A Comparison of the Mathematical Skills of First Graders with and without Preschool Education

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Abstract

The purpose of this study is to compare the mathematical skills of first grade elementary students who had or had not taken preschool education. The sample of the study consists of 150 elementary students, those with and without preschool education, who were enrolled in seven randomly chosen elementary schools located in Sivas (downtown). A questionnaire was used for data collection. The results of the study show that students with preschool education have higher mathematical skills compared to those with no prescchool education.

Key Words

Preschool Education, Elementary Education, Mathematical Skills

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The physical, mental, and social development of children is quite rapid during the preschool education period between the ages of 0-6 years. The development in this period is particularly important for the future of the child. According to Bloom's research, of all the mental development until the age of 17 years, 50% is completed by the age of 4 years, 30% between 4 years and 8 years, and the remaining 20% takes place between the ages of 8 years and 17 years. Consequently, the early ages are important for the child's education and it is imperative to develop his/her behavior and to guide the child for the development of the required skills. This is possible only with a well-planned, systematic preschool education (Poyraz & Dere, 2003, p. 17). Mathematics aims to develop concepts and its basis is the daily experience of the child. Activities like developing models, observation, measurement, comparison, identifying the same and the different things, and matching help the development of mathematical concepts (Metin, 1992, p. 93). Mathematics education helps individuals consider the world and interactions and provides them with the required information and skills. Moreover, it also provides necessary skills on language and a systematic view for them to solve the problems, explain, and analyze different experiences. In addition, it provides aesthetic development and eases creative thinking. Furthermore, mathematics accelerates some skills such as prediction and interpretation by forming environments where the mathematical situations are examined (Millî Eğitim Bakanlığı [MEB], 2005, p. 7). Therefore, the most significant aim of educational reform nowadays is to build a new system in which students will comprehend mathematics (Franke & Kazemi, 2001; Smith, 2000). Measurement, calculation, working with concrete objects, and figures are very important in this step. Some concepts such as numbers, sets, and transactions connected with them are basically imaginary; these concepts can be taught by setting off from the child's daily experiences (Yıldırım, 2000). To this end, static images, virtual environments, and arranged learning contexts can be used (Bodzin, 2002). Jean Piaget claims that the basic mathematical concepts such as counting numbers, space, and continuity appear together with interrelations of the physical objects (Hersh, 1997). This is particularly important in the preschool period.

Preschool and Mathematics Education

Preschool mathematics has been first mentioned in the publications of the National Council of Teachers Mathematics (NCTM) in 2000. Al-

though this was an important initiative, there were not enough details for teachers and educators (see Clements, Sarama, & DiBiase, 2002). With these documents, for the first time, the preschool students came to be defined as individuals with various levels of mathematical knowledge and skills which need to be developed ("Okul Öncesi Dönemde Matematik-I," 2008). The 2006 report of the NCTM defined these basic skills as numbers and operations, and geometry and measurement and built the preschool mathematics curriculum around these topics. Therefore, it is imperative to equip children with these skills starting from elementary education and also connecting them with lifelong learning. At both levels, the main goal is to improve language, reading, writing, and number skills as well as to reduce any possible social disadvantages (Australian Chamber of Commerce and Industry [ACCI], 2007). In addition, preschool mathematics education is required for the following reasons (Clements, 2001):

(i) All preschool children have knowledge of mathematics which remains as a potential. This potential needs to be realized and improved.

(ii) Particularly the minority and low-income children experience difficulties with mathematics at the later stages. Recent developments have shown that these difficulties can be overcome and that the gap between these children and the others can be closed. Thus, preschool education may serve to create positive changes especially in the lives of disadvantaged children (e.g. social economic, minority, and language disadvantages).

(iii) Preschool children have informal and intuitive skills and like to use them. Many children develop their number and geometry skills before they start school by activities like drawing shapes, identifying objects, and counting right. They can use mathematical concepts in daily life and may improve their mathematics knowledge in a surprising way.

(iv) Research on brain reaches three main conclusions. A) The brain of preschool children is open to improvements to a significant extent. B) The accumulated knowledge of children and their learning influence the structure and function of their brains. C) The brain of preschool children is more likely to improve with complex activities rather than the simple ones.

The preschool education is valued more in developed countries such as France and the UK due to the reasons mentioned previously. Furthermore, it is argued that preschool education has an impact on the

mathematics success of children and that this impact is even larger in high quality and efficient preschool institutions (Dorothy, 1996; Edward, Gallimore, Garnier, & Reese, 2007; Melhuish et al., 2008). There is some research confirming the similar results in Turkey (see Bekman, 1991; Polat & Unutkan, 2007). The findings of PISA lend further support to this finding (Organization for Economic Cooperation and Development [OECD], 2004). To make students more successful in science and mathematics in the future, it is necessary to make them face necessary experiences in early years. It is important that we help children enjoy mathematics, feel excitement for it and have positive treatments especially during preschool times (Aktaş-Arnas, 2004; Henniger, 1987; Metin, 1992). However, it is important to know how to teach preschool concepts to children. Mathematics instruction should be done in a hands-on and experiential way rather than using a direct dissemination of information. It should be noted that children have rich imagination; are curious, and critical. Thus, children should be provided by opportunities to meet their curiosity, to allow them realize the cause-effect relationship, help them research, and let them make guesses by their own opinions in a way to improve their development. Therefore, the teachers' role is to provide a stimulating environment and to be a guide for problem solving when the child needs it (Greenberg, 1993 cited in Aktas-Arnas, 2004).

Aim of the Study

Mathematics is the science of patterns and orders. It is also a universal language based on symbols and shapes. Mathematics involves the crafting of knowledge (e.g. ordering, analysis, interpretation, and sharing), production, making guesses, and problem-solving by using this language (MEB, 2005, p. 7). Mathematics is important for the development of number relations for preschool children. The child learns about the phone number, the ages of the siblings, the street number, tri-cycle, a lot of books, a few pennies, and the social security number at a very early age (Hildebrant, 1981 cited in Dere, & Ömeroğlu, 2001). Children work collaboratively during mathematics instruction. In this way, the skills about expression of opinions, listening, and discussion improves for the child (Shov, Chombless, Chessin, Price, & Beardain, 1997 cited in Dere, & Ömeroğlu, 2001). The process of preschool education in Turkey covers the period of 5-6 years of age. The aim of this

study is to determine whether children with preschool education are different from children without this kind of education from the aspect of mathematical development.

Problem

Is there a significant difference between the first grade students who had attended a preschool and those who did not with respect to their mathematical skills (comparing quantities, some propertied of addition, and subtraction)?

Method

Research Design

This is a descriptive study because it investigates the topic by its internal conditions with no external impact (McMillan, 2000).

Discussion

Bekman and Gürlesel (2005) argue that development starts with birth, even before, with the falling of the child into the mother's womb and continues for the rest of the life. According to them, the first 6 years of life is the fastest period for development and is the period that is open to the effects of the environment. Children are physically depended on adults when they are born and during the first years of their lives; however, they actually have advanced faculty of five senses. In other words, they are ready to interact with the environment. They mentally improve very rapidly; although, they are physically dependent. 0-3 years of age is a very critical period for the brain development. The fact that children can learn their mother tongue easily is a sign that they have cognitive capacity. It is obvious that there are very close relationships between the brain improvement and learning process during the first years (Clements, 2001). During this stage, it is crucial to prepare an environment where the very important stimulants help and support the development of the child (social, mental, emotional language and physical) in multiple directions are existent and also where the experienced adults are present. If one would like to grow healthy and successful individuals who can make contributions to the society, education should start as early as pos-

sible (Bekman & Gürlesel, 2005). This approach is voiced and supported by the US National Research Council (NRC) (1996). According to the NRC (1996), early experiences influence future educational outcomes. These experiences increase the orientations of students toward learning mathematics and science, increase their work skills in these critical areas and possibly improve their success profoundly. On the other hand, the concepts are mental tools which make it possible to understand social and physical world and help the construction of meaningful relationships with these environments. Finally, they make thinking possible as well. Children use the concepts during different developmental periods by utilizing one-to-one matching, counting, and patterning by various ways of classification and measurement (Senemoğlu, 1997). The period of early childhood is a period where children can gain fundamental concepts. The concepts can be gained by children as a result of the active interaction with the environment. While children are trying to explore their environment, they can efficiently use their own knowledge. The concept development starts from babyhood and improves while they grow. The concepts increase with experiences and change in parallel to the brain maturity of children (Aktaş-Arnas, 2004). For example, in a research study by Aktas-Arnas, Sığırtmaç, and Deretarla-Gül (2004) with 60-89 months old children, it was found that while 64% of the children between 60-64 months could write the numbers from 1 to 9 correctly, the correct response percentage had increased to 95% in 84-89 months old children. In another study by Aktas-Arnas, Deretarla-Gül, and Sığırtmaç (2003) with 865 children between 48-86 months, a significant difference was found between different age groups in terms of their skills with numbers and operations. It has been reported that an increase in the age of children is positively correlated with children's number and operational skills. The findings of the current study confirm this case. It is shown that students with preschool education are more experienced, more successful in their gains about skills related to comparison of quantities and matching with a number up to 20 than those with no preschool education. In fact, most preschool children are able to verbally count a set of objects. This is important for adults as it shows that the counting skills of children are improving. However, previous research shows that children are equipped with some basic skills of one-to-one comparison even before they start to count a set of objects. Accordingly, children are able to match the pairs of quantities, show the parts of a quantity, and identify each with a number even without

counting. They are capable of forming a basis for a better understanding of the daily application of knowledge, and for a better comprehension of addition and subtraction as well as of quantitative equations in the future (Brenneman, Stevenson-Boyd, & Frede, 2009). Studies by Polat Unutkan (2007) also demonstrated the importance of preschool education for gaining these skills. According to this study, some mathematical skills (e.g. attention-memory, recognizing numbers, subtraction-addition, and ordering) of students with preschool education are higher than those with no such education. Furthermore, another study comparing the students with and without preschool education at the ages of 4-6 found that differences about concept development prevail (Arı, Üstün, Akman, & Etikan, 2000). The findings of this research show that children with preschool education are more successful than those with no such education in regard to concept development. It is argued that early childhood educational programs help children easily make the transition to the school period (Ustun, Akman, & Uyanık, 2000 cited in Aktaş-Arnas, 2004). The results of this study confirm the previous findings, because they show that the gains related to the skills about addition and subtraction are higher for those children with preschool education compared to those with no such experience. This is a particularly important finding given the impact of addition and subtraction on the future learning of students. On this account, past research has shown that the failure in these basic operations or in the more advanced related calculations increase students' fears about mathematics (Cates, & Ryhmer, 2003). Preschool education should be promoted, because it provides a background that increases students' skills about mathematics and helps them to learn advanced mathematical concepts more easily.

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EK 1

ÖĞRETMEN ANKET FORMU

OKUL ÖNCESİ EĞİTİM KURUMLARINA DEVAM EDEN VE ETMEYEN ÇOCUKLARIN MATEMATİKSEL BECERİLERİNİN KARŞILAŞTIRILMASI ANKET FORMU

Değerli öğretmenler;

Bu araştırma, ilköğretim okulları 1. sınıfa devam eden öğrencilerin, okul öncesi eğitim kurumlarına devam etmesi ya da etmemesine bağlı olarak matematiksel becerileri bakımından herhangi bir farkın bulunup bulunmadığını tespit etmek amacı ile yapılmaktadır. Burada sizden, en fazla 10 öğrenciyi (5 tanesi okul öncesi eğitim almış, 5 tanesi okul öncesi eğitim almamış) seçmeniz ve bu öğrencileri göz önüne alarak aşağıdaki anketi doldurmanız istenmektedir. Vereceğiniz bilgiler yalnızca araştırma kapsamında kullanılacaktır. Lütfen anket maddelerinin hiçbirini yanıtsız bırakmayınız.

Araştırmanın gerçekleşmesine katkıda bulunacağınız için şimdiden teşekkür ederim.

ÖĞRENCİ İLE İLGİLİ KİŞİSEL BİGİLER

Aşağıdaki seçeneklerden öğrencinizin durumuna uygun olanı (x) işareti ile belirtiniz. Her soru için yalnızca bir seçenek işaretleyiniz.

1. Okulu :

2. Cinsiyeti :
E ( ) K ( )

3. Okul öncesi eğitimi aldı mı? :
Evet ( ) Hayır ( )

4. Eğer okul öncesi eğitimi aldıysa kaç yıl aldı? :

1 Yıl ( ) 2 Yıl ( ) 3 Yıl ( ) 4 Yıl ( )

OKUL ÖNCESİ EĞİTİMİ ALAN VE ALMAYAN İLKÖĞRETİM 1. SINIF ÖĞRENCİLERİNİN MATEMATİK BECERİLERİ

1: Gelişmemiş 2: Az Gelişmiş 3: Gelişmiş	1	2	3
1. Nesne gruplarını azlık ve çokluklarına göre karşılaştırır.	( )	( )	( )
2. 20'ye kadar olan bir sayıya karşılık gelen çokluğu belirler.	( )	( )	( )
3. Toplamanın bir araya getirme, ekleme ve çoğaltma anlamlarını fark eder.	( )	( )	( )
4. Toplama işleminde sıfırın etkisini nedenleriyle açıklar.	( )	( )	( )
5. Toplamları 20'ye kadar olan iki doğal sayıyı zihninden toplar.	( )	( )	( )
6. Çıkarmanın ayırma, azaltma ve eksiltme anlamlarını fark eder.	( )	( )	( )
7. Bir çıkarma işleminde verilmeyen eksilen veya çıkanı bulur .	( )	( )	( )
8. 20'ye kadar olan iki doğal sayının farkını zihninden bulur.	( )	( )	( )
9. Yarım ve bütün arasındaki ilişkiyi açıklar.	( )	( )	( )
10. Uzamsal ilişkileri ifade etmek için uygun terimleri kullanır.	( )	( )	( )
11. Küp, prizma, silindir, koni ve küre modellerini kullanarak farklı yapılar oluşturur.	( )	( )	( )
12. Eş nesnelere örnek verir.	( )	( )	( )
13. Bir örüntüde eksik bırakılan öğeleri belirleyerek tamamlar.	( )	( )	( )
14. Nesneleri uzunlukları yönünden karşılaştırarak ilişkilerini belirtir.	( )	( )	( )
15. Paralarımızı tanır.	( )	( )	( )
16. Saat modeli oluşturarak saat başlarını okur.	( )	( )	( )
17. En çok üç nesneyi ağırlıklarına göre sıralar.	( )	( )	( )
18. Tabloları okur. -	( )	( )	( )