, 2007; Örnek, 2007; Tanrıseven et al., 2010; Yenilmez and Uygan, 2010). Also in those researches (Wolfgang et al., 2003; Sancak, 2003; Starkey et al., 2004; Bermejo et al., 2004) it was observed that through the methods and techniques used a significant difference,

in favour of the experimental group, emerged in mathematical concept and skills of children. This research and the other researches within the literature lays emphasis on selecting effective method and technique for the acquisition of mathematical concept and skills by children in preschool stage.

The drama method has an important effect on presenting abstract concepts by materialising them and supporting the process of learning by structuring new concepts on intuitive experiences of children, also enabling children to enjoy learning during the implementation process. Concrete materials were presented at the dramatic learning centres such as general store, toy store, market place, bookstore, clothing store while carrying out drama activities throughout the research and enabling children to learn through doing and living. During the implementation process it was observed that children were not bored during the teaching of abstract concepts such as number and operation and that they enjoyed participating. Researches regarding the effectiveness of concrete objects in developing mathematical skills support the results obtained through this research. Gilmore and Bryant (2006) put forth in their research that the use of concrete objects and various ways of presentation affect the mathematical thinking in children in a positive manner. Artut and Tarım (2006) conducted a research to develop the skills of preschool children regarding addition and subtraction operations through cooperative learning method and as a result of this study it was found that children are more successful in addition and subtraction operations implemented with concrete materials than when implementing with semi-concrete materials.

In addition to the aforesaid, at the dramatic learning centres such as general store, toy store, market place, bookstore, clothing store, prepared within our research, it was aimed for the children to acquire operation skills through socially interactive games. Fantuzzo et al. (2004) found out that ability to play interactive peer games is related with mathematical skills of children. Bulotsky et al. (2012) researched whether the interactive peer games have a mediator effect on problem behaviour and mathematics skills. According to the findings of the research, positive interactive peer games have a mediator effect on mathematic knowledge. These findings support the findings achieved through our research.

## SUGGESTIONS

The study aimed to use drama technique for early mathematics education in preschool educational institutions should be practiced in other provinces and the generalizability of the conclusions should be tested. In order to teach mathematics with entertaining activities without causing a fear of mathematics in children, preschool teachers have to be qualified for early mathematics

education. Therefore, in-service training sessions must be organized for teachers who find themselves unqualified in this respect. Also for efficiency of drama technique in mathematics education, through cooperation among the schools affiliated with the Ministry of National Education, training programs for techniques of education with drama should be included in in-service training courses offered to teachers every year according to their fields and branches. This would also raise awareness among teachers who are experienced but have not taken drama training. It is also possible to prepare guidebooks for teachers intended for practice of drama method in teaching. Even the relevant specialists drama guidelines prepared according to the contents of every lesson simplified to every age group may be conveyed to teachers through webpages, CDs, books, and software. Dramatization of shopping technique in mathematics education would not only help students in preschool ages improve their knowledge of counting and operations but also help them gain basic skills of everyday life such as recognition of money, and learning the rules of purchasing and shopping. Thus, the students will be allowed to learn by practice and experience, which will make the taught subjects more lasting.

## REFERENCES

- Akman B (2002). Okul öncesi dönemde matematik. Hacettepe Üniversitesi Eğitim Fakültesi Dergisi 23:244-248.
- Aktaş Arnas Y (2012). Okul öncesi dönemde matematik eğitimi. Ankara: Vize Yayıncılık.
- Artut DP, Tarım K (2006). Anasınıfı öğrencilerine toplama ve çıkarma becerilerinin kazandırılmasında kubaşık öğrenme yönteminin uygulanması, I. Uluslararası Okul Öncesi Eğitim Kongresi Bildiri Kitabı I. Cilt. İstanbul:Yapa Yayınları.
- Avcı N, Dere H (2002). Okul öncesi çocuğu ve matematik. V. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi, Ankara.
- Barth H, La Mont K, Lipton J, Spelke ES (2005). Abstract number and arithmetic in preschool children. Proc. Natl. Acad. Sci. 102:14116-14121.
- Baykul Y (1999). İlköğretim birinci kademe matematik öğretimi. İstanbul: Milli Eğitim Basımevi.
- Bermejo V, Morales S, DeOsuna GJ (2004). Supporting children's development of cardinality understanding. Learn. Instruction 14:381-398.
- Botha M, Maree JG, Witt MW (2005). Developing and piloting the planning for facilitating mathematical processes and strategies for preschool learners, Early Child Dev. Care 175:697-717.
- Busbridge J, Womack D (1991). Effective maths teaching a guide to teaching basic mathematical concepts. England: Stanley Thornes Ltd.
- Butterworth B (2005). The development of arithmetical abilities. J. Child Psychol. Psychiatry 46(1):3-18.
- Charlesworth R, Lind KK (2003). Math and Science for Young Children (4th ed.). Albany, NY: Delmar.
- Charlesworth R (2005). Prekindergarten mathematics: Connecting with national standards. Early Child. Educ. J. 32(4):229-236.
- Coolahan K, Fantuzzo J, Mendez J, McDermott P (2000). Preschool peer interactions and readiness to learn: Relationships between classroom peer play and learning behaviors and conduct. J. Educ. Psychol. 93:458-465.
- Dağlı A (2007). Okul öncesi eğitimi alan ve almayan ilköğretim birinci sınıf öğrencilerinin türkçe ve matematik derslerindeki akademik başarılarının karşılaştırılması. Yayınlanmamış Yüksek Lisans Tezi, Selçuk Üniversitesi, Konya.
- Dearing E, McCartney K, Taylor B (2009). Does higher quality early child care promote low-income children's math and reading achievement in middle childhood? Child Dev. 80(5):1329-1349.
- Debreli E (2012). Yaratıcı drama temelli öğretimin yedinci sınıf öğrencilerinin oran oranı konusundaki başarılarına ve matematiğe yönelik tutumlarına etkisi. Yayınlanmamış Yüksek Lisans Tezi. Orta Doğu Teknik Üniversitesi, Ankara.
- Diaz DP, Gunderson DJ, King PP, Lashley EL, Linder SM, Moss DA, Moss WF, Schumpert J (2009). Math out of the box, developing number concepts: Grade K: Kit A. Burlington, NC: Carolina Biological Supply.
- Duatepe A, Ubuz B (2009). Effects Of Drama-Based Geometry Instruction On Student Achi-Evement, Attitudes And Thinking Levels. The Journal of Educational Research, 102(4):272-286.
- Duatepe A, Akkus O (2006). Yaratıcı dramının matematik eğitiminde kullanılması: kümeler alt öğrenme alanında bir uygulama. Yaratıcı Drama Dergisi 1(2):89-97.
- Duatepe A (2004). Drama temelli öğretimin yedinci sınıf öğrencilerinin geometri başarısına, van hiele geometrik düşünme düzeylerine, matematiğe ve geometriye karşı tutumlarına etkisi. Yayınlanmamış Doktora Tezi, Orta Doğu Teknik Üniversitesi, Ankara.
- Erdogan S, Baran G (2009). A Study on The Effect of Mathematics Teaching Provided Through Drama on The Mathematics Ability of Six-Year- Old Children. Eurasia J. Math. Sci. Technol. Educ. 5(1):79-85.
- Erdogan S (2006). Altı yaş grubu çocuklarına drama yöntemiyle verilen matematik eğitiminin matematik yeteneğine etkisinin incelenmesi. Yayınlanmamış Doktora Tezi, Ankara Üniversitesi, Ankara.
- Fantuzzo J, Manz P, Atkins M, Meyers R (2005). Peer-mediated treatment of socially withdrawn maltreated preschool children: Cultivating natural community resources. J. Clin. Child Adolesc. Psychol. 34:320-325.
- Fantuzzo J, Sekino Y, Cohen HL (2004). An examination of the contributions of interactive peer play to salient classroom competences for urban Head Start children. Psychol. Sch. 41:323-336.
- Fleming M, Merrell C, Tymms P (2004). The impact of drama on pupils' language, mathematics, and attitude in two primary schools. Res. Drama Educ. 9(2):177-197.
- Geçim DA (2012). Yaratıcı drama tabanlı öğretimin, 7. sınıf öğrencilerinin olasılık konusundaki matematik başarılarına ve matematiğe karşı tutumlarına etkisi. Yayınlanmamış Yüksek Lisans Tezi. Orta Doğu Teknik Üniversitesi, Ankara.
- Gifford, S. (2005). Teaching mathematics 3 – 5: developing learning in the foundation stage. England: Open University Press.
- Gilmore KC, Bryant P (2006). Individual differences in children's understanding of inversion and arithmetical skill. Br. J. Educ. Psychol. 76:309-331.
- Greenberg P (1994). How and why to teach all aspects of preschool and kindergarten math naturally, democratically and effectively- part 2. Young Children 49(2):12-18.
- Griffin S (2004). Building number sense with number worlds: Amathematics program for young children. Early Child. Res. Q. 19:173-180.
- Güven Y (2006). 1. ve 2. sınıf öğrencilerinin matematik yeteneğinin okul öncesi eğitimi alıp almama ve kurumda veya ailesinin yanında kalma durumlarına göre karşılaştırılması. I. Uluslararası Okul Öncesi Eğitim Kongresi Bildiri Kitabı I. Cilt: 384-397, İstanbul: Ya-Pa Yayıncılık.
- Hatfield MM, Edwards NT, Bitter GG (1997). Mathematics methods for elementary and middle school teachers. New York: Allyn and Bacon Pub.
- Hatipoğlu YY (2006). İlköğretim 5.sınıf matematik ders konularının öğretiminde drama yönteminin öğrenci başarısına etkisi. Yayınlanmamış Yüksek Lisans Tezi, Gazi Üniversitesi, Ankara.
- Jeanne L, Shinsky JL, Chan CH, Coleman R, Moxom L, Yamamoto E (2009). Preschoolers' nonsymbolic arithmetic with large sets: Is addition more accurate than subtraction?. J. Exp. Child Psychol. 103(4):409-420.
- Kaba H, Şimşek PÖ (2012). İlköğretim bölümü yüksek lisans öğrencilerinin fen ve teknoloji öğretiminde yaratıcı drama yönteminin uygulanmasına ilişkin görüşleri (Hacettepe üniversitesi örneği). X. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi Bildiri Özetleri

- Kitabı. ss.569.
- Kahyaoglu H, Yavuzer Y, Aydede MN (2010). Fen bilgisi dersinin öğretiminde yaratıcı drama yönteminin akademik başarıya etkisi. *Türk Eğitim Bilimleri Dergisi* 8(3):741-758.
- Kale N (2007). Drama temelli öğrenme ile işbirlikçi öğrenmenin yedinci sınıf öğrencilerinin geometri başarıları, geometriye yönelik tutumları ve van hiele geometrik düşünme düzeylerine göre karşılaştırılması. Yayınlanmamış Yüksek Lisans Tezi, Orta Doğu Teknik Üniversitesi, Ankara.
- Kamii C, Housman LB (2000). Young children reinvent arithmetic: implication of Piaget's theory. Second Edition. New York: Teachers Collage Press.
- Karadağ E, Çalıřkan N (2006). İlköğretim birinci kademesi öğrencilerinin drama yöntemine karşı tutumlarının değerlendirilmesi. *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi* (19):45-57.
- Karapınarlı R (2007). İlköğretim 7. sınıf matematik dersinde yaratıcı drama yönteminin öğrencilerin başarı ve kalıcılık düzeyine etkisi. Yayınlanmamış Yüksek Lisans Tezi, Muğla Üniversitesi, Muğla.
- Kariuki P, Humphrey SG (2006). The effects of Drama on the performance of at risk elementary math students. At the Annual Conference of the Mid-South Educational Research Association, Birmingham, Alabama.
- Kayhan HC (2004). Yaratıcı dramanın ilköğretim 3. sınıf matematik dersinde öğrenmeye, bilgilerin kalıcılığına ve matematiğe yönelik tutumlara etkisi. Yayınlanmamış Yüksek Lisans Tezi, Gazi Üniversitesi, Ankara.
- Kayhan HC, Argün Z (2009). Yaratıcı drama yöntemine göre hazırlanan öğretim etkinliklerinin öğrencilerin matematik başarılarına etkisi. *Sakarya University J. Educ. Faculty* 17(3):609-615.
- Korkmaz T, Karadağ E (2007). Geometri derslerinde drama yönteminin etkililiğinin değerlendirilmesi. *Yeditepe Üniversitesi Eğitim Fakültesi Dergisi* 2(2).
- Ktoridou D, Eteokleous N, Gregoriou G (2005). Preschoolers developing mathematical understanding through computer-based activities. *EUROCON* 1:787-790.
- Lansdell JM (1999). Introducing young children to mathematical concepts: Problems with new terminology. *Educ. Stud.* 25(3):327-333.
- MEB (2012). Okul öncesi eğitim programı. Ankara: Milli Eğitim Bakanlığı Temel Eğitim Genel Müdürlüğü.
- Mendez JL, Fantuzzo J, Cicchetti D (2002). Profiles of social competence among low-income African-American preschool children. *Child Dev.* 73:1085-1100.
- Mendez J, Fogle L (2002). Parental reports of preschool children's social behavior: Relations among peer play, language competence, and problem behavior. *J. Psychoeduc. Assess.* 20:370-385.
- Nair A, Pool P (1991). Mathematics methods. A resource book for primary school teachers. Malaysia: MacMillan Education Ltd.
- National Research Council (2001). Eager to learn: Educating our preschoolers. Washington, DC: National Academy Press.
- Nicolopoulou A, McDowell J, Brockmeyer C (2006). Narrative play and emergent literacy: Storytelling and story-acting meet journal writing. In: Singer D, Golinkoff R & Hirsh-Pasek K (Eds.), *Play = learning: How play motivates and enhances children's cognitive and social-emotional growth*. New York: Oxford University Press pp.124-144.
- NMAP (National Mathematics Advisory Panel) (2008). Foundations for success: The final report of the National Mathematics Advisory Panel. Washington, DC: US Department of Education.
- Omniewski R (1999). The effects of an arts infusion approach on the mathematics achievement of second grade students. Unpublished doctoral dissertation, The University of Texas, USA.
- Orton A, Frobisher L (1996). Insights into teaching mathematics. London: Cassell.
- Örnek S (2007). trigonometrik kavramların canlandırma yöntemiyle öğrenilmesinin öğrencilerin matematik başarısına etkisi. Yayınlanmamış Yüksek Lisans Tezi, Marmara Üniversitesi, İstanbul.
- Özsoy N (2003). İlköğretim matematik derslerinde yaratıcı drama yönteminin kullanılması. *Balıkesir Üniversitesi Fen Bilimleri Enstitüsü Dergisi* 5(2):112-119.
- Peker M, Mirasyedioğlu Ş (2008). Pre-service elementary school teachers' learning styles and attitudes towards mathematics. *Eurasia J. Math. Sci. Technol. Educ.* 4(1):21-26.
- Polat Unutkan Ö (2007). Okul öncesi dönem çocuklarının matematik becerileri açısından ilköğretime hazır bulunmuşluğunun incelenmesi. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi* 32:243-254.
- Poyraz H, Turhan G (2006). A research to the effect number and sentence maturity has on preschool children with a lower social economic level by using the applied mathematical concepts in a supportive educational program. *J. Gazi Univ. Vocat. Educ. Faculty* 1(1):147-161.
- Saab JF (1987). The effects of creative drama methods on mathematics achievement, attitudes and creativity. Unpublished PhD Dissertation, West Virginia University, Morgantown.
- Sancak Ö (2003). Okulöncesi eğitim kurumlarına devam eden 6 yaş çocuklarına sayı ve şekil kavramlarının kazandırılmasında bilgisayar destekli eğitim ile geleneksel eğitim yöntemlerinin karşılaştırılması. Yayınlanmamış Yüksek Lisans Tezi, Gazi Üniversitesi, Ankara.
- Seo KH, Ginsburg HP (2004). What is developmentally appropriate in early childhood mathematics education? Lessons from new research. In: Clements DH, Sarama J & DiBiase AM (Eds.), *Engaging young children in mathematics: Standards for early childhood mathematics education*. Hillsdale, NJ: Erlbaum pp.91-104.
- Sezer T (2008). Okulöncesi eğitim alan beş yaş grubu çocuklara sayı ve işlem kavramlarını kazandırmada drama yönteminin etkisinin incelenmesi. Yayınlanmamış Yüksek Lisans Tezi, Abant İzzet Baysal Üniversitesi, Bolu.
- Soner S (2005). İlköğretim matematik dersi kesirli sayılarda toplama çıkarma işleminde drama yöntemi ile yapılan öğretimin etkililiği. Yayınlanmamış Yüksek Lisans Tezi, Abant İzzet Baysal Üniversitesi, Bolu.
- Sophian C (1998). A developmental perspective on children's counting. In: Donlan C (Ed.), *The development of mathematical skills*. Hove, UK: Psychology Press pp.27-46.
- Sözer N (2006). İlköğretim 4. sınıf matematik dersinde drama yönteminin öğrencilerin başarısına, tutumlarına ve öğrenmenin kalıcılığına etkisi. Yayınlanmamış Yüksek Lisans Tezi, Gazi Üniversitesi, Ankara.
- Starkey P, Klein A (2008). Sociocultural influences on young children's mathematical knowledge. In: Saracho ON, & Spodek B (Eds.), *Contemporary perspectives on mathematics in early childhood education*. Charlotte, NC: Information Age Publishing pp.45-66.
- Starkey P, Klein A, Wakeley A (2004). Enhancing young children's mathematical knowledge through a pre-kindergarten mathematics intervention. *Early Child. Res. Q.* 19(1):99-120.
- Şengül S, Ekinözü İ (2006). Canlandırma yönteminin öğrencilerin matematik tutumuna etkisi. *Kastamonu Eğitim Dergisi* 14(2):517-526.
- Şenol Özyiğit EN (2011). İlköğretim matematik dersinde yaratıcı drama uygulamalarının öğrencilerin problem çözme stratejileri, başarı, benlik kavramı ve etkileşim örüntüleri üzerindeki etkisi. Yayınlanmamış Doktora Tezi. Dokuz Eylül Üniversitesi, İzmir.
- Tarıseven Üredi İ, Şengül S, Gürdal A (2010). Matematik öğretiminde problem çözme stratejisi olarak canlandırma kullanılmasının öğrenci başarısına ve hatırlama düzeyine etkisi. *Boğaziçi Üniversitesi Eğitim Dergisi* 25(2):21-33.
- Tarıseven Üİ, Şengül S, Gürdal A (2010). Matematik öğretiminde problem çözme stratejisi olarak canlandırma kullanılmasının öğrenci başarısına ve hatırlama düzeyine etkisi. *Boğaziçi Üniversitesi Eğitim Dergisi* 25(2):21-33.
- Tarım K, Bulut S (2006). Okulöncesi öğretmenlerinin matematik ve matematik öğretimine ilişkin algı ve tutumları. *Çukurova Üniversitesi Eğitim Fakültesi Dergisi* 32(2):152-164.
- Tarım K, Deretarla Gül E (2003). Anasınıfı ve ilköğretim birinci sınıf öğrencilerinin toplama ve çıkarma becerilerinde kullandıkları stratejilerin incelenmesi. [Investigation of subtraction and addition strategies of kindergarten and first grade students] OMEP 2003 Dünya Konsey Toplantısı ve Konferansı pp.270-283.
- Troutman AP, Lichtenberg KB (1991). *Mathematics a good beginning strategies for teaching children* (4th ed.). California Books/Cole Pub.
- Tucker BF, Singleton AH, Weaver TL (2002). *Teaching mathematics to all children*. Upper Saddle River, NJ: Pearson Education.
- Uyanık Ö, Kandir A (2010). Okul öncesi dönemde erken akademik beceriler. *Kuramsal Eğitim Bilim* 3(2):118-134.
- Wolfgang HC, Stannard LL, Jones I (2003). *Advanced constructional*



- play with legos among preschoolers as a predictor of later school achievement in mathematics, *Early Child Dev. Care* 173(5):467-475.
- Yenilmez K, Uygan C (2010). Yaratıcı drama yönteminin ilköğretim 7.sınıf öğrencilerinin geometriye yönelik öz-yeterlik inançlarına etkisi. *Kastamonu Eğitim Dergisi* 18(3):931-942.
- Zhou X, Wang B (2004). Preschool children's representation and understanding of written number symbols. *Early Child Dev. Care* 174(3):253-266.
- Zigler EF, Bishop-Josef SJ (2006). The cognitive child vs. the whole child: Lessons from 40 years of Head Start. In: Singer DG, Golinkoff RM & Hirsh-Pasek K (Eds.), *Play =learning: How play motivates and enhances children's cognitive and social emotional growth*. New York: Oxford University Press pp.15-35.
- Zur O, Gelman R (2004). Young children can add and subtract by predicting and checking. *Early Child. Res. Q.* 19:121-137.
- Ekinözü S, Sengül S (2007). Permutations and Probability student success in teaching the subject, and Remembering The Effect of the Use of Animation. *Kastamonu Educ. J.* 15(1):251-258.