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Kuramın Uygulamayla Buluşamadığı Yer: Erken Çocuklukta Matematik Eğitimi

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ÖZET

Bu çalışmanın amacı okul öncesi öğretmenlerinin matematik eğitimini nasıl gerçekleştirdiklerini saptamaktır. Bu amaç kapsamında ele aldıkları matematik beceri ve kazanımların düzeyi ile matematik etkinliklerindeki pedagojik yaklaşımlarının ortaya çıkarılması hedeflenmiştir. Araştırmanın çalışma grubunu iki farklı anaokulunda görev yapmakta olan 16 öğretmen oluşturmuştur. Nitel yöntem kullanılan çalışmada veriler gözlem ve görüşmeler yoluyla toplanmış ve içerik analizi yapılmıştır. Verilerin analizi sonucunda öğretmenler tarafından öğrencilerinin bireysel farklılıklarının, informal kanallarla edindikleri matematik deneyim, bilgi ve becerilerinin göz ardı edildiği tespit edilmiştir. Çocukların, manipulatif ya da teknoloji kullanımının pek söz konusu olmadığı, öğretmen merkezli gerçekleştirilen çalışma kâğıdı etkinlikleriyle saatlerce meşgul tutuldukları görülmüştür. Ayrıca çalışma grubundaki öğretmenlerin, tavsiye edilen eğitim uygulamalarının değerini fark etmelerini sağlayacak; iyi uygulamaları gözlemleme, deneyimleme ve uygulamaları için fırsatlar sunan; geri bildirim alma ve vermelerine imkân veren bir mesleki ağa erişimlerini sağlayacak sürekli ve kapsamlı bir hizmet içi eğitim programına ihtiyaçları olduğu sonucuna ulaşılmıştır.

Anahtar Kelimeler: Erken çocukluk, matematik eğitimi, öğretmenler

Geniş Özet

Nitelikli bir okul öncesi eğitimin çocukların her alanda gelişimi, akademik başarıları ve gelecekleri üzerindeki hem kısa hem de uzun dönemli faydaları araştırmalarca defalarca kanıtlanmıştır (Barnett, 1995; McClelland, Acock, & Morrison, 2006). Ancak bu faydaların gerçekleşmesi büyük oranda öğretmenlerin düşünce, tutum ve ve uygulamalarına bağlıdır. Okul öncesi dönemi çocuklarının gelişim ve öğrenmelerinin desteklenmesi için öğretmenlerin olumlu bir tutum sergilemelerinin yanında çocuk gelişimi, beceri ve kavram kazanımı süreci ve etkili öğretim stratejilerine ilişkin derin bir bilgi birikimlerinin de olması gerekir. Bireysel farklılıklara dikkat etmeden, aşırı yapılandırılmış öğretmen merkezli öğretim yoluyla temel becerilere odaklı büyük grup çalışmaları erken çocukluk eğitimin hedeflerine ulaşılmasında başarılı olamaz. Çocuk merkezli yaklaşımda ise dokunarak, yaşayarak, sosyal etkileşim ve

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keşif yoluyla çocuklar kendi bilgi ve becerilerini aktif bir şekilde inşa ederler. Daha üst düzey gelişim aşamasına geçmek için çocuklar daha ileri seviyedeki akranlarının veya yetişkinlerin desteğinde mevcut bireysel beceri düzeylerinin biraz üstünde çalışmaya teşvik edilirler. Bunun için de öğretmenlerin çocuklar arasındaki bireysel farklılıkların farkında olması ve bu doğrultuda sosyal olarak destekleyici bir bağlamda zorlayıcı ama başarılabilir eğitim deneyimleri sunması gerekir. Erken çocukluk matematik programının başarısı öğretmenlerin matematik, çocuklarda matematik kavram ve becerilerinin gelişimi ve etkili pedagojik yaklaşımlar hususlarında donanımlı olmalarını gerektirir. Ancak araştırmalar pek çok öğretmenin etkili bir matematik eğitimi verme hususunda başarısız olduğunu göstermektedir (Copley, 2004; Feiler, 2004; Gainsburg, 2012; Moon and Heidi Schweingruber 2005; Sarama & Dibiase, 2004). Öğretmenlerin kendi geçmiş deneyimlerine bağlı olarak matematiğin çocuklar için ilgi çekici bir konu olmayacağı varsayımı taşıyabildikleri, çocukların matematik öğrenme kapasitelerini ve önceki öğrenmelerini küçümsedikleri ve buna bağlı olarak da oldukça sınırlı bir matematik eğitimi verme yoluna gittkleri sıklıkla karşılaşılan bir durumdur. Bu çalışmanın amacı okul öncesi öğretmenlerinin matematik eğitimini nasıl gerçekleştirdiklerini araştırmaktır. Özellikle de ele alınan matematik beceri ve kavramlarının düzeylerine ve matematik etkinliklerinde benimsenen pedagojik yaklaşıma odaklanılmıştır. Ayrıca, çocukların serbest oyun zamanında sergiledikleri matematiğe yönelik ilgileri, matematik becerileri ve kavramları belirlenmeye çalışılmıştır.

Yöntem

Çalışma iki farklı bağımsız anaokulunda görev yapmakta olan 16 öğretmenle gerçekleştirilmiştir. Katılımcılardan 6 öğretmen 3-4 yaş grubunun, 10 öğretmen ise 5-6 yaş grubunun eğitim çalışmalarını yürütmüştür. Veriler, öğretmenlerle gerçekleştirilen yarı-yapılandırılmış görüşmeler ve sınıflarında yapılan gözlemler yoluyla toplanmıştır. Gözlemler her bir öğretmen ve sınıfı için aynı hafta içinde iki farklı günde gerçekleştirilmiştir. Gözlemler öğretmenin gelişiyle başlayıp çocuklar ayrılana kadar sürmüştür. Gözlem esnasında detaylı not tutma yoluyla veriler toplanırken görüşmeler esnasında ses kaydı yapılmıştır. Görüşmeler ortalama 30-40 dakika sürmüştür. Çözümlemesi yapılan veriler içerik analizine tabii tutulmuştur. Gizliliği korumak amacıyla katılımcıların gerçek isimleri yerine rumuz kullanımı yoluna gidilmiştir.

Bulgular

Bulgular, çocukların matematikten zevk almalarına ve serbest oyun zamanında matematiği sıklıkla kullanmalarına rağmen öğretmenlerin matematiğe yeterince odaklanmadığını göstermiştir. Matematik etkinliklerinin ele alınan beceri ve kavramlar açısından sınırlı tutulup, aşırı yapılandırılmış olarak bireysel farklılıklara dikkat edilmeden çocukların uzun süre masa başında oturmasını gerektiren, öğretmen merkezli, büyük grup

etkinlikleri olarak gerçekleştirildiği saptanmıştır. Teknoloji veya manipülatif kullanılmadığı ve çoğunlukla çalışma kâğıdı kullanımına gidildiği görülmüştür. Bütünleştirilmiş etkinliklerin gerçekleştirilmediği ve çocukların gerçek yaşamlarıyla matematiği ilişkilendirme konusunda yeterince çaba gösterilmediği dikkati çekti. Etkinlikler esnasında çocukların kendi aralarında diyaloğa girmelerinin ise istenmeyen bir durum olarak karşılandığı tespit edilen bir diğer hususdur.

Tartışma

Bu çalışmada serbest oyun esnasında gözlenen çocukların ilgili alanyazında da (Baroody, 2004; Seo & Ginsburg, 2004) belirtildiği gibi matematiği oyunlarında sıklıkla kullandıkları, ancak öğretmenlerinin çocukların bireysel farklılıklarını ve informal öğrenmelerini gerçekleştirdikleri etkinliklere pek yansıtmadıkları dikkati çekmiştir. Öğretmen merkezli yaklaşımın nedenlerinden birinin ticari amaçlı yayınevleri tarafından yayımlanan çalışma kitaplarının yaygın kullanımı olduğu düşünülmektedir (Baroody, 2004). Diğer ülkelerde gerçekleştirilen çalışmalarda yapılan okul öncesi öğretmenlerinin matematik eğitimini tek rakamlı sayılar, belirli şekiller ve basit kavramlarla sınırlı tuttukları saptaması bu çalışmada da kendini göstermiştir.

Bu çalışma, üniversite düzeyindeki öğretmen yetiştirme programlarından mezun okul öncesi öğretmenlerinin kaliteli erken çocukluk eğitimi sağlanması ve özellikle de etkili bir matematik eğitimi gerçekleştirilmesi hususlarında başarısız olabildiklerine işaret etmektedir. Öğretmenlerin kendileri matematikten zevk almadıkları, matematiğe ilişkin özgüvenleri eksik olduğu, öğretmen eğitiminde genel kabul gören yaklaşımların uygulamada yeri olmadığını düşündükleri sürece uygulamalarında bir değişim gerçekleşmesi mümkün olmayacaktır.

Sonuç ve Öneriler

Öğretmenlerin eğitimleri esnasında öğrendiklerini bir kenara bırakıp okullardaki hâkim kültüre asimile olmalarına yol açan etmenlerin belirlenmesi önem arz etmektedir. Bu çalışma ayrıca, üniversitelerle işbirliğine giderek öğretmenlere yönelik yoğun ve sürekli bir hizmetiçi eğitim programı sunulması ve bu program kapsamında hem bir mentor hem de meslektaş desteği bulabilecekleri bir mesleki-sosyal ağ oluşturulmalarına imkân sunulması ihtiyacına işaret etmektedir. Sadece iki okul öncesi kurumunda gerçekleştirilen bu çalışma ulusal düzeyde gerçekleştirilecek geniş kapsamlı çalışmalarla takip edilirse ülkemizde okul öncesi matematik uygulamalarının genel olarak nasıl gerçekleştirildiğine dair bir bilgi birikimi oluşması sağlanacak ve alınması gereken tedbirler ve izlenecek stratejiler açısından yol gösterici olacaktır.

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Where Theory Does not Meet the Practice: Teaching Math to Young Children in Turkey

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ABSTRACT

The aim of this qualitative study was to explore how teachers of young children provide math education in their classrooms in Turkey. More specifically, attention was paid to reveal the levels of math skills and concepts that were addressed in, and pedagogical approaches that were characterized the math practices in two pre-k programs. Data was obtained through observations and interviews. Content analysis of the data revealed that there was a disregard for individual differences, and children's informal math experiences, knowledge and skills. Children had to spend hours in teacher directed activities that mostly comprised of worksheets without much use of manipulatives or technology. Connections between children's real lives and teaching activities were rarely made. There is an urgent need for ongoing and extensive teacher development programs in which teachers could see value in recommended teaching practices; find plenty of opportunities to observe, experiment, and implement good practices; receive and provide feedback in a network of professionals. Partnership between universities and schools should become more effective and not be limited to curriculum development or one-shot training sessions.

Keywords:Early childhood education, mathematics, teachers.

Introduction

The new millennium has brought a drastic increase in access to publicly funded early childhood education programs in Turkey. This government and UNICEF supported initiative gained a momentum with the realization that early education is essential for the efforts to ameliorate widespread class, gender, ethnic, and geographic based inequalities (Polat, 2009; Turkish Industry & Business Association [TUSIAD], 2005; World Bank, 2010). Short and long term benefits of early education on individuals and, in turn, on economy, welfare, and the development of a country is well recognized (Kagitcibasi, Sunar, Bekman, Baydar, & Cemalcilar, 2009; Polat, 2009; TUSIAD, 2005; World Bank, 2010). This recognition has been put into action by accelerating the start of new programs, hiring thousands of new teachers for young children, and facilitating collaborative work among early childhood teacher educators and bureaucrats who engage in an ongoing process to develop and revise early education standards and to modify preservice and inservice teacher education.

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However, it would not be unfair to say that the behind the scene drive for this large initiative somewhat seems to be an ambitious desire to obtain an abrupt escalation in quantity rather than a genuine concern for education and wellbeing of young ones. It is unfortunate that despite strong concerns stated by both development experts of the country and early education scholars (Polat, 2009; Haktanir, 2012), quality has been sacrificed in the name of improving the country's developmental indices. The recent gains in the number of children enrolled in early education programs have not been accompanied by an improvement in the quality of programs offered (Gol-Guven, 2009; Haktanir, 2012). Yet, decades of research shows that only quality and extended early education produces short and long-term benefits on children's cognitive and social development, academic success, and future wellbeing (Barnett, 1995; McClelland, Acock, & Morrison, 2006; O'Brien Caughy, DiPietro, & Strobino, 1994; Phillips, McCartney, & Scarr, 1987; Reynolds & Temple, 1998; Skibbe, McDonald Connor, Morrison, & Jewkes, 2011; Wen, Bulotsky-Shearer, Hahs-Vaughn, & Korfma, 2012; Yoshikawa, 1995).

Nevertheless, realization of the promise of early childhood education is mostly dependent upon teacher beliefs and practices (Copple & Bredekamp 2009; Hayes, Palmer, & Zaslow, 1990; Schweinhart & Weikart, 1997). No matter how perfect the curriculum or the physical conditions are, it is the teacher who generally sets the classroom atmosphere (Copple & Bredekamp 2009). In order to foster development and learning of young children, teachers should not only carry out a positive, caring and nurturing attitude, but also, have in depth knowledge about child development, developmental sequences of learning, skill and concept acquisition, and effective teaching strategies as well as information about developmental status, needs, strengths, interests, and cultural background of individual children in their classrooms (Bowman, Donovan, & Burns, 2000; Copple & Bredekamp 2009).

Highly structured teacher-directed teaching that mainly includes teaching basic skills through whole-group instruction while keeping children passive with little attention to individual differences would fail to achieve desired outcomes of early education (Schweinhart, 1997; Schweinhart & Weikart, 1997). Following learning theory, basic-skills oriented teaching is mostly comprised of repetitions, practice, and review of certain skills under strict teacher control (Stipek & Byler, 1997).

Child-centered practices, on the other hand, as recommended by National Association for the Education of Young Children (NAEYC), allow children to actively engage in construction of their own knowledge and competencies through direct experience with hands-on objects, social interaction, and exploration of their environment (Bredekamp & Copple, 1997; Copple & Bredekamp 2009). Children are encouraged to work just above their individual level of functioning under the guidance of adults or more competent peers in order to help them move to more complex levels of development. This requires teachers to be cognizant and appreciative of individual variations in development and learning paying close attention to where individual children are in order to provide challenging but achievable educational experiences for each child in a supportive social context (Bredekamp & Copple, 1997; Clements, 2004;

Frede, 1995). Play is placed at the heart of developmentally appropriate practice for its provision of a great avenue for children to acquire and practice new social, emotional, and cognitive skills as well as providing teachers opportunities for evaluation of individual children and spontaneous teaching moments (Bowman, Donovan, & Burns, 2000; Bredekamp & Copple, 1997; Copple & Bredekamp 2009).

The recognition that acquisition of mathematics skills in early years is associated with future academic success has lead to mathematics education become an important part of early education (Blair, Gamson, Thorne, & Baker, 2005; Campbell & Ramey, 1994; Clements, 2004; Clements & Sarama, 2011; Copple & Bredekamp, 2009; Lee & Ginsburg, 2009; Entwisle & Alexander, 1998; Linder, Powers-Costello & Stegelin, 2011; O'Brien Caughy, DiPietro, & Strobino, 1994; Tsamir, Tirosh, & Levenson, 2011). The preschool mathematics standards were developed by NCTM and included in Principles and Standards for School Mathematics (PSSM) in 2000 (National Council of Teachers of Mathematics [NCTM], 2000). NCTM's early childhood standards are divided into five major content areas including numbers and operations, geometry, measurement, algebra (including patterns), and data analysis (NAEYC, 2010). More specifically, one-to-one correspondence, number sense, counting, logic and classification, comparison, geometry, spatial relations, parts and wholes comprise the preschool math standards (Charlesworth, 2005). Following the acquisition of these fundamental skills and concepts, higher-level objectives including ordering, seriation, patterning, measurement, addition and subtraction, data collection and analysis, and use of symbols are introduced.

Despite the acknowledgment of the importance of early math, a more cautious approach is observed in the national pre-k standards in Turkey. Apparently, sharing the same concerns stated by Bredekamp (2004) that setting specific learning goals for young children may lead teachers to switch to inappropriate teaching of basic-skills with a total ignorance of individual differences, interests, and needs, in the Pre-k Standards developed and endorsed by Turkish Ministry of Education (MEB), teachers are advised to pay attention to individual variation and focus on cultivating the whole child rather than subject matters (MEB, 2006, 2013). It is recommended to teach subjects integrated around a theme instead of teaching them as separate entities. Accordingly, mathematics related objectives are not specifically named or time-lined, but, instead, listed under the section of cognitive skills. Still, similarity with those of NCTM can be observed in the Turkish pre-k standards. Early math skills and concepts that are included in the standards are one-to-one correspondence, counting, number recognition, comparison, seriation, addition and subtraction by using objects, recognition of colors, shapes and patterns, patterning, observation, measurement, data collection and analysis, establishment of cause and effect relation, graphic design, use of symbols, spatial relations, and notion of time (Caliskan-Dedeoglu & Alat, 2012; MEB, 2006). National standards are set to serve many purposes including providing guidance to describe what young children are capable of and expected to acquire in early childhood programs, how teaching activities should be organized to

achieve those goals, and whether teachers or programs are effective (NAEYC, 2009; MEB, 2006, 2013).

Responsibility to implement a curriculum falls almost entirely on the shoulders of teachers (Clements, 2004). Success of any early math program requires teachers to have a solid background in mathematics, development of math skills and concepts in children, and effective pedagogies. Teaching activities should be meaningful for children and related to their interests, needs, and questions. Contrary to common assumptions, young children frequently engage in and display more sophisticated mathematical behavior than traditionally assumed during free play regardless of their background or gender (Baroody, & Tiilikainen, 2003; Clements, 2004; Copley, 2006; Cowan, 2003; Fennema et al., 1996; Greenes, Ginsburg, & Balfanz, 2004; Moon, & Schweingruber, 2005; Seo & Ginsburg, 2004). Teachers should take advantage of young children's informal knowledge, curiosity, high motivation to learn, and spontaneous engagement with mathematics in their daily activities, play, and interactions by turning those moments into an opportunity to deliver both structured and integrated mathematics education. Ongoing and appropriate use of educational technology enhances teaching activities (Clements, 2004). An investigative approach, rather than basic-skills training, should be adopted. The investigative approach allows children to construct their own knowledge by taking an inquiry based, active, critical and creative stand drawing from their informal knowledge, questions, and experiences (Baroody, 2003, 2004; Clements, 2004; Fuson & Burghardt, 2003). Hence, children could more efficiently make linkages between conceptual and procedural knowledge fostering their adaptive expertise through which children transfer what they already acquired into new circumstances. Another benefit of the investigative approach is that it promotes a more productive and persistent disposition towards mathematics (Baroody, 2003, 2004; Fuson & Burghardt, 2003).

However, despite decades of research that demonstrates critical importance of early math skills, children's informal math knowledge, power of the active inquiry based learning, and presence of national or state standards and guidelines, many teachers still fail to run an effective early math program (Copley, 2004; Feiler, 2004; Gainsburg, 2012; Moon and Heidi Schweingruber 2005; Sarama & Dibiase, 2004). Teachers often drawing from their own struggle with mathematics tend to assume that mathematics would not be an attractive subject for young children. They underestimate children's capacity to learn math and the level of experiential math knowledge children have (Clements, 2004; Copley, 2004; Feiler, 2004). This math bias combined with teachers' unfamiliarity with math standards creates a major impediment for math education. As a result, it is often the case that early math education is only limited to counting, adding, subtracting, and knowing shapes (Copley, 2004; Feiler, 2004). It is a major challenge to have a research-based curriculum implemented when teachers' lack of knowledge and misconceptions pose a major challenge to reform. Success of the new national early childhood curriculum published in 2013 by the Ministry of Education in Turkey and accompanying early child teacher development initiative very much depends on addressing the needs and concerns of teachers (Clements, 2004).

Therefore, the aim of this study was to explore how teachers of young children provide math education in their classrooms in Turkey. More specifically, attention was paid to reveal the levels of math skills and concepts that were addressed in, and pedagogical approaches that characterized the math practices in two pre-k programs.

Method

Participants and Procedure

A total of 16 teachers who served in two different public early childhood education centers volunteered to participate in the study. There was only one male teacher among the participants. All the participants held a four-year-university degree in early childhood education. Average year of experience for the participants was 8 with a range of 4 to 28 years. Both centers only offered half-day services. While 6 of the participants worked in the classrooms for 3 and 4 year-olds the rest worked with 5-6 year-olds.

Data was collected through classroom observations and semi-structured interviews with the teachers. Each teacher's classroom was observed twice in the same week. Observations started with the arrival of the teacher and lasted until all the children left. Elaborate notes were taken in an effort to provide a thick description of what was occurring in the classroom at the time of the observation. Interviews started with the demographic questions and followed with questions about how the participants taught mathematics. More specifically, questions about math standards that were focused, integration of subjects, use of technology and educational materials, teaching techniques, and child-centeredness in their practice of teaching math were directed to the participants. The interviews lasted around 30-40 minutes and were all audiotaped.

Data Analysis

All the interviews were transcribed and coded along with the observation data. Content analysis was carried out on data in order to reveal underlying categories. Pseudonyms were used in order to protect the identity of the participants.

Results

Analysis of the data revealed that mathematics was a largely ignored subject despite children's enjoyment and frequent use of math in their free-play. Teacher-directed math activities were limited in skills and concepts targeted for development; highly structured and offered in large group activities without any regard for individual differences or informal learning. Over reliance on worksheets left no room for use of technology or manipulatives. No effort was made to integrate math with other subjects or build connections with children's real lives. Dialogue among children was not encouraged.

Mathematics is Largely an Ignored Subject

In some classrooms, math was not even a part of regular learning experiences provided. Nothing to observe, in those classrooms where no teacher-driven/facilitated math activity took place, it became necessary to rely on the participants definition of

how they usually taught mathematics. Among those who did not integrate any math into their teaching during the observations, Filiz reiterated the common view shared by Turkish primary school teachers who commit themselves to standards/teacher-centered practices that teaching mathematics should be left to primary school teachers along with literacy skills. Filiz who taught kindergarten explained:

> *There is no time for math activities [although her teacher structured-large group activities lasted over two hours]… We used to teach counting and writing the numbers from 1 to 10 and simple additions. But now with the new curriculum we don't have to focus on math much. If children learn too much math early on it is inevitable that they would get bored in first grade. Just a touch of mathematics should be enough for the children in my class since they will learn the same things in more detail next year.*

Sharing the same view in addition to her seeing mathematics as something boring, Suzan weighed heavily on teaching self-help, language, and arts dismissing the mathematics completely. Suzan went on:

> *Our focus is on teaching self-help skills. … We also teach mathematics but I wouldn't mind if they don't learn math at all. Okay, let it be taught, but it should be fine with us if a kid does not learn much. He/she will learn it next year anyway. … Stories can be read everyday, paintings can be drawn, but no need to bore children with numbers everyday.*

Math was a Big Part of Children's Play during Free-Play Time

Observations made during free-play time revealed that children used, enjoyed, and were very much engaged in math in their play. A few children even attended private math programs after school, and some joined competitions. The conversation with one of those children shows how much he enjoys the experience:

> *Researcher: Is it fun? Do you like math?*
>
> *Cenk: Yes, it is so much fun. I like math so much.*
>
> *Researcher: Which one is harder? Math you learn at school or the one they teach at the after school program?*
>
> *Cenk: After school program is harder. What they teach here is way too easy.*

Children's engagement with mathematics during free-play was hard to miss and seemed to offer great teachable moments if only the teachers had taken advantage of them. A group of 5-6- year old-children who were observed during free-play were measuring, giving map directions, using math concepts, and making comparisons, all included in the national standards but unfortunately not in any of the teachers' plans. Here is the extract:

> *Zehra and Ayse were busy measuring their heights with a ruler. Ayse told Zehra "You are 109 kilogram." Zehra did not believe that and asked the student teacher, "Teacher, how tall am I?" The student teacher checked and responded, "You are 110cm." Ayse, "Could you tell me my weight too?" The student teacher measured her height and said, "92cm." Zehra turned to Ayse and said, "Look honey, I am a little bigger than you." Not happy about it, Ayse replied, "My mum is heavier than you. Her shoe size is 25." Zehra was quick to respond, "My mum wears size 2 ½ 80."*

A Limited View on and Provision of Early Math

Classroom observations revealed that the participants' provision of math experiences included simple concepts, shapes, numbers, counting, classification, addition and subtractions with single digits. For some of the participants, teaching only the single digit numbers, certain shapes and simple concepts were enough. They found it inappropriate to teach preschoolers mathematics other than counting and simple shapes. Suzan who worked with the preschoolers expressed her reservations about teaching mathematics to young children:

> *We don't teach how to write numbers. The first semester we teach counting till 5, and the second semester counting till 10 and some skip counting. They are expected to recognize the numbers in kindergarten but not in preschool. Families are usually enthusiastic about it or they teach it, but it is not a part of our program. We only give directions like "There is only one apple. Let's paint it." They are not required to recognize the number … It would be overwhelming for the children if we taught more. … Concepts like less and more, tall and short … numbers could also be taught.*

Some other participants gave a broader list of skills including seriation, classification, one-to-one correspondence, and recognizing the number of a group of objects. When asked, Karin's response included, "numbers, seriation, classification, counting backwards, one-to-one correspondence, matching, increasing and decreasing, recognizing the number of grouped objects." Some of the participants supported teaching additions and subtractions using single digit numbers.

When asked why mathematics was not a regular part of daily teaching activities, some of the participants put the blame on the national curriculum while for some others it was the result of a mutual understanding between the teachers and parents. Nil went on to explain how the national curriculum tied her hands:

> *For the age group I am working right now, I know it will sound too simplistic, I focus on counting, symbol recognition, writing numbers, one-to-one correspondence, classification, sorting, additions and subtractions. … We follow the national curriculum in which the math standards are limited comparing to those of other domains. Once we are done with the listed standards there is nothing left we could provide for.*

Inattention to Individual Differences and Previous Experiences

Teacher driven and strictly structured large group activities were the common practice. When asked how children's previous math experiences influence her teaching, Seher shrugged her shoulders and replied, "I guess, not at all." Same tendency appeared in Maide's words:

> *When I select the activities I start with the assumption that nobody knows anything. Like, they are all at the same level. I pay more attention to those who can't.*

The teachers were aware that children they served were actually not a homogenous group. But, advanced math skills turned into something unwanted in Karin's classroom where there was no room for difference:

> *First of all, we start with the number 1, like children know nothing. We try to include those already know by letting them help others … sometimes I try to keep the balance by*

explaining them that "your friends do not know what I am teaching now, and you, in fact, are supposed to learn it now" [not come to school already knowing].

Individual or Small Group Activities are not Provided

None of the participants provided individual or small group activities. Belen gave the overcrowded classrooms as her reason for not providing individual or small group activities while for Filiz it was the small class size that led her to implement only large group activities. Belen argued:

> *Well, I have 25 children in my class. Think about dividing it by 5. Who is going to attend those other groups when you work with one? It is applicable in classrooms with, let's say, 15 children, but impossible in crowded ones.*

The opposite argument was put forward by Filiz who believed that small-group or individual activities are only necessary when class-size is too large. Filiz went on:

> *Not having too many children in my classroom, I don't feel the necessity to provide small group activities. There are usually 10 children who show up everyday. But, in crowded classrooms small group activities are a must.*

Overuse of Worksheets

Some of the participants were open about their heavy reliance on worksheets while some others denied that during the interviews. Alya expressed a firm stance against use of worksheets by saying "There is no place for worksheets in our teaching activities. We always go for activities that keep children active." However, classroom observations revealed that she kept children constantly work on worksheets for 2 ½ hours. Belen, on the other hand, did not try to hide it and justified its use by pointing its convenience in overcrowded classrooms. When asked how she taught math, Belen explained:

> *To be honest, I always use worksheets. When working with a large-group of children this is the only way I can keep track of everyone. Those who finish show me their papers so I can evaluate their work. That's how we work. We pass around the worksheets, give them directions, and help those who can't.*

Similar to usage of textbooks in grade schools, the teachers followed a certain curriculum package that each child was expected to have in possession. Only difference was that the curriculum package to follow was the same for all the teachers. It was a common practice for the teachers to ask children have a seat around the tables, stay quiet, take their books, open certain page, and follow the directions.

Worksheets were even sent home as part of "parent involvement" or just as homework. As Pinar explains, "I ask the parents to supervise their children when they study with their worksheets since what we teach here needs to be practiced at home." The aura of a typical primary school was completed with a scene depicting a teacher checking the assignments as seen in the following extract from Feray's classroom: "The teacher called out the children as they entered the classroom, "Bring your assignments." The kids dropped their worksheets on the teacher's desk."

Manipulatives and Technology

Use of manipulatives and incorporation of technology in teaching math seemed to be uncommon in the classrooms that were observed. It was either random objects already present in the immediate surroundings, writing boards, or, often, just fingers of the children which were picked to concretize the concepts or operations. When asked if she used manipulatives in her teaching, Mina replied, “I use the magnet board, which really works. I also use the toys.” Saba gave a similar response:

> *I used to work on the abacus, but not anymore. Now it is mostly the toys that I use. Things like, “bring me 2 toys,” “pick up 3 toys,” or “who is going to bring me 2 squares?”*

Melike preferred to use the blackboard:

> *Melda, one of the kids in the class, complained, “When are we going to play? I am bored.” Melike was harsh in her response, “I hear that it is all play in the other classroom. Would you like to join them?” “No,” said Melda. Melike began writing simple addition equations on the writing board while children all waiting in silence. When she was done writing 1+1=2, 1+2=3, 1+3=4, 1+4=5, and 1+5=6 she turned to the children and started reading the equations in order while demonstrating the numbers using her fingers and asking children to count her fingers, “There was 1. Another 1 joined it. How many 1s are there now?” “There was 1. Two more arrived. How many are there now?” …*

When asked if children were given access to computer technology in their inquiry of mathematics, Suzan’s words revealed her reservations about computer use of children:

> *Well, [if they were allowed to work on a computer] they would just play a game rather than try to understand the activity. I don’t want them to spend too much time at the computer. I think it is better they learn math through worksheets or blocks.*

A misconception that computers could only be used in a lab was surfaced in Esma’s words. When asked how she used technology in her teaching math, Esma replied:

> *Esma: I use it quite frequently. Power point presentations, overhead slides are used. To me it is important to use visual materials like television.*
>
> *Researcher: Do you let children use technology for their individual work.*
>
> *Esma: There is no computer lab in this school, neither a computer training program. Why would I let them use it individually?*

For some others, it was the crowded classrooms that hinted the individual use of computers. Nil explained, “There is only one computer. It is impossible for me to give each child personal time on it.” Sibel gave the same reason:

> *My class is overcrowded. So, I don’t have that luxury. We only provide whole-group activities.*

Integration of Subjects

For some of the participants, integration of math was not even something to consider while for some others, it was only possible with literacy activities. A dismissive attitude surfaced right away in Seda’s words:

> *Seda: I don’t try to integrate it to other subjects. I have never tried. … I have never thought about it, never felt its necessity.*

Those who could see the possibility of integration restricted it to the literacy instruction. Saba expressed her view as followed:

> *Honestly, I don't' think math could be integrated into every activity. We can talk about it in a language activity; we can study that at reading and writing, but that's it. That's the reason I only teach math with certain subjects.*

It was only Rasim who had the belief that math is threaded into everything leading him to offer activities in an integrated form:

> *I don't implement just one pure activity. There is math in everything I implement. … When necessary, I just sprinkle it everywhere.*

Real Life Experiences

It appeared that some of the participants provided math activities just for the sake of it while some others directed children's attention to math in every part of their lives. Seda displayed a total dismissive attitude, "I don't do anything specific about that, I have never tried, and I don't think it's necessary." Contrary to Seda, Belen expressed dissatisfaction with her own teaching:

> *The thing is we just teach numbers and simple operations, but I am well aware that it would be more effective if we just taught things they could use in their daily lives. In the way we teach we don't offer anything related to their daily lives other than just a plain teaching of numbers, symbols, like an apple or a pear. Hands-on, active learning would be more effective. … Nothing I taught has been linked to their lives.*

Similar position was held by Filiz:

> *I don't think children can relate what they learn at school to their lives. Things we teach here remain to be abstract for the kids. I guess I don't pay attention to that.*

Karin, on the other hand, described the way she teaches as meaningful learning experience in which children are encouraged to look for and apply math in their lives. Karin stated:

> *I always try to show where they could use what they learn in class. An example would be learning the number 3. I ask them questions like "Would you be able to bring 3 plates if your mum asks you to when she sets the dinner table?" Or, we have learned the shape triangle. I try to help them see math in their surroundings by asking them questions like "What things in your neighborhood are in shape of a triangle? Roof of houses, pine trees etc."*

Children Kept Quiet

Children's engagement with math in their conversations was neither paid attention nor encouraged by the teachers. Children were constantly reminded to "zip it up" or be quiet like a statue. In fact, because of their desire to have a quiet classroom the teachers missed out on perfect moments that could be turned into meaningful learning experiences. The following field note taken during the free-play time is an example of those missed opportunities:

> *Mikail: My father bought this. He paid 50 liras for it.*
>
> *Kaya: They tricked me into paying 10 liras for a goody that was actually worth 40 liras.*
>
> *Nejat: I was also cheated out of 10 liras for stuff that was worth a quadrillion.*

Teacher: Silence everyone. People in the other classrooms are disturbed by the noise you are making.

The rule of silence was kept in effect majority of time including transitions, lunchtime, and even during activities. Saba was observed using a whistle to keep children quiet during activities. She warned children by saying, “And, we should do all these tasks in complete silence. If you keep talking like that the workbook would never be finished.” Similar attitude was reigning in Melike’s classroom:

It became a little louder in class. Kids were conversing. The teacher warned, “Let’s be quiet. We don’t talk during the activities. What are the rules in this school?” The kids replied, “To be quiet.” The teacher, “Correct, we talked about this before. Why don’t you follow it?”.

Discussion

Mathematics is a significant part of young children’s daily lives (Seo & Ginsburg, 2004). Their curiosity and interest in math leads them to integrate mathematics spontaneously into their play with well more advanced skills than educators usually assume (Baroody, 2004). It is the responsibility of teachers to build on current functioning level of individual children in a way to extend what children are capable of and make learning meaningful avoiding unfruitful repetitions (Clements, 2004; Seo & Ginsburg, 2004). This study set out to explore how early childhood teachers in two pre-k programs taught math to young children and the levels of math skills and concepts they addressed in their teaching revealed that children’s interest, display of advanced skills, and rich engagement with mathematics during free play did not find their reflection and largely ignored in the teacher directed strictly structured activities. Convenience of published curricula and workbooks made them popular among the teachers. This popularity of commercial curricula would not have been a cause of concern as long as they they had proven validity and the teachers made adaptations for the diversity of children in their classrooms (Copple & Bredekamp, 2009). Unfortunately, it was revealed in the study that workbooks and day by day teaching plans provided by the curriculum replaced the children at the center and stood as a serious impediment for a provision of developmentally appropriate education. The common inclination to disregard individual differences and informal learning experiences turned teaching activities into meaningless wasted time periods for many children whose mastery levels were significantly above what their teachers offered.

Centrality of workbooks, unavoidably, paved the way for the domination of the skills-approach which was characterized by teacher centeredness, authoritarian teaching style, lectures and demonstration, rigidity in terms of possible answers, and rote memorization (Baroody, 2004). Long hours of isolated work in silence without any cooperation with peers, reliance on worksheets, and no use of technology typified the drill-in approach (Baroody, 2004). The teachers made no effort to link in-class-learnings to children’s real lives, nor to integrate math with other subjects to make it more meaningful for the learners.

Added to this combination of strict adherence to the curriculum packages with a devoution to the skills-approach was a limited perspective on early mathematics. The requirement to follow the national curriculum was not necessarily led the participants to provide rich and challenging mathematics experiences. Rather, as research conducted in other countries reported (Copley, 2004; Graham, Nash, & Paul, 1997; and Tudge & Doucet, 2004), they limited their teaching to simple concepts, shapes, numbers, counting, classification, addition and subtractions with single digits. Some of the participants were openly content with teaching only the single digit numbers, certain shapes and simple concepts.

Conclusion

Results of this study clearly supports the research that indicates the failure of the university level teacher education to ensure quality teacher-child interactions and provision of effective math programs (Early et al., 2007). It seems that positive beliefs in child-centered pedagogy and investigative approach acquired during teacher training are not always acted upon in practice (Baroody, 2003). Teachers' own years of math learning experiences and observation of how math is taught also have a strong bearing on their attitudes, emotions and convictions (Sarama & Dibiase, 2004). Changing those would require more than making a progressive curriculum available. As long as teachers themselves do not derive enjoyment from their engagement with mathematics; lack confidence in their math skills and knowledge; are satisfied with the ways they teach; and see no practicality in approaches endorsed by teacher educators and curriculum makers, change in their teaching would be highly unlikely (Sarama & Dibiase, 2004). More research is needed to determine what strategies effectively work in teacher education, which would help novice teachers put theory into practice. Furthermore, factors in school atmosphere that perhaps lead teachers to abandon what they learn in the teacher training and to assimilate into existing culture of teaching need to be tackled (Early et al., 2007).

For long term benefits of ECE to occur, children should continue with their education in schools where quality of staff, materials, curriculum, environment, and community are all ensured (Phillips, McCartney, & Scarr, 1987; Woodhead, 2006). What makes findings of this research more striking is that the participants in the study were all cooperating teachers in student teacher placements. Their observed poor performance only maintains the vicious circle in which linkages between theory and practice is left forever broken. The study reveals the urgent need for effective partnership between universities and schools, not just in curriculum development or one-shot teacher development sessions, but ongoing and extensive teacher development programs in which teachers find plenty of opportunities to observe, take risks, experiment, implement, interact, learn, mentor, and develop a network of professionals as well as see, first hand, value in recommended teaching practices (Sarama & Dibiase, 2004).

In this small-scale study, data was collected in two early childhood education centers. Although ample information was collected through observations and

interviews with the teachers, a larger sample should be employed in future research to capture the nationwide picture. Also, the research sites in this study were publicly funded and served mainly urban children from middle-class families. Future investigations should include both public and private programs located in both urban and rural areas and in different regions of the country. Finally, a quantitative investigation of classroom practices and interactions supplemented with observations and interviews in addition to assessment of school quality and child outcomes would provide invaluable data to inform efforts to provide a robust early math program and improve early childhood education in general in Turkey.

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