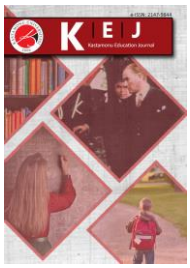
**Kastamonu Education Journal**, 2021, Vol. 29, No:5, 1052-1064
doi: 10.24106/kefdergi.735687



| Research Article / Araştırma Makalesi |

# Mathematical Skills in Traditional Children's Games in Early Childhood

# Erken Çocukluk Döneminde Geleneksel Çocuk Oyunlarıyla Matematik

**Sema ÖNGÖREN**[1], **Serhat GÜNDOĞDU**[2]

**Keywords**
1. Traditional play
2. Math
3. Early childhood

**Anahtar Kelimeler**
1. Geleneksel oyun
2. Matematik
3. Erken çocukluk

**Received/Başvuru Tarihi**
11.05.2020

**Accepted / Kabul Tarihi**
18.08.2021

## Abstract

*Purpose*: To protect the intangible cultural heritage by transferring it from generation to generation, it is imperative to effectively use games specific to our culture in children's education. The present study presents examples of the traditional games related to early childhood mathematical skills, including matching, comparing, grouping, sorting, creating patterns, numeracy, operation, geometric figures, spatial thinking, measurement, estimation and creating patterns. In addition, it is explained how the games can be adapted and played in different ways for a better achievement of these skills.

*Design/Methodology/Approach:* This descriptive study uses a qualitative research method to examine mathematical skills in traditional children's games and provide examples of adaptations that support mathematical skills. In the study, traditional children's games were examined with document analysis and the data obtained were analyzed with descriptive analysis method.

*Findings*: 11 examples of traditional games that can be associated with math skills in the pre-school education program are presented in the study. The way these games are played, their math skills and adapted versions are explained in detail. It was concluded that these games, which were discussed in the research, can be used by teachers and parents in teaching and reinforcing math skills in early childhood.

*Highlights*: Teachers can adapt different math skills to children by adapting them according to the gains and indicators included in the program.

## Öz

*Çalışmanın amacı:* Kültürümüze özgü oyunların çocuk eğitiminde etkin bir şeklide kullanılması da somut olmayan kültürel mirasın nesilden nesile aktarılarak korunmasında oldukça önemlidir. Bu araştırmada; erken çocukluk dönemi matematik becerilerinden, eşleştirme, karşılaştırma, sınıflandırma/gruplama, sıralama, örüntü oluşturma, sayı, işlem, geometrik şekiller, uzamsal düşünme, ölçme, olasılık ve örüntü oluşturma ile ilgili geleneksel oyun örnekleri sunulmuş ve oyunların uyarlanarak bu becerilerin kazanımında nasıl farklı şekillerde oynanabileceği açıklanmıştır.

*Materyal ve Yöntem:* Geleneksel çocuk oyunlarındaki matematik becerilerinin incelendiği ve matematik becerilerini destekleyici uyarlama örneklerinin sunulduğu bu araştırma nitel araştırma yöntemi kullanılarak yapılandırılan betimsel bir çalışmadır. Doküman analizi ile geleneksel çocuk oyunları incelenmiş ve elde edilen veriler betimsel analiz yöntemiyle analiz edilmiştir.

*Bulgular:* Araştırmada okul öncesi eğitim programında yer alan matematik becerileri ile ilişkilendirilebilecek 11 geleneksel oyun örneği sunulmuştur. Bu oyunların oynanış şekli, kazandırdığı matematik becerisi ve uyarlanmış hali detaylı bir şekilde açıklanmıştır. Araştırmada ele alınan bu oyunların erken çocukluk döneminde matematik becerilerinin öğretiminde ve pekiştirilmesinde öğretmenler ve ebeveynler tarafından kullanılabileceği sonucuna ulaşılmıştır.

*Önemli Vurgular:* Öğretmenler programda yer alan kazanım ve göstergeler doğrultusunda oyunlarda uyarlama yaparak farklı matematik becerilerinin çocuklara kazandırılmasını sağlayabilirler.

[1] **Corresponding Author,** Nevşehir Hacı Bektaş Veli University, Faculty of Education, Department of Pre-school Education, Nevşehir, TURKEY; E Mail, ongorensema@gmail.com, https://orcid.org/0000-0002-6034-1400
[2] Nevşehir Hacı Bektaş Veli University, Faculty of Education, Department of Pre-school Education, Nevşehir, TURKEY; E Mail, gundogduserhat50@gmail.com, https://orcid.org/0000-0001-6841-8890

**Citation/Alıntı:** Öngören, S., & Gündoğdu, S. (2021). Mathematical Skills in Traditional Children's Games in Early Childhood, *Kastamonu Education Journal, 29*(5), 1052-1064. doi: 10.24106/kefdergi.735687

## INTRODUCTION

In addition to acquiring many mathematical concepts, the foundations of more complex concepts to be acquired in later school life are laid in early childhood (Aktaş-Arnas, 2012). Mathematics education given in this period aims to contribute to the cognitive development of the children, to enable them to form a positive attitude towards mathematics, to help them establish a connection between their previous conceptual knowledge and new knowledge and to understand why and how mathematical concepts are used (OÖEP, 2013). Mathematical thinking ways are basic scientific processes, and through these, children organize, internalize and construct the knowledge they receive from the outside world by making sense of it. They interpret the situations they encounter by establishing cognitive connections between the four essential components of mathematics: concrete materials, symbols, language and pictures (Haylock & Cockburn, 2014). Children learn the concept of "more" in early childhood and therefore begin to distinguish the more group in a certain aspect. For example, they count the orange juice poured from the jug into glasses as "1, 2, 3". Children who are allowed to think about a problem and produce ideas can have a broader mathematical knowledge as they grow up and become self-confident mathematics students in the future (Sperry-Smith, 2009). For this reason, it is vital to provide the mathematics education given in early childhood concerning situations that children may encounter in daily life and to support children in acquiring the said mathematical skills (OÖEP, 2013).

Game is one of the best ways to teach mathematical skills early childhood. Games form the basis of children's first mathematical experiences, such as reflecting their experiences, establishing relations between different experiences, researching, making estimations and making sense of all these (Carruthers & Worthington, 2011). Although the game is an activity in every phase of life, it has a critical role for children to recognize the world they live in and express their thoughts, especially in the first years of life (Başal, 2017). Games can be played anywhere in the world at any time, with anything and under any circumstances. Games form the basis for human beings to get to know themselves as well as the world around them in childhood, and they have a positive effect on all development areas of children, leading to the acquisition of various skills (OÖEP, 2013; Sümbüllü & Altınışık, 2016). Playing games enables children to enrich their experiences by stimulating their senses and emotions, establishing relationships and making comparisons between people, events, and objects. Due to the features based on movement, interaction, active participation and thinking, pleasurableness of games results in the stimulation of the human brain in a holistic manner (Tuğrul, 2015). Through playing games, children begin to comprehend the similarities and differences between objects and develop abstract abilities that require mental skills such as thinking, perception, comprehension and imagination (Poyraz, 2003).

The main goal of mathematics programs is to enable children to understand mathematics through research, exploration and problem-solving. The use of game-play in mathematics education enables children to develop a positive attitude and understanding towards mathematics in addition to helping them make connections between the parts of a whole (Ginsburg, 2006; Holton, Ahmed, Williams, & Hill, 2001; NAEYC & NCTM, 2002). Children encounter many mathematical skills such as angle, direction, distance, perspective while playing games and transfer their daily mathematical skills to games (Clements, 2004). For instance, the child who realizes which of the two plates has "more" cookies and decides to choose the plate with the most significant number, and the child who uses conversational skills and ideas about number, shape and pattern while playing with the blocks can be given as examples of this transference. Having a good game experience in the early childhood period provides children with a cognitive foundation for mathematics and other aspects of life (Ginsburg, 2006). Children develop their conceptual knowledge through their experiences during the games they play. While playing, children encounter many different situations and try to make a new decision to solve each new problem faced. The highest level of establishing knowledge structure is realized in the game-playing process. Thus, playing games allows mental operations in children (Tuğrul, 2015). Mathematics through playing games is part of the process of problem-solving, and it involves using mathematics to generate ideas through experimentation and creativity and concluding an idea. Mathematics through playing games offers children the opportunity to push their limits and follow their ideas in any way they can think of (Holton Et al., 2001). The game plays an important role in acquiring many skills, such as having fun while learning, problem-solving, critical thinking, concept learning, strategy development, goal-oriented thinking and adapting to individual and group work. In addition to these, it is also stated that playing games should be used to provide effective mathematics education starting from an early age (Ginsburg, 2006; NAEYC & NCTM, 2002; Öz-Pektaş, 2017). In early childhood mathematics education, teachers should provide children with opportunities to reveal their mathematical skills in daily activities and games. Teachers should help children establish a relationship between the game and mathematics by directing children's attention to mathematical parts with the use of mathematical language, providing children with enough game time and materials, supporting children accordingly and helping them expand their knowledge and skills (Clements, 2004; NAEYC & NCTM, 2002; Parks & Wager, 2015). Previous studies on games and cognitive skills (Dansky, 1999; Gredlein & Bjorklund, 2005; Keeley & Fox, 2009; Moore & Russ, 2008; Nielsen & Dissanayake, 2000; Ranger, 2014;) have shown that playing games positively affect cognitive skills, and previous research on the effects of game-based mathematics education programs (Gözalan, 2013; Karaman, 2012; Kaya, 2010; Sönmez, 2013; Türkoğlu, 2016) has also supported that these programs support children's acquisition of mathematical skills. It was also concluded by the research on game and mathematics (Ginsburg, 2000; Giren, 2013; Levine, Ratliff, Huttenlocher, & Cannon, 2012; Ness & Farenga, 2016; Nikfarjam, 2012; Oostermeijer, Boonen, & Jolles, 2014; Ramani, Zippert, Schweitzer & Pan, 2014; Parks & Wager, 2015) that the game has a significant effect in the development of mathematical skills.

All games play an essential role in the physical, emotional and mental development of children (Güneş, 2015; Fırat, 2013; Tuğrul, 2015); however, traditional children's games have particular importance. Traditional children's games have been transferred from past generations to the present generation and continue to be transferred as they are kept being played. Traditional games are played with a sharing spirit, sometimes outdoors, sometimes inside the home or school. Although traditional games with a long history differ in some regions geographically and culturally, they still contain the national and spiritual values of the society in terms of the natural materials/toys they include (Sümbüllü & Altınışık, 2016). Traditional games, which have been one of the important sources in the transfer of culture for centuries, have survived to the present day with some changes that are resulted from modern life, urbanization, technology and many new developments. Today, outdoor games played in the streets, gardens and parks have been replaced by games played indoors with computers due to technology (Öz-Pektaş, 2017). Clements (2004) has shown that today's children spend much less time playing outdoor games than their mothers played outdoors in their childhood. The reasons for that have been determined to be various, ranging from addiction to television and digital media to security concerns. Despite games changing over time and new ones being added to old ones, some traditional games exist. It is known that many of the games known and played today were also played in ancient times. One of the oldest game tools was stones, and similar games have been played in different cultures with different materials, such as knucklebones instead of stones. In order to protect the intangible cultural heritage by transferring it from generation to generation, it is very important to use games specific to our culture effectively in children's education (Başal, 2017).

In the literature, there are various studies that compile traditional children's games (Cengiz, 1996; Çolak, 2015; Demir, 2015; Doğan, 2010; Esen, 2008; Oğuz and Ersoy, 2005; Özbakır, 2009; Tokuz, 2011; Şarman, 2015), examine the contribution of traditional games to the development of children (Aliyeva-Esen, 2008; Akay, 2017; Gürbüz-Özden, 2016), and investigate the use these games for teaching purposes (Aksoy, 2014; Araz, 2013; Başal, 2007; Bay, 2018; Gümüştaş, 2010; Karadeniz, 2017; Öz-Pektaş, 2017Sümbüllü & Altınışık, 2016;). However, no study has been conducted on the effect of traditional children's games on mathematical skills in early childhood. Therefore, the present study aims to examine mathematical skills in traditional children's games, which constitute our cultural heritage, and present examples of adapted versions of these games that support the said mathematical skills. In the Ministry of National Education (MoNE) Preschool Education Program (2013), it is stated that mathematical activities consist of the following studies: establishing relations, matching, grouping, creating patterns, sorting, counting, addition-subtraction, recognizing geometric figures (symbols) and preparing graphics. Accordingly, the present study presents examples of the traditional games related to early childhood mathematical skills, including matching, comparing, grouping, sorting, creating patterns, numeracy, operation, geometric figures, spatial thinking, measurement, estimation and creating patterns. In addition, it is explained how the games can be adapted and played in different ways for a better achievement of these skills. The present study is unique in that it examines contemporary mathematical skills in traditional games, presents examples, and gives suggestions for adaptations for these mathematical skills. In addition, this study will guide pre-school teachers working in the field and those who research this field and form the basis for future research.

## METHOD/MATERIALS

### Research Model

This descriptive study uses a qualitative research method to examine mathematical skills in traditional children's games and provide examples of adaptations that support mathematical skills. Qualitative research is an interpretative process of perceiving and addressing previously known or unrecognized problems in a realistic manner (Seale, 1999). Qualitative research examines what kind of meaning people attribute to events, that is, how they describe events (Dey, 1993). Thus, the present study aims to examine traditional children's plays with regards to the mathematical skills in the preschool education program and to support the said mathematical skills with examples of game adaptations.

### Data Collection

In qualitative studies, data are generally obtained through observation, interviews and documents. In the present study, document analysis was used for data collection. Document analysis is defined as the process of analyzing documents such as diaries, letters, and books that are considered to be related to the research topic by the researcher (Yıldırım & Şimşek, 2013). Accordingly, mathematical skills in the "Preschool Education Program" (MoNE, 2013) were primarily examined. In addition, achievements and indicators that can be associated with these skills have been identified. Later, a literature search was conducted to find examples of traditional children's games (Aliyeva-Esen, 2008; Aksoy, 2014; Başal, 2007; Başal, 2017; Bay, 2018; Cengiz, 1996; Çolak, 2015; Demir, 2015; Doğan, 2010; Gümüştaş, 2010; Gürbüz-Özden, 2016; Oğuz & Ersoy, 2005; Özbakır, 2009; Öz-Pektaş, 2017; Sümbüllü & Altınışık, 2016; Şarman, 2015; Tokuz, 2011) and 1000 game examples obtained from different sources were examined by the researchers.

### Data Analysis

In this study, traditional games to be discussed in terms of mathematical skills have been determined by the descriptive analysis method. Descriptive analysis is performed with an aim to organize the findings and present them to the reader in an interpreted form (Yıldırım & Şimşek, 2013). For this reason, achievement and indicators were also determined, in addition to mathematical skills in the MoNE preschool education program (matching, comparing, grouping, sorting, creating patterns,

sorting, numeracy, operation, geometric figures, spatial thinking, measurement, estimation and creating patterns). In the second stage, 58 games reflecting mathematical skills were determined from among the 1000 games that have been examined. Six of these games were found to be suitable for using to measure two different skills. Afterwards, selected games are defined, analyzed and interpreted. The following criteria were taken as a basis for the selection of the games included in the research: the game should be suitable for the development level of preschool children, the game should be easily played by children in this period, and the game should support at least one of the achievements and indicators of the relevant skill in the preschool education program. In order to increase the reliability, the games used in the study were examined separately by both researchers and only the games on which a consensus was reached were included in the research. An example of a game for each mathematical skill in 58 traditional games, that are found suitable for the purpose of the study, is explained in detail. The games included in the study and the way they are played are provided below.

*Noah's Ark Game (Nuh'un Gemisi):* Noah's Ark is a game played with two groups. The players are divided into two groups of equal numbers of boys and girls. At the beginning of the game, animal names are determined to be half the number of players. For example, if there are 10 players, five animals (eg. cat, dog, bird, cow, monkey) are determined. The two groups gather in different areas and share the names of these animals among themselves. Thus, each child chooses an animal name. The players of both groups come together after a short while and try to find their partner in the opposite group by imitating the sound of the animal they have chosen (such as meowing, barking) or by making the movements of the animal. Players who cannot find their match when time runs out get penalized. Punishment is usually rhyme chanting.

*Well Game (Kuyu Oyunu):* The well game is played with two people in an open area. Before starting the game, the players dig two small pits opposite each other about four meters apart, which are called "wells". Children take ten stones, provided that they are not too big. Then, players pass behind the wells in such a way that they stand opposite each other. They throw stones into the wells with their fingertips or hands. After finishing throwing, the stones in the well are counted. Whichever well has more stones, the player that threw stones into that well wins the game. The game continues in this way.

*Slouch Game (Hımbıl Oyunu):* Slouch is a game played in groups. First, as many fruit groups as the number of players are created. The names of the fruits are written on small pieces of paper of equal number as the number of players (for example, four apples, four pears, four strawberries, four cherries). Pictures of fruits can be drawn instead of names for young children who cannot read. Then, the cards are folded, shuffled and randomly distributed to the players in equal numbers. Players try to collect cards belonging to the same fruit group in their hands. The player to start the game is decided by counting. The player who starts the game gives any of the cards s/he wants to the player next to him/her. In the same way, this player gives any of the cards in his/her hand to the player on his/her other side. The game continues like this. The first player to complete the same fruit group in his/her hand reveals his/her hand by saying "slouch" (hımbıl). The other players must also quickly place their hands on the hand of the player who placed his/her hand on the ground. Scoring is done according to the order of the hand placement. The player with the hand on the bottom gets more points, while the player who puts his/her hand on the top gets no points. The way of scoring is determined at the beginning of the game. The player with the most points wins the game.

*Shake Hands, Greet and Run Game (El Sık Selam Ver Koş Oyunu):* Children line up around a large circle drawn on the playground. One of them is chosen "it". While the "it" kid is walking around outside the ring, s/he touches the back of a friend s/he wants, and the two start running in opposite directions. The child whose back is touched and the "it" shake hands and greet at the point where they come face to face. "It" tries to take the place of his/her friend whose back s/he touched. The child whose back is touched tries to take his/her place back, in order not to become "it". If the "it" child occupies the place, s/he stops thing "it", the other child becomes "it". If the opposite happens, the child who is "it" continues to be "it". In case players do not shake hands and greet their friends during the run, the game is stopped and other children join the game.

*Boom Game (Bom Oyunu):* Players sit on the floor in a circle. They choose the person to start the game by counting. The first player shouts "one", the second player continues to count "two". But they need to shout "boom" at numbers five and multiples of five. The game is played fast and those who hesitate, say boom in the wrong place or forget to say boom are eliminated.

*Dodgeball (Yakan Top Oyunu):* Players are divided into two equal groups by counting. One person from each group is selected and it is decided which group will be "piggy (rat/mouse in Turkish)" using the foot counting method ("I took & I gave" rhyme). The group with "piggy" is the group that will be in the middle. Other group members will try to hit them by going to the opposite determined places. Players who try to hit the middle group with the ball throw the ball from the air and if one of the players in the middle catches the ball, that player gains an extra life. But if that player fails to catch the ball and the ball touches a player in the middle group, that player is out of the game. The player who gains a life can call a friend who was hit back to the game by using this extra life. The game continues until there is only one person left. If the last player remaining is not hit in any of the ten ball throws in total, that player's team wins and the game starts over. If the last player is hit, the groups change places.

*Puss in the Corner Game (Köşe Kapmaca Oyunu):* Puss in the corner is played in a garden, room or any area with at least four corners. The game requires at least five people. All players move to the middle of the playing area. Players simultaneously try to take the corners in the area they are in, and the person left outside becomes "it". After the "it" is determined, the other players try to change corners among themselves by running, while "it" tries to move to one of the vacant corners. Whichever player's corner is captured by "it", that player becomes "it".

*Ali Father What Time is it?/Fox Fox, What Time is it? Game (Ali Baba/Tilki Tilki Saat Kaç Oyunu):* This game is played in a wide area. A minimum of three players is required. "It" is chosen among the players and becomes "Ali Baba". "It" faces the wall, and the players stand in a line 6-8 meters behind the "it" child. The aim of the players is to touch "it" and return to the starting line again. The aim of the "it" kid is to catch the players who touch him/her, run away and make them "it". The players ask "it" in unison, "Ali Baba, what time is it?" Ali Baba can answer in two ways: s/he either says a time or says “cauldron base” (kazandibi) When the time is told, the players try to get closer to "it" by taking steps as the said clock (as many times as the number said). When "it" says "cauldron base (kazandibi)", s/he suddenly turns around and sends the closest player to the starting line.

*Loop Game (Loop Oyunu):* Loop game is played with at least two people. Players draw a circle on the ground and throw their loops (buttons) there in turn. The player throws closest to the circle starts the game first. After the player ranks are found, the measures to be used in the game are determined. As a rule, the player who throws the loop one inch away from the loop thrown by the first player wins the game. Whichever player's loop has fallen to the agreed distance wins the game. This player will take the loops of the others.

*Watermelon Seller / Zucchini Seller Game (Karpuzculuk/ Kabakçı Oyunu):* The game is played with at least 10 players. A scarf or a suitable eye patch is used to bind the player's eye in the game. Two groups are formed and group leaders are determined. Group members crouch while the group leaders stand. Group leaders name group members (fruit, vegetables, etc.). The following conversation takes place between the group leaders:

- Zucchini seller, did your zucchinis get cooked?
- They did.
- How should I come?
- By bouncing on the countryside.
- There is a well in the middle.
- Pass on the side.
- There is a dog.
- Shoo shoo.

In turn, the leader of the other group touches the heads of the players in the opposite group, saying "not cooked, not cooked". The leader chooses one of the players and says "cooked" and covers eyes of this player with a piece of cloth or scarf. The leader summons a fruit from his/her group (for example, a cherry). The cherry comes, the player who is blinded hits the head of the cherry and the cherry returns to see where it came from. All the players turn their backs. The players clap their hands and say in unison: "I hit". The blindfolded player’s blindfold is opened, s/he taken to the group and told to find out who hit him/her on the head. If the blindfolded player knows which player hit his/her head, s/he takes the hitter to his/her own group. If s/he doesn't know, s/he is transferred on to the other group. The game continues like this. At the end of the game, whichever group has the most numbers wins the game.

*Surprise Game (Şaşırtmaca Oyunu):* Surprise is played in groups of two. In groups of two, children say the rhyme written below by doing the movements described within parentheses. Surprise (two players facing each other grab each other's hands as if shaking hands and rotate their hands) / 3 times a a a (clap once and high-five their right hands 3 times) / 3 times b b b (clap once and high-five their left hands 3 times) / 1 time a (clap once and high-five their right hand once) / 1 time b (clap once and high-five each other with their left hands once) / al (clap once) / pha (high-five each other's right hands) / bet (they high-five each other with their left hands and at the same time the right thumb touches the right shoulder and the left thumb touches the left shoulder simultaneously).

## FINDINGS

In this section, data analysis findings of the present study are presented. Table 1 below shows achievements and indicators related to mathematical skills in the MoNE preschool program, including matching, comparing, grouping, sorting, numeracy, operation, geometric figures, spatial thinking, measurement, estimation and creating patterns.

**Table 1. Mathematical skills, achievements and indicators**

| Mathematical Skill | Achievement | Indicator |
|---|---|---|
| Matching | **C. D. Achievement 6.** Matches objects or things according to their properties. | Matches objects/things one-to-one. Distinguishes and matches objects/things according to their color, shape, size, length, texture, sound, material, taste, smell, quantity and usage purposes. Shows the matching object/things. Matches objects/things with their shadows or images. |
| Comparing | **C. D. Achievement 8.** Compares properties of objects or things. | Distinguishes and compares the color, shape, size, length, texture, sound, smell, material, taste, amount and purpose of use of objects/things. |
| Grouping | **C. D. Achievement 7.** Groups objects or things according to their properties. | Groups objects/things according to their color, shape, size, length, texture, sound, material, taste, smell, quantity and intended use. |
| Sorting | **C. D. Achievement 9.** Sorts objects or entities according to their properties. | Sorts objects/things by their length, size, quantity, weight, and hue. |
| Numeracy | **C. D. Achievement 4.** Counts objects. | Counts forward/backward one by one rhythmically. Points to the specified number of objects. Tells how many objects s/he counted. Says the sequential number. Says the number that comes before a number among the numbers up to 10 and the number that comes after it. |
| Operation | **C. D. Achievement 16.** Performs simple addition and subtraction operations using objects. | Adds the specified number of objects to the object group. Separates the specified number of objects from the object group. |
| Geometric figures | **C. D. Achievement 12.** Recognizes geometric figures. | Says the name of the geometric shape shown. Tells the properties of geometric figures. Shows objects that look like geometric figures. |
| Spatial thinking | **C. D. Achievement 10.** Follows directions about location in an area. | Tells the position of the object in the area. Positions the object in the right place in accordance with the instruction. Takes position in the area. |
| Measurement | **C. D. Achievement 11.** Measures objects. | Predicts the measurement result. Child measures in non-standard units and tells the measurement result. Compares measurement results with predicted results. |
| Estimation | **C. D. Achievement 2.** Makes an estimation of the object/situation/event. | The child tells his/her guess about the object/situation/event. Explains estimation clues. Examines the real situation. Compares the estimation with the real situation. |
| Creating patterns | **C. D. Achievement 14.** Creates patterns with objects. | Creates patterns with objects by looking at the model. Says the rule in the pattern consisting of at most three elements. Specifies and completes the missing element in a pattern. Creates a unique pattern with objects. |

Table 1 shows the mathematical skills that are associated with achievement and indicators in the field of cognitive development (C.D.). It has been determined that matching skill is related with achievement 6 and its indicators, comparing skill with achievement 8 and its indicators, grouping skill with achievement 7 and its indicators, sorting skill with achievement 9 and its indicators, numeracy skill with achievement 4 and its indicators, operation skill with achievement 16 and its indicators. It has been found that the geometric figures skill is associated with achievement 12 and indicators, spatial thinking skill with achievement 10 and indicators, measurement skill with achievement 11 and indicators, estimation skill with achievement 2 and indicators, and creating patterns skill with achievement 14 and indicators. In Table 2 below, traditional children's games and frequency values that support the mathematical skills of matching, comparing, grouping, sorting, numeracy, operation, geometric figures, spatial thinking, measurement, estimation and creating patterns skills, which are among the mathematical skills in the MoNE preschool education program, are given.

**Table 2-Mathematical skills, achievements and indicators**

| Mathematical Skill | Traditional Children's Plays | f |
|---|---|---|
| Spatial thinking | Ali Father (Ali baba), Stop (İstop), House (Hane) , Box box pliers (Kutu kutu pense), Hot-Cold (Sıcak soğuk), Puss in the Corner (Köşe kapmaca), I'm on the stone I'm on the ground (Taştayım topraktayım), Nightingale in the cage (Bülbül kafeste) , Shake (Sallama), Bottle (Şişe) | 10 |
| Matching | Noah's Ark (Nuh'un gemisi), Hopscotch (Seksek), Fire-earth-air-water (Ateş-toprak-hava-su), Pine Cone (Kozalak), What do you need (Ne lazım), Ball goal (Top kalesi), Girl girl out (Kız kız dışarı) | 7 |
| Measurement | Loop (İlik), Ali Father (Ali baba), I took it I gave it (Aldım verdim), Tipcat (Çelik çomak), Lever (Naldırnaç), Stone (Tot), Step Jump (Adım atlama), Rock (Kaya) | 7 |
| Geometric figures | Puss in the Corner (Köşe kapmaca), I sell oil, I sell honey (Yağ satarım bal satarım), House (Hane), Hopscotch (Seksek), Matches (Kibrti), Needle (Tığ) | 6 |
| Numeracy | Boom (Bom), Hide and Seek (Saklambaç), Ring (Halka), Train (Tren), Surpass (Ütmenli), Odd or Even? (Tek mi çift mi?) | 6 |
| Operation | Dodgeball (Yakantop), Seven Tiles (Yedi kiremit), My hand is epelek (Elim elim epelek), Marbles (Bilye), Nine stone (Dokuztaş), Castle grab (Kale kapmaca) | 6 |
| Creating Patterns | Surprise (Şaşırtmaca), Tic-tac-toe (Üçtaş), Boom (Bom), Row stone (Sıra taş) | 5 |
| Sorting | Shake hands, greet and run (El sık selam ver koş), Seven Tiles (Yedi kiremit), Tar (Katran), Tulip (Laleli) | 4 |
| Comparing | Well (Kuyu), Open the door Bezirgan Başı (Aç kapıyı bezirgân başı), Broody hen (Gurk tavuk) | 3 |
| Estimation | Watermelon seller (Karpuzculuk), Aspirin | 2 |
| Grouping | Slouch (Hımbıl), Jackstones (Beştaş) | 2 |

As seen in Table 2, there are 10 traditional games for spatial thinking, 7 for matching, 7 for measurement, 6 for geometric figures, 6 for numeracy, 6 for operation, 5 for creating patterns, 4 for sorting, 3 for comparing, 2 for estimation, and 2 games for grouping. Below given the games of Noah's Ark, Well, Slouch, Shake Hands, Greet and Run, Boom, Dodgeball, Puss in the Corner, Ali Father What Time is it?, Loop, Watermelon Seller and Surprise with regards to the mathematical skills in preschool education program. Traditional games are presented in two parts: In the first part, the findings about the mathematical skills acquired by the game are given, and in the second part, the adapted versions of the games are presented.

**Matching**

Noah's Ark: Matching is establishing the correspondence of objects in one group to the objects in another group (Charlesworth & Lind, 2009). Noah's Ark game is one of the traditional games that can be used to improve matching skills in children. There are two groups in the game. Number of players in the group is equal. Children have to find the same animal they have chosen from among their friends in the opposite group. For example, a child who chooses a cat tries to find the other player who also chose the cat in the opposite group. This makes children practice matching. This game is also appropriate for achievement 6 in the field of cognitive development, which is as follows: 'matches objects or things according to their properties'. In this game, children fulfill the indicators of the matching achievement by bringing the things together according to their sounds and movements and matching them one-to-one.

Adaptation: The Noah's Ark game can also be played by adapting it in different ways for the matching skill achievements and indicators. For example, different objects/things can be used instead of animals. It is possible to match the color, shape, size, length, texture, sound, material, taste, smell, quantity and usage purposes of the object/things. For example, half the number of vehicles is determined at the beginning of the game. That is, if there are 10 players, five vehicles (train, plane, ship, automobile, bicycle) are determined. The two groups gather in different areas and share these vehicles among themselves. Each child chooses a vehicle. The players of both groups come together after a short while and try to find their partner in the opposite group by imitating the sound or the movements of the vehicle they choose.

**Comparing**

Well: Comparing is the name given to the process of determining whether two objects or groups of objects are the same or different according to a certain feature (Aktaş-Arnas, 2012). One of the traditional games that can be used to improve children's comparing skills is the well game. In this game, the player who throws the most stones at the end of the game wins the game. To determine which player has thrown the most stones, the stones in the well must be counted, and then the two numbers must be compared to decide which one has the most. Here, the children decide who is the winner of the game by comparing the amounts. The well game is suitable for achievement 8 in the field of cognitive development. This achievement is as follows: 'Compares properties of objects or things'. Children achieve this achievement by comparing objects according to their quantity in this game.

Adaptation: It is possible to play the well game by adapting it in different ways in terms of achievements and indicators of comparing skill. For example, the stones used in the game may have different properties. Thus, children can compare objects/things by color, shape, size, length, texture, sound, material from which they are made, and their intended use. In order to compare according to their size, players take five big and five small stones in their hands and pass behind the wells in opposite directions. They throw stones into the wells with their fingertips or hands. After the throwing, the stones in the well are counted. Whichever well has a greater count of large stones, that player wins the game. The game continues as this.

**Grouping**

Slouch: The ability to bring objects together according to their general qualities or characteristics such as color, shape, size is called classification (Charlesworth & Lind, 2009). The slouchy game is one of the traditional games that can be used to improve children's classification, in other words grouping skills. The aim of the game is to collect the most points on an individual basis. The most points are obtained by making slouch. To make slouch, players must hold all the cards of a fruit group. Players make slouch by bringing together the same fruit cards that they have chosen, that is, by grouping. The Slouch game is suitable for achievement 7 in the cognitive development area, which is: 'groups objects or things according to their properties'. In this game, children acquire the achievement by grouping the same fruits.

Adaptation: It is possible to play this game in different ways by adapting the grouping skill in terms of achievements and indicators. For example, different objects/things can be used instead of fruit pictures. These objects/things can be grouped by color, shape, size, length, texture, sound, material, quantity, and intended use. For example, for grouping by shape, as many geometric shape groups as the number of players are created. These shapes are drawn on as many pieces of paper as there are players (for example, four triangles, four squares, four circles, four rectangles). These small cards are then folded, shuffled and randomly distributed to the players in equal numbers. Players try to collect the same group of geometric shapes in their hands. The first player to complete the same group of geometric shapes in his/her hand reveals his/her hand by saying "slouch". The player with the most points wins the game.

**Sorting**

Shake Hands, Greet and Run Game: Sorting is the arrangement of more than two objects or groups of objects according to certain characteristics such as length, height, weight, and tone of voice (Charlesworth & Lind, 2009). This game is a traditional game that can be used to develop sorting skills in children. There are behaviors that need to be done and expressions that need to be said in order to achieve the game goal. These behaviors are shaking hands, greeting and running when children meet. Children have to perform these behaviors in a given order, otherwise they will be out of the game. In order to continue the game, shaking hands, greeting and running must be done in sequence. In other words, children are expected to have a certain “sorting” of these behaviors. This game is suitable for achievement 9 in the cognitive development area, which is: 'orders objects or things according to their properties'. Here the children can obtain this achievement by sorting the behaviors.

Adaptation: Shake hands, greet and run game can be played in different manners by being adapted in terms of achievements and indicators of sorting skill. The sequential behavior in the game can be changed. Also, sorting of length, size, amount, weight, color tone can be asked. For example, children line up around a large circle drawn on the playground and one of them is chosen as "it". While the "it" kid walks around outside the ring, s/he touches the back of a friend s/he wants and both start running in the opposite direction. At the point they meet, the “it” child and the child whose back is touched, jump, hug, wave and continue running. The “it” child tries to take the place of the friend whose back is touched, and the child whose back is touched tries to take his/her place again in order not to become the “it”.

**Numeracy**

Boom: Number refers to the amount of units that are found at the end of operations such as counting, measurement, weighing, and it means pieces (TDK, 2020). The boom game is one of the traditional games that can be useful for developing children's counting skills. This game helps children develop counting skills and consolidate numbers. Children count rhythmically from 1 to 4, 6 to 9, 11 to 14, and 16 to 19. In addition, they know that in rhythmic counting 5 will come after 4 and 10 will come after 9 etc., and they show this by saying “boom”. The boom game is in accordance with the cognitive development area achievement 4 and its indicators, which is stated as: 'counts objects’. The child acquires this achievement by counting forward one by one rhythmically in the game.

Adaptation: The boom game can be played in different ways by adapting the number skill in terms of achievements and indicators. For example, instead of 5 and multiples of 5, different numbers and multiples can be used. For instance, players sit in a circle on the ground and count and choose the person to start the game. The first player starts to count by shouting one, the second player continues to count by two, but it is necessary to shout boom on three and multiples of three. Thus, children acquire the achievement of counting forward one by one rhythmically, saying the sequential number, and saying the number that comes before and after a particular number among numbers up to 10.

**Operation**

Dodgeball: Operation is defined as obtaining another element from two elements of a set or obtaining another item from more items according to a certain rule (Baykul, 1999; cited in Baydemir, 2016). The dodgeball game is one of the traditional games that can be used to develop children's simple addition and subtraction skills. In the game, children gain a life when they catch the ball. The child who catches the ball does the addition operation by adding one to the previous life count. At the same

time, a child who is hit by a ball loses a life. In this case, the child calculates the new number of lives by subtracting one from the previous number of lives. If children who have only one life in the game are hit, they are out of the game. When the child with the only life in the group is hit and leaves the game, the number of players in the group decreases by one. The dodgeball game is suitable for cognitive development area achievement 16. Achievement 16 is as follows: 'Performs simple addition and subtraction operations using objects'. In this game, kids get this achievement by catching the ball and adding a life, or by being hit by the ball and losing a life.

Adaptation: The dodgeball game can be played in different ways by adapting it in terms of operation skill achievements and indicators. Children can gain or lose a different number of "lives". For example, when players trying to hit the middle group with the ball throw the ball from the air, if one of the players in the middle catches the ball, they can gain two lives. The player who gains a life can re-include a friend who was hit by giving two of their own lives.

**Geometric Figures**

Puss in the Corner: Geometric figures are standards used to determine the shape of an object (Aktaş-Arnas, Aslan & Günay-Bilaloğlu, 2017). Puss in the corner is one of the traditional games that can be used to develop children's geometric figures skills. In this game, children hear different examples of geometric shapes such as corners and edges, and they reinforce geometric figures by trying to catch one of the four corners (edges) in the playground. This game is suitable for cognitive development area achievement 12, which is as follows: 'Recognizes geometric figures'. In the game, children gain awareness about different geometric figures.

Adaptation: Puss in the corner game can also be played by adapting the geometric figures skill differently in terms of achievements and indicators. Children's recognition of the names and properties of geometric figures can be ensured by using different geometric figures in the game. For example, the game puss in the corner can be played in two different stages. The first stage is played by catching the corners in the square-shaped playing field. The second stage is played on a rectangular area using the same rules. The game focuses on the differences between square and rectangular shapes. The square-shaped play area ensures that children are equidistant from both adjacent corners and can navigate from the adjacent corners to whatever they want. When played in a rectangular area, children will be able to go to one of the corners next to them more quickly, while it will be more difficult to go to the corner on the other side (the longer side). Thanks to this adapted version, children can see the similarities and differences between geometric figures.

**Spatial Thinking**

Ali Father What Time is it?/Fox Fox, What Time is it?: The concept of space, which is explained by the area and the use of this area, is related to the distance between objects, the relationship between objects and the direction of one's body (Charlesworth, 2011). Ali father game is among the traditional games that can be played to improve the spatial thinking skills of children. Children move by calculating the distance between themselves and "it", being close or far from "it" throughout the game. When the "it" child says "cauldron base", the player closest to "it" must return to the starting line. In order not to return to the starting line, children have to calculate the position between them and the "it" and make an effort not to be closest to the "it". Ali father is a game suitable for cognitive development area achievement 10. Cognitive development area achievement 10 is: 'Executes location-related directions in the area'. In this game, children acquire this achievement by taking position in the area according to the instruction.

Adaptation: It is also possible to play the Ali father game by adapting it in different ways in terms of spatial perception skill achievements and indicators. Children may be asked to position themselves differently in the area and to say their position. For example, at the beginning of the game, all children are positioned in different places behind the "it" child. The players all in unison ask "it", "Ali father, what time is it?" Ali father can respond in two ways: by saying a time or by giving directions such as one step to the right, one step to the left, one step forward, back and forth. Children move in accordance with these instructions and say their position (like I'm on the right, I'm behind). When the time is told, the players try to get closer to "it" by taking steps (as many times as the number said) for the clock. Whoever approaches and touches "it" the fastest wins the game.

**Measurement**

Loop: Measurement is the expression of physical properties such as volume, weight, length and height of situations or objects or non-physical properties such as temperature, time, money with a number and comparing them with situations or objects of the same nature (Charlesworth, 2011). Loop game is one of the traditional games that can be used to practice measurement with children. In order to start the game in the first place, the loop must be thrown the farthest. In addition, a measurement operation is performed to determine the farthest loop. In the game, the winner is decided as a result of the measurement operation performed with the non-standard unit "handsbreadth". Loop is a game suitable for cognitive development area achievement 11, which is as follows: 'Measures objects'. Children acquire this achievement by measuring with non-standard units in the game.

Adaptation: It is possible to play the Loop game in different ways in terms of measurement skill achievement and indicators. Different measurement tools, standard or non-standard, can be used in the game. Children may be asked to predict a measurement result, tell the actual measurement result, and compare the measurement results with the predicted results. For example, players draw a circle on the ground and place their loops (buttons) there in turn. The player who throws the closest distance to the circle starts the game first. After the player ranks are determined, the measures to be used in the game are

determined. As a rule, the player who drops the loop one step away from the loop thrown by the first player wins the game. Whichever player's loop falls within the agreed distance wins and gets others' loops as well.

**Estimation**

Watermelon Seller / Zucchini Seller: Estimation is the likelihood of something to happen, it is the probability, the possibility of something (TDK, 2020). Watermelon seller game is a traditional game that can be used for developing estimation skills in children. In this game, the blindfolded player has to guess and choose one of the five players from the opposite group who may have touched him/her. In other words, the child knows that the player who touched him/her is one of the five players, that is, s/he realizes that there is a one in five probability that his/her estimation will be correct. This game complies with the cognitive development field achievement 2, which is: 'Makes an estimation of the object/situation/event'. Children acquire this achievement by telling their estimation about a situation/event in the game.

Adaptation: The watermelon game can also be played by adapting the estimation skill in different ways in terms of achievements and indicators. Children can be asked to guess not one but two people. The child may be given clues about the prediction or the child may be asked to compare the prediction with the actual situation. For example, two groups are created. The leader of the group chooses one of the opposing group and summons two fruits from his/her own group (for example, cherry and apple). Cherries and apples come and hit the blindfolded player's head, then the cherry and apple return to their places. All the players turn their backs. The players clap their hands and say in unison: "I hit". The blindfolded player's eyes are opened, taken to the group, and told to find out who hit him/her on the head. If the blindfolded player knows which players hit on the his/her head, s/he takes those players to his/her own group. If s/he does not know, s/he will be transferred to the other group. The game continues like this. The group with the most numbers wins the game.

**Creating Patterns**

Surprise: A pattern is a systematic combination of geometric figures, sounds, symbols or events (Souviney, 1994). A pattern is defined as a "core" group of at least two objects lining up according to a certain rule and the said rule repeating sequentially. Surprise is one of the traditional games that can be used to help children gain pattern skills, because this game consists of both a sound pattern and a movement pattern. In this game, children create patterns by repeating sounds and movements consecutively according to a certain rule. This game is in compliance with the cognitive development area achievement 14, which is: 'Creates patterns with objects'. Children acquire this achievement by creating patterns with sounds and movements in this game.

Adaptation: Surprise can also be played by adapting the pattern skill in different ways in terms of achievements and indicators. Movements and sounds in the pattern can be changed or new ones can be added to the existing ones. For example, in pairs, children say the following nursery rhyme by performing the movements described in parentheses: Surprise (the two players standing opposite each other hold each other's hands as if shaking hands and rotate their hands) / 5 times a a a a a (clapping their hands once, high-fiving their right hands 5 times) / 5 once b b b b b (clapping once and high-fiving their left hands together 5 times) / 2 times a (clapping their hands twice, high-fiving their right hands twice) / 2 times b b (clapping their hands twice and high-fiving each other with their left hands twice) / al (clapping once) / pha (high-fiving each other's right hands together) / bet (they clap their left hands together and at the same time the right thumb touches the right shoulder and the left thumb touches the left shoulder).

## CONCLUSION AND RECOMMENDATIONS

The present study aimed to examine mathematical skills in traditional children's games and provide examples of adaptations that support these mathematical skills. In this context, the study presents classic game examples related to matching, comparing, grouping, sorting, numeracy, operation, geometric figures, spatial thinking, measurement, estimation, and creating patterns skills included in early childhood mathematical skills. In addition, a detailed explanation of these games has been made in terms of mathematical skills. In addition, it is emphasized that these games can be used by adapting them in line with the achievements and indicators in the preschool education program. The present study also presented adapted examples of these games. This study is limited to traditional game examples obtained due to document analysis and associated with mathematical skills.

The results of the study show that, among the traditional children's games obtained as a result of document analysis, there are 58 traditional games for mathematical skills, including matching, comparing, grouping, sorting, numeracy, operation, geometric figures, spatial thinking, measurement, estimation and creating patterns, which are also included in the MoNE preschool education program. It has been found that six of these games can support two different mathematical skills. Through games, it is possible for children to develop positive attitudes towards mathematics and to learn mathematics concretely by having fun. The mathematical skills of children who are actively involved in the game can be supported in this manner (Uygun & Hakkoymaz, 2019).

Within the scope of the study, Noah's Ark for was examined for matching skill, Well for comparing skill, Slouch for grouping skill, Shake Hands, Greet and Run for sorting skill, Boom for numeracy skill; Dodgeball for operation skill, Puss in the Corner for geometric figures skill, Ali Father, What time is it? For spatial thinking skill, Loop for measurement skill, Watermelon Seller for estimation skill and Surprise for creating patterns skill was examined in detail.

The gameplay of the games and their associated mathematical skills were presented. Playing games is an indispensable occupation of childhood and creates one of the most effective learning opportunities. By playing, children develop in all areas of experience. In other words, playing games contribute to the child's development (OÖEP, 2013). Games are one of the best ways to teach mathematical skills in early childhood (Carruthers & Worthington, 2011). Therefore, it is of great importance that traditional games that support the learning of mathematical skills are presented to children from an early age. In this way, children can learn mathematical skills enjoyably and entertainingly through games. The traditional games examined within the scope of the present study are games that teachers and parents can easily use to teach and consolidate mathematical skills in early childhood. It can be said that these games are known by teachers and parents and even played by them in the past.

This study presented adaptation suggestions for each of the games Noah's Ark, Well, Slouch, Shake Hands, Greet and Run, Boom, Dodgeball, Puss in the Corner, Ali Father What Time is it? Loop, Watermelon Seller and Surprise are in line with the achievements and indicators in the preschool program. In addition, the way these games are played is explained with the examples given. Mathematics through playing games offers children the opportunity to push their limits and follow their ideas in any way they can think of (Holton et al., 2001). For this reason, it is important to offer different play opportunities according to children's ages, developmental needs and interests. Traditional children's games can also be considered an opportunity to gain mathematical skills because they can be played in different environments, with different materials and in different ways with various adaptations. Accordingly, preschool teachers can create opportunities to reveal mathematics in traditional games while teaching mathematics to children. In addition, teachers can benefit from traditional games in their activity plans and daily education flow. Adapting and playing traditional children's games will offer children various opportunities for playing games. This will also help teachers in their classroom practices. At the same time, teachers need to pay special attention to using mathematical language while playing these games with children to help children establish a relationship between games and mathematics and raise awareness about mathematical concepts in children from an early age. In order to achieve this, various practical educational activities related to traditional children's games can be organized for preschool teachers.

## Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.


## Funding

The authors received no financial support for the research, author-ship, and/or publication of this article.


## Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

## Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

## Ethics Committee Approval Information

Ethics committee evaluation was not presented because the study was not conducted with human contributors.

## REFERENCES


Akay, R. (2017). Geleneksel çocuk oyunlarının çocuk gelişimine katkıları üzerine bir araştırma. *Social Sciences Studies Journal, 3*(10), 1385-1393.

Aksoy, H. (2014). Çocuk oyunlarının işlevleri: Sarıkeçili Yörük çocuk oyunları. *Millî Folklor, 26*(101), 265-276.

Aktaş-Arnas, Y. (2012). *Okul öncesi dönemde matematik eğitimi*. Ankara: Vize Yayıncılık.

Aktaş-Arnas, Y., Aslan, D., & Günay-Bilaloğlu, R. (2017). *Okul öncesi dönemde matematik ve fen etkinlikleri*. Ankara: İzge Yayıncılık.

Aliyeva-Esen, M. (2008). Geleneksel çocuk oyunlarının eğitimsel değeri ve unutulmaya yüz tutmuş Ahıska oyunları. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi, 21*(2), 357-367.

Araz, Y. (2013). *Osmanlı toplumunda çocuk olmak*. İstanbul: Kitap Yayınevi.

Başal, H. A. (2007). Geçmiş yıllarda Türkiye'de çocuklar tarafından oynanan çocuk oyunları. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi, 20*(2), 243 – 266.

Başal, H.A. (2017). *Geçmişten günümüze Türkiye'de geleneksel çocuk oyunları*. Ankara: Nobel Yayıncılık.

Bay, D.N. (2018). Okul öncesi eğitimde bir kültür aktarımı: Millî oyunlar. *E-Uluslararası Eğitim Araştırmaları Dergisi, 9*(2), 82-104.

Baydemir, G. (2016). Okul öncesi dönemde işlem kavramı. B. Akman (Ed.). *Okul öncesi matematik eğitimi içinde*. (s. 91-101). Ankara: Pegem Akademi.

Carruthers, E., & Worthington, M. (2011). *Understanding children's mathematical graphics: beginnings in play*. England: Open University Press.

Cengiz, S. A. (1996). *Karadeniz Ereğli örneğinde çocuk oyunlarının halk bilim açısından değerlendirilmesi*. (Yüksek Lisans Tezi), Ankara Üniversitesi, Ankara.

Charlesworth, R. (2011). *Experiences in math for young children*. California: Cengage Learning.

Charlesworth, R., & Lind, K. K.(2009). *Math ve science for young children (sixth edition*). California: Wadsworth/Cengage Learning.

Clements, R. (2004). An ınvestigation of the status of outdoor play. *Contemporary Issues in Early Childhood. 5*(1), 68-80.

Çolak, M. (2015). *Adana geleneksel çocuk oyunları*. (Yüksek Lisans Tezi), Niğde Üniversitesi, Niğde.

Dansky, J. L. (1999). Play. In M. Runco and S. Pritzker (Eds.). *Encyclopedia of creativity* (pp. 393-408). San Diego: Academic Press.

Demir, İ. (2015). *Niğde geleneksel çocuk oyunları ve halkbilimsel incelemesi*. (Yüksek Lisans Tezi), Niğde Üniversitesi, Niğde.

Dey, I. (1993). *Qualitative data analysis: A user-friendly guide for social scientists*. London: Routledge Publications.

Doğan, A. (2010). *Geleneksel mahalli çocuk oyunları Malatya ili Battalgazi ilçesi örneği*. (Yüksek Lisans Tezi), Niğde Üniversitesi, Niğde.

Fırat, H. (2013). Çocuk oyunları-eğitim ilişkisi: Bezirgan başı örneği. *Turkish Studies*, 8(13), 885- 896.

Ginsburg, H. P. (2000). Preschoolers' mathematical reading. *Teaching Children Mathematics*, 7(4), 226-229.

Ginsburg, H. P. (2006). Mathematical play and playful mathematics: A guide for early education. In D. G. Singer, R. M. Golinkoff and K. Hirsh-Pasek (Eds.). *Play = learning: How play motivates and enhances children's cognitive and social-emotional growth* (p. 145–165). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780195304381.003.0008

Giren, S. (2013). *Sosyal problem çözme eğitiminin altı yaş çocuklarının matematik becerilerine etkisi*. Doktora Tezi. Selçuk Üniversitesi, Konya.

Gözalan, E. (2013). *Oyun temelli dikkat eğitim programının 5-6 yaş çocuklarının dikkat ve dil becerilerine etkisinin incelenmesi*. (Yüksek Lisans Tezi), Selçuk Üniversitesi, Konya.

Gredlein, J. M., & Bjorklund, D. F. (2005). Sex differences in young children's use of tools in a problem-solving task. *Human Nature, 16*(2), 211–232. https://doi.org/10.1007/s12110-005-1004-5

Gümüştaş, N. (2010). *Geleneksel çocuk oyunlarından çağdaş eğitimde yararlanılması*. (Yüksek Lisans Tezi), Yeditepe Üniversitesi, İstanbul.

Güneş, F. (2015). Oyunla öğrenme yaklaşımı. *Turkish Studies, 10*(11), 773-786.

Gürbüz-Özden, D. (2016). Geleneksel çocuk oyunları ve eğitimsel işlevleri: Emirdağ örneği. *Turkish Studies, 11*(14), 529-564.

Haylock, D., & Cockburn, A. D. ( 2014). *Küçük çocuklar için matematiği anlama*. Z. Yılmaz (Çev. Edt.). Ankara: Nobel Yayınları.

Holton, D.D., Ahmed, A., Williams, H., & Hill, C. (2001). On the importance of mathematical play. *International Journal of Mathematical Education in Science and Technology, 32*(3), 401-415. doi: 10.1080/00207390118654

Karadeniz-Hacısalihoğlu, M. (2017). Geleneksel çocuk oyunlarının matematiğe uyarlanması ve uygulanması sürecindeki kazanım ve problemlere genel bir bakış. *Kastamonu Eğitim Dergisi, 25*(6), 2245-2262.

Karaman, S. (2012). *Okul öncesi eğitim kurumuna devam eden 6 yaş çocuklarının matematik becerileri ile sosyodramatik oyunun boyutları arasındaki ilişkinin incelenmesi*. (Yüksek Lisans Tezi), Pamukkale Üniversitesi, Denizli.

Kaya, A. (2010). *Oyun müdahale programının 3-5 yaş arasındaki özel gereksinimli çocukların bilişsel becerilerinin desteklenmesindeki etkililiğinin incelenmesi*. Yüksek Lisans Tezi, Ankara Üniversitesi, Ankara.

Keeley, T. J.H., &Fox, K. R. (2009) The impact of physical activity and fitness on academic achievement and cognitive performance in children. *International Review of Sport and Exercise Psychology, 2*(2), 198-214. doi: 10.1080/17509840903233822

Kolcu, Ş. (2014). *Farklı bilişsel tempodaki çocukların oyun davranışlarının ve akran ilişkilerinin incelenmesi*. (Yüksek Lisans Tezi), Selçuk Üniversitesi, Konya.

Levine, S. C., Ratliff, K. R., Huttenlocher, J., & Cannon, J. (2012). Early puzzle play: A predictor of preschoolers' spatial transformation skill. *Developmental Psychology*, *48*(2), 530–542. https://doi.org/10.1037/a0025913

Milli Eğitim Bakanlığı, Temel Eğitim Genel Müdürlüğü, *Okul Öncesi Eğitim Programı* (2013). Ankara.

Moore, M., & Russ, S. W. (2008). Follow-up of a pretend play ıntervention: effects on play, creativity, and emotional processes in children. *Creatıvıty Research Journal, 20*(4), 427-436. doi: 10.1080/10400410802391892

National Association of for the Education of Young Children (NAEYC) and National Council of Teachers of Mathematics (NCTM). (2002). *Early childhood mathematics: Promoting good beginnings. A joint position statement of the National Association for the Education of Young Children (NAEYC) and the National Council of Teachers of Mathematics (NCTM).* Washington, DC: NAEYC/NCTM.

Ness, D., & Farenga, S. J. (2016). Blocks, bricks, and planks: Relationships between affordance and visuo-spatial constructive play object. *American Journal of Play, 8*(2), 201-227.

Nielsen, M., & Dissanayake, C. (2000). An investigation of pretend play, mental stateterms and false belief understanding: ın searchof a metarepresentational link. *British Journal of Developmental Psychology, 18,* 609–624.

Nikfarjam, P. (2012). *Mathematics and play: Analyzing the growth of early elementary mathematical understanding through an enactivist perspective*. (The Degree of Master of Science). Graduate Program In Education York University, Toronto.

Oğuz, M. Ö., &Ersoy, P. (2005). Türkiye'de 2004 yılında yaşayan geleneksel çocuk oyunları. *Ankara: Gazi Üniversitesi Türk Halkbilimi Araştırma ve Uygulama Merkezi Yayınları*: 4.

Oostermeijer, M., Boonen, A. J. H., & Jolles, J. (2014). The relation between children's constructive play activities, spatial ability, and mathematical word problem-solving performance: a mediation analysis in sixth-grade students. *Frontiers in Psychology, 5*, 1-7.

Özbakır, İ. (2009). Geleneksel Türk çocuk oyunlarında fonksiyonel oyuncu "Ebe". *Uluslararası Sosyal Araştırmalar Dergisi, 2*(6), 481-492.

Öz-Pektaş, H. (2017). Geleneksel çocuk oyunlarının modern eğitimde kullanılması. *Uluslararası Sosyal Araştırmalar Dergisi, 10*(49), 478-490.

Parks, A. N., & Wager, A. A. (2015). What knowledge is shaping teacher preparation in early childhood mathematics? *Journal of Early Childhood Teacher Education, 36*(2), 124-141, doi: 10.1080/10901027.2015.1030520

Poyraz, H. (2003). *Okul öncesi dönemde oyun ve oyuncak*. Ankara: Anı.

Ramani, G. B., Zippert, E., Schweitzer, S., & Pan, S. (2014). Preschool children's joint block building during a guided play activity. *Journal of Applied Developmental Psychology, 35*, 326-336.

Seale, C. (1999). Quality in qualitative research. *Qualitative İnquiry, 5*(4), 465-478.

Souviney, R. J. (1994). *Learning to teach mathematics* (2nd ed.). New York: NY: Merrill.

Sönmez, A. (2013). *60-72 aylık dezavantajlı çocuklar için hazırlanan ilköğretime hazırlık oyun destek programının çocukların ilköğretime hazırbulunuşluk düzeyine etkisi*. (Yüksek Lisans Tezi), Marmara Üniversitesi, İstanbul.

Sperry-Smith, S. (2009). *Erken çocuklukta matematik*. S. Erdoğan ve H. Arslan Çiftçi (Çev. Edt.). Ankara: Eğiten Kitap.

Sümbüllü, Y. Z., & Altınışık, M. E. (2016). Geleneksel çocuk oyunlarının değerler eğitimi açısından önemi. *ETÜ, Sosyal Bilimler Enstitüsü Dergisi, I*(2), 73-85.

Şarman, A.S. (2015). *Seferihisar geleneksel çocuk oyunları ve oyuncakları üzerine bir inceleme*. (Yüksek Lisans Tezi), Ege Üniversitesi, İzmir.

TDK (Türk Dil Kurumu) (2020). Güncel Türkçe Sözlük.

Tokuz, G. (2011). *Gaziantep çocuk oyunları üzerine halk bilimsel bir inceleme*. (Yüksek Lisans Tezi), Gaziantep Üniversitesi, Gaziantep.

Tuğrul, B. (2015). Oyunun gücü. Edt. A. B. Aksoy. *Okul öncesi eğitimde oyun*. Ankara: Hedef Yayınları.

Türkoğlu, B. (2016). *Oyun temelli bilişsel gelişim programının 60-72 aylık çocukların bilişsel gelişimine etkisi*. (Doktora Tezi), Selçuk Üniversitesi, Konya.

Uygun, N., & Hakkoymaz, S. (2019). *Hakeke: Gaziantep geleneksel çocuk oyunları aracılığıyla Türkçe ve matematik öğretimi*. İstanbul: Hiperlink.

Yıldırım, A., & Şimşek, H. (2013). *Sosyal bilimlerde nitel araştırma yöntemleri* (9. Genişletilmiş Baskı). Ankara: Seçkin Yayınevi.