

Investigating Mathematical Concepts and Skills in Story Books Appropriate for Pre-schoolers

Tuğba ÖÇAL¹ – Mehmet Fatih ÖÇAL*¹ – Mertkan ŞİMŞEK¹

¹ Ağrı İbrahim Çeçen University, Faculty of Education, Ağrı, Turkey

Abstract

As individuals' cognitive enhancement begins from birth, their mathematical knowledge that is necessary for their whole lives should be supported during early childhood. Considering the education given during the pre-school period, story books are one of the valuable educational materials for their growth in cognition. From this perspective, the purpose of this study is to investigate mathematical concepts and skills in story books that are appropriate for preschoolers. This study followed qualitative approaches. In this study, story books were investigated with respect to the mathematical concepts and skills found in national early childhood education curriculum. Randomly selected 30 story books were analyzed with documentary analysis method. Data were collected from the story books, each of which was reviewed by at least two researchers. The results indicated that story books generally concentrate on counting, spatial perception and time among mathematical concepts and skills. On the other hand, patterns, operations (addition and subtraction), and graph are most rarely seen concepts and skills in these books. Especially mathematical expressions related to problem solving skill highly emphasized in primary and secondary school curricula were not significantly observed in the story books investigated.

Keywords: Early childhood education, mathematical concepts and skills, story books.

Okulöncesi Öğrencilerine Uygun Hikâye Kitaplarında Geçen Matematiksel Kavram ve Becerilerin İncelenmesi

Öz

İnsanların bilişsel gelişimlerinin doğumdan itibaren başladığı göz önüne alındığında, hayatları boyunca gerekli olan matematiksel bilginin okul öncesi dönemde desteklenmesi gerekmektedir. Okul öncesi dönemde verilen eğitim dikkate alındığında, hikâye kitapları öğrencilerin bilişsel gelişimleri için en değerli eğitsel materyallerden biridir. Bu bağlamda, bu çalışmanın amacı okul öncesi öğrencilerine uygun hikâye kitaplarında geçen matematiksel kavram ve becerilerin incelenmesidir. Çalışmada nitel yaklaşım benimsenmiştir. Hikâye kitaplarında geçen matematiksel

* Sorumlu Yazar:
Ağrı İbrahim Çeçen
University, Faculty of
Education, Ağrı, Turkey
fatihocal@gmail.com

kavram ve beceriler Okul Öncesi Eğitim Programı göz önüne alınarak incelenmiştir. Rastgele seçilmiş 30 hikâye kitabı doküman analizi yöntemiyle analiz edilmiştir. Veriler hikâye kitaplarından toplanmış ve en az iki araştırmacı tarafından gözden geçirilmiştir. Araştırma bulgularına göre, hikâye kitaplarında matematiksel kavram ve beceriler arasında sayma, uzamsal algı ve zaman yoğunlukla bulunmaktadır. Diğer taraftan, hikâye kitaplarında en az rastlanan matematiksel kavram ve beceriler ise örüntüler, işlemler (toplama ve çıkarma) ve grafikler olarak belirlenmiştir. İlkokul ve ortaokul öğretim programlarında özellikle üzerinde durulan problem çözme becerisine yönelik matematiksel ifadelere incelenen hikâye kitaplarında çok fazla rastlanılmamıştır.

Anahtar Kelimeler: Okul öncesi eğitim, matematiksel kavram ve beceriler, hikâye kitapları.

1. Introduction

Mathematics is explained as a tool used for understanding life around the individual and the world, and also is about generating an idea for these issues (Ernest, 1991). Besides, mathematics improves individual's thoughts and scope. Moreover, mathematics education plays a crucial role in development of a country and in constituting a knowledge society. It also has a significant role in a country's future (Yenilmez, 2010). So, it is usual to teach mathematics during early childhood period due to its significant function in individual's lives.

In recent years, mathematics education during early childhood has been given a different importance. This situation can be seen in increased numbers of studies (e. g., Alisinanoğlu, Güven, & Kesicioğlu, 2009; Berberoğlu, Demirtaşlı, İş Güzel, Arıkan, & Özgen-Tuncer, 2010; Çalışkan Dedeoğlu & Alat, 2012; Ginsburg & Amit, 2008; Lee & Ginsburg, 2007; Starkey, Klein & Wakeley, 2004), in early childhood education curriculum used in our country (Ministry of National Education [MoNE], 2013a), in Principles and Standards for School Mathematics (National Council of Teachers of Mathematics [NCTM], 2000), and also in the content of Common Core State Standards (CCSS, 2012). According to Clements (2001), children experience mathematics before beginning school and that content is anemic, so, this situation should be improved. Secondly, he mentioned that children coming from minority and low socio-economic groups have difficulties when they begin primary schools, so, these difficulties can be decreased. Besides, children have informally mathematical skills; they like to use these mathematical ideas in everyday life. Lastly, it is known that preschoolers' brains undergo significant development and their brains grow most as a result of complex activities instead of simple skill learning (Clements, 2001). Therefore, it is normal to start mathematics education in earlier years of childhood.

When early childhood education period is considered, it is significant preparing children to primary schools with necessary basic informal mathematical knowledge. For students to be successful in primary school and also for developing higher order thinking skills in this period it is significant, as well (Kilpatrick, Swafford and Findell, 2003; National Association of Education of Young Children [NAEYC], 2002; Tsamir, Tirosh, & Levenson, 2011). Rich and meaningful mathematics education taught in this period would eliminate learning difficulties that children would encounter in their further education lives (Fuson, Smith & Lo Cicero, 1997) and inhibit mathematical anxiety during these ages.

In Turkey, in early childhood education mathematical knowledge that are planned to be gained by children are presented under cognitive process skills. This knowledge includes matching, comparing, sorting, grouping, numbers, operations (addition and subtraction), graphics, measurement, spatial sense, geometry, estimation, problem solving, cause and effect relation, part and whole relation, time, and pattern. (MoNE, 2013a). When these concepts and skills are investigated one by one, their significance in starting to learn mathematics during early childhood will be understood easily. First of all, matching is about determining if objects in different sets are in the same number of not and generally gained between 2 and 4 ages (Brush, 1972 cited by Kirova & Bhargava, 2002). Among all mathematical concepts and skills, matching is one of the first gained ones and serves as a basis for logical thinking. About comparing, it includes the operation

of whether the objects are different in size, color, shape etc dimensions or not. And it constitutes the basis for sorting and is significant for grouping in determining same and different things (Arnas Aktaş, 2009). During sorting two or more objects or object groups are compared and sorted from the first one to the last. This skill includes comparing and constitutes also basis for number system. Grouping, on the other hand, is about combining and separating groups according to a specific characteristic (Arnas Aktaş, 2009). Other concepts in the curriculum are numbers and operation; they compromise a significant part in early childhood education curriculum. Number sense is about understanding the relation between counting and objects. And operation concept is defined as knowledge about mathematical symbols, rules, and situations (Baykul, 1999). Then, geometry and spatial sense are two mostly mentioned subjects in the curriculum just after number and operation. And spatial sense is related with understanding the relation between objects in position, direction and distance issues. The aim of measuring covered in early childhood education curriculum is not to teach measuring with standard units instead to teach children the idea of measuring. About graphics, in the curriculum children are wanted to see the relation in object or picture graphs. The concepts and skills like estimation, problem solving, cause and effect relation, part and whole relation, time, and pattern are the other ones mentioned in the curriculum. These concepts and skills are also significant for preparing students to further grades. For instance, estimation and problem solving skills are mentioned and given importance in elementary school mathematics curriculum. There are various techniques and methods used in these teaching processes; for instance, games, mathematical activities, toys, etc. The environment children were born in, toys given to them and educational materials and specifically books are important for their further lives (Tür & Turla, 1999). For children to learn and improve their language the important source are books. From the early ages reading or telling about qualified books will increase children's experiences, word knowledge and will improve their sensibility to language. And as well incorporating literature into mathematics gives chance to children to benefit from a richer and complex understanding of mathematics. Therefore, storybooks written appropriate to early childhood education are significant and these books should be written carefully and necessitating extra cautions. Explaining and understanding mathematical concepts and skills in these books are used in mathematical learning. Therefore, these story books should be written consciously and carefully.

There are various studies about mathematics education in early childhood education. Some researchers studied factors affecting students' success in mathematics (e. g., Choi, 2011; Fisher, 2004; Kilday, 2010; Klibanoff, Levine, Huttenlocher, Vasilyeva, & Hedges, 2006; Öçal, 2015), the others preferred studying the effects of early childhood education in further mathematical success (e.g., Dursun, 2009; Polat Unutkan, 2007) or studying mathematical concept development during early childhood education (e.g., Kabael & Tanışlı, 2010; Kesicioğlu, Alisinanoğlu, & Tuncer, 2011; Olkun, Yeşilpınar, & Kışla, 2014; Olkun, Fidan, & Babacan Özer, 2013). In addition to these researches, İnan (2014) and Umay (2003) studied pre-service preschool teachers' knowledge levels in distinguishing mathematical concepts and skills in given texts and in using these concepts and skills appropriately and they also studied the mathematical knowledge pre-service preschool teachers will use in their teaching processes. However, in these studies the researchers only used given texts and did not use story books that are significant and could be used as teaching tools. Therefore, it is believed that studying story books as teaching tools is significant and would be different. The purpose of this is to investigate the mathematical concepts and skills in story books appropriate for early childhood education with respect to Turkish early childhood education curriculum. In this respect, the frequency of each mathematical concept or skill was determined.

2. Method

In this study, qualitative research techniques were utilized in order to analyze pre-school story books in terms of mathematical concepts and skills. While pre-school story books formed the population of research,

30 pre-school story books formed sample of research. 30 story books were chosen randomly among the books in bookshops. The story books investigated are presented in Table 1 given below.

Table 1. *The List of Storybooks Analyzed*

#	Storybook Name	Publisher	Age Group	Publishing Year
1	Altın Yumurtlayan Tavuk	Gonca	4-7	2012
2	Üç Ayı	Çilek	5-6	2013
3	Kümeşte Kimler Var	Nesil	4-7	2006
4	Vak Vak Vaki	Timaş	4-6	2014
5	Kıpır İle Zıpır	Tanışır	4-7	2014
6	Tırtıl Tırtı	Sıradışı	3-7	2014
7	Meraklı Pot Pot	Timaş	4-7	2014
8	Evdeki Bahçe	Çilek	4-7	2013
9	Kangurunun Tek Cepli Giysisi	İstanbul Murat	5-6	2013
10	Özgürlük	Sıradışı	4-7	2011
11	İtfaiyeci Fil Filli	Bahar	5-6	2011
12	İnatçı Keçiler	Kuşak	4-7	2013
13	Nehir Gezisi	Nar Çocuk	4-6	2013
14	Niloya Araba	Zambak Çocuk	4-7	2012
15	Öğretmen Baykuş Bilgin	Bahar	4-7	2011
16	Küçük Kaplumbağa Saklambaç Oynuyor	Morpa	5-6	2001
17	Horoz İle Tilki	Kuşak	4-7	2013
18	Doğum Günü	Mavi Yunus	3-7	2009
19	Serçe Ve Fil	Şimşek	4-7	2013
20	Bülbül İle Kırlangıç	Payda	4-5	2011
21	Yaz İle Aslan	Birleşik Tomurcuk	4-7	2008
22	Örnek Abim	Tanışır	3-7	2014
23	Dünyamız Ve Uzay	Tanışır	4-7	2007
24	Leylekler	Atlas	5-7	2008
25	Kırmızı Başlıklı Kız	Bordo-Siyah	4-7	2010
26	Kendim Olmaktan Mutluyum	Tubitak	3-7	2011
27	Arkadaşım Oynuyorum	Karaca	5-6	2009
28	Minik Yunus	Sıradışı	4-7	2013
29	Dört Arkadaş	İstanbul Murat	4-6	2011
30	Şakacı Balıklar	Atlas	3-7	2008

Data were collected from those books via reviewing documentary analysis method. This technique provides analyzing documents which include information about target facts (Yıldırım & Şimşek, 2006). Analysis process occurred in the way that books were reported by at least two researchers, then, they finalized reports after examining reports and books. Before analyzing the story books, the researchers prepared a report template in accordance with the mathematical concepts and skills found in early childhood education curriculum. Then, the expert opinion was gathered from one pre-school teacher and one academic staff from the department of early childhood education. Researchers reported the book according to the report template. The curriculum includes 21 objectives in cognitive development part (MoNE, 2013a). Among them, 16 objectives were related to mathematical skills and concepts. Mathematical concepts and skills such as grouping, matching, comparing, measurement, sorting, numbers, operations (addition and subtraction), geometry, spatial sense, cause and effect relation, part and whole relation, estimation, problem solving, graphics, pattern, and time were given as separated categories. These categories and respective objectives found in curriculum were presented in Appendix 1. Each mathematical skill and concept found in storybooks were categorized according to form presented in Appendix 1. Moreover, a part was included in the template which provided them to make a general interpretation about the concepts and skills in stories. In the second phase, researchers aimed to provide reliability by comparing stories and prepared reports. Besides, each book and its report were examined by two researchers on behalf of reliability. Data were analyzed through content analysis. Characteristics such as language, philosophy, perspective in the

documents can be revealed in consequence of quantifications made with content analysis (Karasar, 2007). Data in stories were coded and categorized as mathematical concepts and skills. Furthermore, descriptive statistics were used in order to make data meaningful according to the categories.

3. Findings

Mathematical factors in Table 2 compose of mathematical concepts and skills mentioned in early childhood curriculum. Besides, Table 2 indicates the frequency of mathematical concepts and skills encountered in the analyzed story books, how many of the stated concepts and skills are found per book on average and percentage of encountered mathematical concepts and skills with respect to all the concepts and skills in story books.

Table 2. *Frequency and Percentage Distribution of Mathematical Concepts and Skills Encountered in Analyzed Story Books*

Mathematical Concepts and Skills	Total Frequency in Books	Average Per Book	Percentage
Estimation	11	0,37	0,9
Numbers	266	8,87	22,7
Matching	8	0,27	0,7
Grouping	16	0,53	1,4
Comparing	135	4,50	11,5
Sorting	43	1,43	3,7
Spatial Sense	242	8,07	20,7
Measurement	46	1,53	3,9
Geometry	9	0,30	0,8
Pattern	2	0,07	0,2
Part-Whole	43	1,43	3,7
Operation	4	0,13	0,3
Cause-Effect	41	1,37	3,5
Time	277	9,23	23,7
Problem Solving	28	0,93	2,4
Graphics	0	0	0

Objectives and indicators of cognitive development of early childhood education curriculum were considered while forming Table 2. Therefore, the mathematical concepts and skills ensued as estimation, numbers, matching, grouping, comparing, sorting, spatial sense, measurement, geometry, pattern, part-whole, operation, cause-effect, time, problem solving, graphics (MoNE, 2013a). When Table 2 is analyzed, it can be seen that some mathematical concepts and skills existed extremely. As mathematical concepts and skills, the most encountered ones were numbers, spatial sense and time in analyzed story books.

In early childhood education curriculum, one of the cognitive process skills in mathematics is time. Time is the most found one in story books among other mathematical concepts and skills. While story books were being analyzed, words like “today”, “years”, “weekend”, “soon”, “at that moment” were regarded. In this context, elements about time were encountered 277 times. This quantity formed 23.7% of all mathematical concepts and skills encountered in story books. There were 9 and above words about time in each books. Samples about time found in story books are given below:

“We have enough food until *spring* comes, haven’t we?”

“She is looking at an ant on the surface of the water *at the moment*.”

“*In the old days*, there was a grandfather living with his son and daughter-in-law.”

“*Years* have passed, in the meantime.”

“I and Bora hit it off with each other *in a few minutes*.”

Number is one of the cognitive process skills in early childhood education curriculum. Using the words like “two”, “three”, “single” suitably shows that children gained that skill. In this context, number concept was encountered 266 times in the analyzed story books. Concepts used about numbers formed 22.7% of all mathematical concepts and skills encountered in those books. This concept was ranked at the second among the most encountered mathematical concepts and skills in story books. There were 8.87 numbers in average in each book. Samples about numbers encountered in story books are given below:

“She saw *four* signs indicating *four* different directions.”

“Tonton and Ponpon were *two* very naughty baby bears.”

“*Two* goats and *three* rabbits welcomed them.”

Spatial sense is associated with direction concepts among children. So, this concept is also among cognitive processes in early childhood education curriculum. It is frequently encountered among mathematical concepts and skills in story books, too. Concepts like “in front of”, “right side of”, “on”, “in” are considered as concepts about spatial sense. In story books, 242 concepts about spatial sense were encountered. Concepts encountered about spatial sense formed 20.7% of all mathematical concepts and skills encountered in those books. It was stated that there were approximate 8 concepts about spatial sense. Samples about this element are given below:

“They looked *inside* when they come *in front of* the classroom.”

“While the prince was going *up to* the stairs, the witch pushed him *down*.”

“They put chairs *in the middle of* play room.”

Another mathematical skill encountered frequently in the story books is comparing skill. While this skill was being examined, it was searched for whether there was a comparison between two objects/people. Words or word groups like “faster”, “bigger” were considered in this category. When Table 2 is analyzed, it is determined that there are 135 cases in total about comparing skill in story books. This formed 11.5% of all the other mathematical concepts and skills in books. There are about 4.5 words or word groups in each book about comparison. Related samples are given below:

“Because their hind legs are *long*, forelegs are *short*.”

“My brother is *tall* but I am *short*. Hence, his clothes are *larger* than mine.”

“I am *older* and *stronger* than you.”

“The princess is climbing *faster* than you. You are too slow.”

When Table 2 is analyzed, it is seen almost equally with the concepts and skills of “sorting”, “measurement”, “part-whole”, and “cause-effect”. It was seen that there was a big difference among them when they were compared to numbers, spatial sense and time concepts. Frequency of words and word groups decreased noticeably. In story books, “sorting”, “measurement”, “part-whole” and “cause-effect” concepts and skills were encountered 43, 46, 43 and 41 times, respectively. Those frequencies formed

3.7%, 3.9%, 3.7% and 3.5% of all the mathematical concepts and skills encountered in story books, respectively.

While sorting skill was being investigated, it was taken into account whether the sorting was according to a specific criterion or not. In this context, some samples about sorting skill encountered in story books are given below:

“We went running to play hide and seek to the woods while Emir was at the front, my brother was in the middle, and I was at the back in a row.”

“When the night falls, we will steal the biggest of delicious chickens.”

When story books were being investigated, words and word groups about area, volume, weight, and temperature were associated with measurement concept. Words such as “full”, “two kilograms”, “hot” were considered for measurement concept. Samples in story books for measurement concept are given below:

“Stallholder gave *two kilograms* of oranges to Ece after he had weighed them.”

“The weather was very *cold*.”

“She saw an *empty* barrel next to the hut.”

Concepts and skills about part-whole relation in story books were also considered. Samples about this concept are given below:

“The boat was *torn into the pieces*.”

“Poor grandpa dropped *some of* the food while eating.”

Cause-effect concept is also among cognitive process skills in early childhood education curriculum. In the analyzed books, it was searched for whether there was a cause-effect relation between events and situations. Samples given below are important for denoting cause-effect relations between the following situations.

“She didn’t like the color of the house. *Therefore*, she became unhappy occasionally.”

“Fırfır went to her room *in order to* draw pictures when she came from school.”

“She was looking for something familiar *in order to* remember the way to her home.”

“*Because of* bear fear, one of the two friends ran away. The other one lied on the floor playing dead.”

Problem solving skill is an important one that students need to improve in each grade. This skill has an important role also in early childhood education curriculum. In the analyzed story books, lots of problem cases and solutions are identified. There were total 28 problem cases and solutions in story books. 2.4% of all the mathematical concepts and skills encountered in books were about problem solving. This indicates that there is almost one problem case and solution in each book. Some of the problem solving cases encountered in the books are given as the samples below:

“Crocodiles helped rabbits who were seeking a remedy to cross over the big river. They built up a bridge parading coast-to-coast. Rabbits crossed over walking on the crocodiles.”

“Buffalo, tiger and giraffe tried a lot but couldn’t move the tree. They informed the elephant. The elephant came, wrapped the huge tree with his trunk. He started to pull strongly. The tree moved a little bit but it wasn’t uprooted. Other members of aid society helped the old elephant. They uprooted and pulled off the tree in cooperation. They opened the closed forest road.”

“The weather was getting dark. Grandma wanted to light the oil lamp. Suddenly, she realized that wick of the lamp was too short. She tried to stretch out wick, but she couldn’t. Then, she remembered thorn of the stork. She hoisted the wick using thorn.”

“Stork wept for hours. This case disturbed grandma. Grandma couldn’t endure stork’s tumbling and crying. She gave the stork a cow considering there is no other way to get over this.”

Other mathematical concepts and skills which take place in early childhood education curriculum but rarely encountered in story books emerged as estimation, matching, grouping and geometry. Estimation skill has gained importance especially in primary and secondary schools curriculum by the year 2005. Besides, matching and grouping skills which are attached importance to in early childhood education curriculum and accepted as the basis of numbers, were rarely encountered in the analyzed books. When Table 2 is analyzed, it is seen that frequencies of mathematical concepts and skills about estimation, matching, grouping and geometry existing in story books were 11 (0.9%), 8 (0.7%), 16 (1.4%) and 9 (0.8%), respectively. As it is seen, these concepts and skills form a minor part of all the mathematical concepts and skills encountered in story books. Samples about these mathematical concepts and skills are given below.

Samples about estimation encountered in story books are as indicated below:

“Plastic bags *seem* heavy.”

“*Probably*, the stork won’t come.”

Samples about matching encountered in story books are as indicated below:

“*Each* animal helped *the other*.”

“Birds of a feather flock *together*.”

Samples about grouping encountered in story books are as indicated below:

“She said: vitamin C is found in fruits like strawberries, apples, lemons and kiwis; and vegetables like green peppers and parsley.”

“Animals gave and took among themselves.”

“Their teacher has imposed duty to everyone in the classroom. Some of them will have a part in the show, some will read a poem and some will sing songs.”

Geometry is correlated with spatial sense. However, as those two concepts and skills are specified separately in early childhood education curriculum, they were investigated separated in this study, too. Samples encountered about geometry concept in the story books are given below:

“She drew drop-dead gorgeous *patterns* on Sevimli’s house.”

“There were two huge, *round*, imbricated stones inside the mil.”

Mathematical concepts and skills existing in early childhood education curriculum but encountered the least in the analyzed story books were pattern and operation skills. Besides, it was not encountered with any sample about graphics concept. Among the encountered mathematical concepts and skills, only two were about pattern and four were about operation concepts and skills. When encountered mathematical concepts and skills are considered, 0.2% is about pattern and 0.3% is about operation of all the mathematical concepts and skills. It was accepted that being told and done continuously repeated and follow-up actions are pattern. Two samples were found about this case. Besides, samples about operation skill are given below:

“What is *three times eight*?”

“She *added many tiny hearts* to the picture she drew.”

“Squirrel and birds undertook as a duty to pick dry fruits on trees.”

Considering all mathematical concepts and skills; time, spatial sense, comparing and number concepts and skills are mainly found. When early childhood education curriculum is taken into account, other mathematical concepts and skills are rarely found in the story books. Especially, mathematical concepts and skills such as pattern, operation, geometry, matching, and estimation rarely take part in the story books. Moreover, none of samples were encountered about graphics concept in the story books.

4. Conclusion and Discussion

The results of this study emerge some interesting conclusions about the way that the story books take the mathematical concepts and skills into account. In this study, the purpose is to analyze the mathematical concepts and skills in randomly selected story books appropriate to pre-school children. Among the mathematical concepts and skills that early childhood education curriculum covered, the story books analyzed frequently included three mathematical concepts and skills; time, numbers and spatial sense. In fact, these results were supported by Umay’s (2003) and İnan’s (2014) studies. In these studies, both researchers found out that pre-service teachers could determine number related concepts in the given texts. In addition, İnan (2014) stated that given texts included many times and numbers related mathematical concepts and skills. Moreover, the number of mathematical concepts and skills related to spatial sense was frequently used in the texts. Considering the findings of Umay’s (2003) and İnan’s (2014) studies, the analyzed story books has similarity in the number of mathematical concepts and skills. In Turkish early childhood education curriculum and also in Common Core State Standards for Mathematics (CCSSM) more learning time is dedicated to number than other topics (CCSS, 2012) and this shows that number and operations as well are important mathematical learning areas. These give evidences that usage of these mathematical concepts and skills in the daily life, therefore, in the story books, has similar manner.

On the other hand, the analyzed story books included mathematical concepts and skills related to pattern and operation (addition and subtraction) concepts and skills very rare. Besides, there was no mathematical concept and skill related to graphics which was also a mathematical concept covered in the early childhood education curriculum. Comparing these findings with the results of İnan’s (2014) study, pre-service teachers moderately thought that graphics and patterns were not included in the early childhood education curriculum. These thoughts had decreasing manner for addition and subtraction skills. In the present study, similar to pre-service teachers’ thoughts in İnan’s (2014) study, such concepts and skills were barely found in the analyzed story books. Besides, there was no graphic related concept. It can be said that the story book writers did not emphasize these concepts and skills. Therefore, it is possible that story book writers also had similar thoughts.

Problem solving and estimation skills are highly emphasized both in national and international primary and secondary school mathematics curricula and standards (e.g., CCSS, 2012; MoNE, 2005; 2011; 2013b, & NCTM, 2002). Firstly, the informal bases of problem solving skills are formed before and during early childhood education like other mathematical concepts and skills as also Clements (2001) mentioned children encounter mathematics before school. However, the story books analyzed did not attach importance to these concepts and skills. Looking at the findings of the present study, there was almost one problem situation per story book. Considering the positive side of these findings, the problem situations included in the story books were generally related to daily life experiences that pre-school children can encounter. On the other hand, mathematical skills related to estimation were barely found in the story books. Although people use estimation skill in their whole lives, this situation was not taken into consideration in the story books analyzed.

Another interesting finding of the present study is about comparing skill. This mathematical skill was another frequently found in the analyzed story books. As known, comparing skill should be gained before learning sorting, numbers and grouping elements (Akman, 2012). Also in daily lives comparing skill is usually used by children.

5. Recommendations

The obtained results show a clear message that there are various mathematical concepts and skills mentioned in the early childhood education curriculum covered by the analyzed story books without the graphics. However, the story book writers should continue giving importance to all the mathematical concepts and skills covered in the curriculum that would contribute to the development of mathematical concepts and skills in children. Although this is not an easy task to cover all the mathematical concepts and skills in only a book, there should be written more story books appropriate to mathematics in early childhood education.

If the aim of these story books is to develop more mathematical concepts and skills in children, preschool teachers can use them in their daily program frequently especially during their mathematical activities. So, a practical application of the present study can be used for story books in teaching mathematical concepts and skills. Reading story books in mathematical activities would also encourage children in gaining reading habits as found in Tür and Turla's (1999) study.

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Appendix

Appendix 1. *The Cognitive Development Objectives in MoNE (2013a) and Related Mathematical Skills and Concepts*

Objectives	Related Mathematical Concepts and Skills
Nesne/durum/olayla ilgili tahminde bulunur.	Estimation
Nesneleri sayar.	Numbers
Nesne ya da varlıkları özelliklerine göre eşleştirir.	Matching
Nesne ya da varlıkları özelliklerine göre gruplar.	Grouping
Nesne ya da varlıkların özelliklerini karşılaştırır.	Comparing
Nesne ya da varlıkları özelliklerine göre sıralar.	Sorting
Mekânda konumla ilgili yönergeleri uygular.	Spatial Sense
Nesneleri ölçer.	Measurement
Geometrik şekilleri tanıır.	Geometry
Nesnelerle örüntü oluşturur.	Pattern
Parça-bütün ilişkisini kavrar.	Part-Whole
Nesneleri kullanarak basit toplama ve çıkarma işlemlerini yapar.	Operation
Neden-sonuç ilişkisi kurar.	Cause-Effect
Zamanla ilgili kavramları açıklar.	Time
Problem durumlarına çözüm üretir.	Problem Solving
Nesne/sembollerle grafik hazırlar.	Graphics