



Dinnertime Math Conversations between Preschoolers and Their Parents

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Abstract

Emerging evidence indicate that through sustained conversations with adults in everyday activities, children learn mathematical concepts in real life contexts. The present study was designed to investigate the kinds of math terms and concepts parents and children use and refer to when they engage in math conversations, specifically during dinnertime. The study sample consisted of 25 Turkish parents with children whose ages were between 36 months and 60 months. Participants were asked to audiotape their dinner conversations. All audio recordings were transcribed verbatim, and jointly coded by the researchers through content analysis. The coding schemes were developed specifically for the research context, based on the themes arisen in the conversations and the math categories (shape, size, quantity, number/counting, time) that are outlined by the Ministry of Education in Turkey. The results of the study indicated that majority of the participants' conversations focused on children's daily activities and importance of finishing meals. It was also revealed that mathematics concepts were only used or mentioned: (1) when parents asked clarifying questions about their child's day or the activities they have done at school and (2) during child-initiated conversations. Math language used by the children and parents focused on concepts such as numbers (e.g., counting) and measurement (e.g., time, comparison).

Anahtar Kelimeler

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Okul Öncesi Dönem Çocukları ile Ebeveynlerinin Akşam Yemeği Vaktinde Yaptıkları Matematiksel Konuşmalar

Öz

Matematik çok küçük yaşlardan itibaren insan yaşamının önemli bir parçasıdır. Günlük yaşam içerisindeki deneyimlerin birçoğu matematikle bağlantılıdır. Okul öncesi eğitim kurumuna başlamadan önce zamanlarının önemli bir kısmını evde ebeveynleri ile geçiren çocukların matematik ile tanışmalarında ev ortamı deneyimleri önemli bir yere sahiptir. Bu sayede çocuklar okul öncesi eğitim kurumlarına ebeveynlerin öğrettikleri bazı matematik bilgileri ile başlamaktadırlar. Ayrıca kurumda verilen eğitimin evde ebeveynler tarafından desteklenmesi akademik başarı açısından daha iyi sonuçların alınmasına yardımcı olmaktadır. Yaşamın ilk yıllarında ebeveynlerin çocuklarıyla birlikte geçirdikleri nitelikli zamanların ileriki yıllarda çocukların akademik başarılarına

Keywords

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büyük etkisi olduğu pek çok araştırma tarafından belirlenmiştir. Bu noktadan hareketle, bu çalışmada ebeveynlerin çocukları ile birlikte geçirdikleri zaman olarak akşam yemeği vakitlerine odaklanılmış ve birlikte yaptıkları konuşmaların matematiksel kavramlar açısından incelemenin önemli olduğu düşünülmüştür.

Introduction

Beginning from the early years of life, young children informally notice and explore mathematical concepts. These informal early math experiences are essential for developing foundational math knowledge and cognitive skills, which serve as the cornerstone for later mathematical achievement and thinking (Aunola, Leskinen, Lerkkanen, & Nurmi, 2004; Carr & Peters & Young-Loveridge, 1994; Lee & Ginsburg, 2009; NCMST, 2000; Sanders & Rivers, 1996; Starkey, Klein, & DeFlorio, 2014). The National Council of Teachers of Mathematics (NCTM) advances the claim of mathematics' importance one step further by connecting it to individual growth and social success and states, "in this changing world, those who understand and can do mathematics will have significantly enhanced opportunities and options for shaping their futures. A lack of mathematical competence keeps the doors closed" (NCTM, 2000, p. 5).

In order for our society to develop citizens who are knowledgeable and globally competitive, it is essential to provide them with excellent quality mathematical experiences and facilitate their mathematical abilities. Unfortunately, research also suggests that children's early mathematical experiences before formal school varies drastically and this variation only grows wider as they continue to go through formal schooling and beyond (Levine, Suriyakham, Rowe, Huttenlocher & Gunderson, 2010). Furthermore, differences observed before formal schooling can actually be attributed to variations in informal early mathematics experiences provided to young children at home (Anders et. al., 2012; Gunderson & Levine, 2011; Melhuish et. al., 2008; Rodriguez & Tamis-LeMonda, 2011).

Promoting math at home

Over the last 30 years or so, a growing body of literature has indicated that many mathematical competencies, such as sensitivity to set, size, pattern, and quantity are present very early in life (Clements & Sarama, 2009; Ginsburg, Lee, & Boyd, 2008; NRC, 2009). Research also states that most children enter school with a natural wealth of knowledge in early mathematics and cognitive skills that provide a strong foundation for mathematical learning (Clements & Sarama, 2009; Ginsburg, Lee, & Boyd, 2008; Mix, 2001). Emerging evidence indicates that the environment that parents provide at home can support children's mathematical learning and development in different ways and can even have long-term implications for children's mathematics achievement (Levine, et. al., 2010; Manolitsis, Georgiou, & Tziraki, 2013; Skwarchuk, Sowinski, LeFevre, 2014). For example, an observational study carried by Levine and colleagues investigated implications of parent-infant number conversations by documenting their interactions at different time points (Levine, et. al., 2010). The results of their study revealed that even though there was a variation between parents in terms of how they approach to talking about numbers with their children, parent-infant talk about numbers predicted infants' numerical knowledge as preschoolers. Furthermore, research also suggested that parents' use of numbers as attributes of sets of objects was a strong predictive of their children's later number knowledge (Gunderson & Levine, 2011).

In another study, Skwarchuk and her colleagues investigated how frequently parents and children engage in informal and formal math activities at home (Skwarchuk, Sowinski, LeFevre, 2014). Researchers grouped activities such as "counting out loud" as formal math experiences as they were meant to explicitly teach math, while activities such as "playing cards" was considered as informal math activities because they were not meant to explicitly teach math. The results of the study revealed that there is a positive correlation between the frequency of parent-child engagement in both informal and formal math activities at home and children's mathematics knowledge in first grade. In other words, parents who frequently engage their children in both formal and informal math activities

at home had children who had higher math achievement in first grade, compared to children whose parents did not frequently engage in such activities with them.

Research is clear is on one thing. Parents can play a role in their children's math learning; and support their children' mathematical thinking by engaging math conversations and exploring early math concepts though informal and formal activities (LeFevre, Skwarchuk, Smith-Chant, Fast, Kamawar, & Bizans, 2009; Blevins-KnabeveMusun-Miller, 1996; Levine, et. al., 2010; Starkey & Klein, 2000; Melhuish, Phan, Sylva, Sammons, Siraj-Blatchford & Taggart, 2008).

The role of parents and how their support can contribute to their children's mathematical learning and thinking can be explained with Vygotsky's approach to teaching and learning. Vygotsky suggests that learning occurs within the zone of proximal development (ZPD) of the child—a distance between a child's ability to solve a problem independently and her ability to solve it with just enough support from a more skilled person in the environment (Vygotsky, 1978). According to Vygotsky, parents as the more knowledgeable other can foster the optimal development for the child through social interaction and dialogue. Furthermore, he claims that such an approach not only supports children's overall cognitive development, but also language development. Vygotsky's approach to teaching and learning has been put to test by several researchers (Geist, 2017; Clements, 2004; Copple, 2004; Ren & Hu, 2011). For example, Ren and Hu (2011) found out that when math exploration opportunities at home are within the range of child's zone of proximal development, children not only engage in math-related thinking, but their overall cognitive and even language development gets stimulated and supported (Ren & Hu, 2011).

According to Geist (2017), the more frequently parents engage in mathematical conversations with their children during the day, the better their children's cognitive outcomes would be. As children engage in such interactions, they learn how to communicate their thoughts and support their point of view; and how to analyze others' thinking processes and thoughts. Unfortunately, especially in this century, families tend to spend less time together due to busy schedules of the parents' and extracurricular activities of the children. Dinner may be the only time of the day that family come together. For this reason dinnertime is certainly can have great potential to serve as a time for parents and children to bond and learn from each other. Dinner time conversations are used in the families as opportunities to catch up on the day's events, plan the next day's activities, reminisce about shared experiences, answer puzzling questions, seek explanations for strange happenings, and solve problems (Snow & Beals, 2006). These conservations contribute to children's linguistic and cognitive development. During this time experience with informal mathematics learning is also emerging. Engaging in conversations about number of the plates, forks and spoons on the table, volume of a glass of water, slicing the bread for part and whole and etc. are the valuable opportunities for children to learn every day use of mathematics. Such experiences at home lays the foundation for formal mathematics learning and achievement (LeFevre et. al., 2009).

Furthermore, as indicated by various international studies, early mathematics learning experiences, among all educational resources, are especially important contributors to young children's learning and later achievement in mathematics in 1st and 2nd grade (Aunola, Leskinen, Lerkkanen, & Nurmi, 2004; Desoete & Gregorie, 2007; Jordan, Kaplan, Locuniak, & Ramineni, 2007). Despite its importance, there is a dearth of research on how Turkish children's mathematics understanding is supported prior to formal schooling. In order to address this gap in the literature, in this study, the researchers have examined the types of math terms and concepts parents and children use during dinnertime in relation to math categories (shape, size, quantity, number/counting, time) outlined by the Turkish Ministry of Education's Preschool Education Program (see Table 1).

Table 1. Math categories and concepts outlined by turkish ministry of education's preschool education program

Categories	Concepts
Shape	Circle Cycle Triangle Square Rectangle Ellipse Margin Edge
Size	Big-Mid-Small Thin-Thick Tall-Short Large-Narrow
Quantity	Less-More Heavy-Light Empty-Full Odd-Even Partial-Total Equal Crowded-Desolate Part-Whole Money
Number/Counting	Numbers Between 1-20 Zero Primary-Middle-Last Previous-Next Ordinal Number (First-second...)
Time	Ago-Now-Later Morning-Afternoon-Evening Yesterday-Today-Tomorrow Night-Daytime

Methodology

This is a qualitative study with a group of 25 families with children whose ages were between 36 and 60 months.

Sample

The study setting was Konya, major city in southwestern edge of the Central Anatolian Plateau in Turkey with a population of over 2.1 million. Parents who have children attending a preschool in downtown Konya area is recruited by using snowball sampling. 42 pair of parents agreed to be a participant but later 17 of them withdrawn from the study. Final sample of the study consisted of 25 parents with children whose ages were between 36 months and 60 months. Neither parents nor children were compensated for their participation. All participation was voluntary. The sample for children included 52% male (n=13) participants with a mean age of 4.25 and 48% female (12) participants with a mean age of 4.2. When reporting their age, 60% of the female parents and 40% of the male parents reported as between 20 and 30 year olds while the rest of them reported as between 30 and 40. About 48% (n=12) of mothers and fathers finished 4-year-college. While 36% (n=8) of the fathers were high school graduates, only about 16% (n=4) of the participating mothers were high school graduates. While only about 20% (n=5) fathers were elementary school graduate, about 36% (n=9) of the mothers were elementary school graduates. About 68% (n=17) of the families identified themselves as middle and upper middle class, the rest identified as low-income families.

Instruments

Once a family had agreed to participate and signed the informed consent, researchers used audio recorders to record their interactions at home during the course of dinnertime. None of the researchers was with the participating families during tapings. All audio recording occurred at families their own home without any interference from the researchers. Participants were encouraged to behave and talk as naturally as possible during tapings. After participants completed their recording at their

own leisure, they were asked to return the tapes and audio recorders back to the researchers. All data collection completed over the course of 15 days.

Data Analysis

All audio recordings were transcribed verbatim, and jointly coded by the researchers through content analysis. All coders utilized these transcripts when coding. The coding schemes were developed specifically for the research context, based on the themes arisen in the conversations and the math categories (shape, size, quantity, number/counting, time) that are outlined by the Ministry of Education in Turkey. Based on the transcripts, interactions during the dinnertime were coded to identify the math concepts discussed in the parent-child conversations.

Results

To find out what kind of math conversations parents and preschool children are engaged during dinnertime, 25 parents were asked to audio record their conversations during the dinnertime. The analysis of these conversations revealed such themes as talk about child's day at school and importance of finishing dinner. How math concepts were surfaced and initiated by whom during dinnertime is also reported.

Conversation starter: Let's talk about your day

About 56% (n=14) of the parents started their conversation by asking their children about their day at the school, while 44% (n=11) of them did not ask this question at any point during the dinnertime. When children were asked about their day, all of them reported about the activities they did. None of the activities they mentioned included any math concepts or math language listed in the math categories that are outlined by the Ministry of Education in Turkey. Children who shared what they did at school made statements such as: "We cut snowballs out of paper and glued them on our art book," "We made lions. Look at the lion!," "I was a teacher," "We celebrated a friend of mine's birthday. We made a cake, played games, and gave her presents." 71 % of the parents who started their dinner conversations by asking their children's day at school (n=10) did not ask any math related question as a follow up. Only 29 % of these parents (n=4) 4 asked a math related question as a follow-up question as their children shared what they did at the school on that day. Such questions focused on concepts such as shapes and numbers. These parents questions were either close-ended and focused on child's ability to draw or write mathematical representations (e.g., "Do you know how to draw a square?," "Do you know how to write numbers?") or focused on the curriculum (e.g., "Have you learned how to write numbers yet?," "Have you learned number 1 and 2 yet?"). Child initiated math conversations were only observed in 36% of the parent-child pairs (n=5). Math language used by the children focused on concepts such as numbers and measurement. These children made statement such as "We had so much fun today. We played with girls. They were 10 and 11 and we were 10 and 11 and they were 11," "Look these are halves and small," "Add mine more," "Mom, more bread, two more slices. No not two, one," "One of my friends says she is bigger than all of us. I said I always eat my food and don't leave anything behind. I said therefore I am bigger."

Conversation starter: Eat your dinner

11 out of 25 parents (44%) didn't start dinnertime conversations by asking about their children's day at school. Analysis of the transcripts of these conversations revealed that most of the dinnertime conversations focused on encouraging children to finish their dinner. These parents made statements such as "If you don't eat your dinner, you won't grow," "If you don't eat, they will not let you go back to school," "If you finish your dinner, we will go out," "If you eat this, I will get you a gift," "If you eat this, I have surprise for you." Further, 7 out 11 these parent-child pairs have not engaged in any kind of math talk during these conversations. Neither these parents nor their children have initiated any math talk during the dinnertime. For the rest of the 4parent child pairs out of 11, when math talk occurred, it was initiated by the child. These math talk occurred as children joined the conversations between parents or commented on what they were watching on TV. Children made statements such as "They are 10 people," "You can work one more year daddy and then retire. I mean 4 weeks. One year is 365 days. 4 weeks later...Mom...is four weeks a month?," "You put all of 6 of

them in my mouth. 1, 2, 3, 4,5...5!Look! 1, 2, 3, 4 ,5, 5!” “Mom, this is a big fork. Sometimes I want a small fork and sometime I want a big fork.”

Disucssion and Futire Dorections

Developmental studies and emerging evidence indicated that through sustained conversations and joint participation with adults in everyday activities, such as dinnertime conversations, young children learn mathematical concepts and ideas in real life contexts (Greenberg, 2012; Ginsburg & Pappas, 2004; Mendola, 2014). The present study was designed to investigate the kinds of math terms and concepts parents and children use and refer to when they engage in math conversations, specifically during dinnertime. The results of the study indicated that majority of the participants' conversations focused on children's daily activities and importance of finishing meals. As children talked about their day at school, some math conversation was initiated either by the parent or by the child. It is also important to note that some of the parent-child pairs, though in minority, did not engage in any kind of math talk.

When audio recording of the parent-child pairs who used or referred to math concepts during the dinner-time were further analyzed, it was revealed that mathematics concepts were only used or mentioned: (1) when parents asked clarifying questions about their child's day or the activities they have done at school (e.g., Do you know how to draw a square); and (2) during child-initiated conversations (e.g., You put all of 6 of them in my mouth. 1, 2, 3, 4,5...5!). Math language used by the children and parents focused on concepts such as numbers (e.g., counting) and measurement (e.g., time, comparison). While increasing amount of literature has indicated that many mathematical competencies, such as sensitivity to set, size, pattern, and quantity are present very early in life (NRC, 2009), the results revealed that none of the parent-child pairs in this study have engaged in such conversations that tapped into these mathematical ideas or concepts. Existing research has also shown similar results on this matter. For instance, Vandermaas-Peeler, Boomgarden, Finn and Pittard (2012) stated that even though parents have ample amount of opportunities to mathematize young children's everyday experiences, they often miss these opportunities. In current study, children initiated some math-related conversations but most of the time, their parents ignored them or parents did not engage in follow-up conversations. This is especially alarming because children's early mathematics knowledge is a strong predictor of their later achievement in math (Duncan, et. al, 2007). In fact, research shows that engaging in informal math activities at home starting in early years increases children's mathematics knowledge and skills (Akyuz, 2013; Kormanik, 2012; Klibanoff, Levine, Huttenlocher, Vasilyeva, & Hedges, 2006; Starkey & Klein, 2000).

Research describes several avenues for families to support foundational mathematics learning starting in early years. Such research results include: (1) having conversations about numbers 1-10 on a regular basis (Gundersone & Levine, 2011); (2) discussing mathematical ideas when reading storybooks (Anderson, Anderson, & Shapiro, 2004); (3) plating math games (e.g., board games, finger plays) (Benigno & Ellis, 2004); and having conversation about geometry and spatial relations and playing with puzzles (Levine, Ratliff, Huttenlocher, & Cannon, 2012; Pruden, Levine, & Huttenlocher, 2011). In this study, it is documented that parents often engage in number related math conversations. Such conversations involved knowledge about number sense and counting. Existing research has also shown similar results on this matter. Parents often prefer to engage in number and counting related math conversations with their children (Cannon & Ginsburg, 2008; Skwarchuk, 2009; Susperreguy & Davis-Kean, 2015).

This study is a broad look at the math-related conversations that occur between parents and preschool children during dinner time. Future research may focus on such conversations that occur throughout the day (e.g., play time). Moreover, current data was collected at one time point. In other words, parents were only asked to audiotape their dinner conversations once. Collecting data across multiple settings (e.g., play time, bedtime etc.) and multiple time points (e.g., 3 times in a given week), would provide a richer dataset and potentially give a better picture of math-related conversations occur between parents and children. Future research may also focus on measuring children's math abilities prior and investigate the relationship between the frequency of math-talk observed between parent-child pair and children's mathematics achievement. By examining the math-related parent-child

conversations in relation to children's math skills can depict a more reliable and comprehensive picture of this very complex relationship. Lastly, re-application of this study with a wider sample should also be considered.

To conclude, the findings of this study contribute to our understanding of the ways that parent-child conversations in informal settings, such as dinnertime, can support young children's developing mathematics knowledge. Although parents did not engage in various math related conversations, documented parent-child conversations provided a snapshot of these children's mathematical thinking and learning and their parents' approach to engage their children in mathematical thinking. Majority parents engage in some level of math-related conversation with their children, suggesting that families do integrate mathematical information into their dinnertime conversations. Even though such conversations provide opportunities for young children's engagement in early mathematical learning experiences and develop positive attitudes towards math (Linder et. al., 2011), math-related conversations detected in this study were rather rare and procedural.

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