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Harmony between Turkish Early Childhood and Primary Mathematics Education Standards*

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Abstract

The aim of this study was to explore the spiral relation and the congruency between mathematics standards listed in the Early Childhood and First Grade curricula in Turkey. A descriptive content analysis was conducted on Early Child Education Curriculum (OÖEP) for 36-72 months old children and Math Curriculum for the Grades 1-5 (İMÖP), both prepared by Turkish Ministry of Education. Results revealed the inadequacy of OÖEP in its provision of showing clear linkages between early math skills and future learnings despite the statements made for the importance of schools readiness in its texts; and complete disregard for early math education and school readiness in İMÖP. The ratio of spiral design established between OÖEP and first grade standards was only 51%, pinpointing the need for a revision of almost half of the first grade standards in İMÖP. These findings show the importance of collaborative work between early childhood and elementary math educators in the processes of curriculum development.

Key Words

Early Childhood Curriculum, Elementary Mathematic Education Curriculum, Spiral Design, Readiness.

Early years (age 0-6) set the stage for the fastest development in all areas of human development. Research shows that 50% of cognitive development occurs within the first four years of age followed by a 30% increase between the ages 4-8 (Shonkoff & Phillips, 2000). Positive effects of early education on life quality of individuals have been proven to be an empirical fact (Administration for Children & Families [ACF], 2002, 2006; Barnett, 1995; Campbell & Ramey, 1994; Entwisle & Alexander, 1998; Gomby et al., 1995; Halle et al., 2009; National Association for the Education of Young Children [NAEYC], 2009, 2010; O'Brien Caughy, Dipietro, & Strobino, 1994; Phillips, Voran, Kisker, Howes, & Whitebook, 1994; Polat, 2009; Türk Sanayicileri ve İşadamları Derneği [TÜSİAD], 2005, 2006; Yoshikawa, 1995). Quality and intensive early childhood education provide long lasting gains in cognitive, social, and emotional development especially for children from disadvantaged groups. Research shows that provision of a comprehensive early intervention is the most effective means to end educational disparities in society. Children who received quality early intervention stay in school longer, are more likely to finish high school, less likely to repeat grades and placed in special education.

These research findings have motivated many governments to invest in early childhood education. Consequently, schooling rates for the ages 3-6 has reached %100 in some developed countries (Bulletin Officiel de l'Education Nationale [BO], 2008; Information in Education Systems and Policies in Europe [EURYDICE], 2009, 2010a, 2010b; Ministère

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des Affaires Etrangères [MAE], 2007; Organisation for Economic Co-operation and Development [OECD], 2001, 2004; TÜSİAD, 2005; United Nations Educational, Scientific and Cultural Organization International Bureau of Education [UNESCO], 2006). It was a long-awaited development that Turkish Ministry of Education (MEB) has finally embarked on a big scale initiative to increase access to early education and included kindergarten education within the mandatory education years (Milli Eğitim Bakanlığı [MEB], 2011). Currently, 61% of five year olds are placed in kindergarten classes. However, schooling rates for children under five are still disappointing. Only 4% of 3-4 year olds and 17% of 4-5 year olds are receiving preschool education (Deretarla Gül, 2012). There are also regional and class disparities in enrollments.

Language, early literacy, mathematics, social, emotional, and cognitive skills gained in early childhood programs are significant predictors of future academic achievement of individuals (Campbell & Ramey, 1994; Entwisle & Alexander, 1998; NAEYC, 2009; O'Brien Caughy et al., 1994; Starkey, Spelke, & Gelman, 1983). There is strong empirical evidence that children's mathematics skills develop much earlier and more complex than Piaget and other cognitive development theoreticians have estimated (Aubrey, 1993; Baroody, Lai, Li, & Baroody, 2009; Charlesworth & Lind, 1999; Davies & Walker, 2008; Flavell, Miller, & Miller, 1993; Ginsburgh & Seo, 1999; Griffin, 2004; Starkey, Klein, & Wakeley, 2004; Wynn, 1992). Young children are exposed to and engage in mathematical concepts and such procedures as comparing quantities, measuring, sorting, classifying, and finding patterns in their natural environments (NAEYC, 2010). Mathematics skills gained in early years better predict later school success than intelligence (Tsamir, Tirosh, & Levenson, 2011). Therefore, mathematics education has become an important part of early childhood education (Blair, Gamson, Thorne, & Baker, 2005; Clements, 2004; Clements & Sarama, 2011; Davies & Walker; Lee & Ginsburg, 2009; Linder, Powers-Costello & Stegelin, 2011; Manning, 2005; Montessori, 1961; NAEYC, 2010; National Council of Teachers of Mathematics [NCTM], 2000; Newcombe & Huttenlocher, 2003; Perry & Dockett, 2007; Pinel, Piazza, Le Bihan, & Dehaene, 2004; Platz, 2004; Sarama & Clements, 2009; Sharon, 2006; Sharon & Rao, 2005; Yeboah, 2002).

In 2000, the preschool mathematics standards developed by NCTM became a part of Principles and Standards for School Mathematics (PSSM) for school age children. Numbers and operations, geometry, measurement, algebra (including patterns), and data analysis comprise the five major content areas in the NCTM's early childhood standards (NAEYC, 2010). Fundamental math skills and concepts that are expected to be acquired in preschool are listed as one-to-one correspondence, number sense, counting, logic and classification, comparison, geometry, spatial relations, parts and wholes (Charlesworth, 2005). These fundamental skills and concepts are followed by higher level concepts and skills including ordering, seriation, patterning, measurement, addition and subtraction, data collection and analysis, and use of symbols.

Similarly, mathematics objectives are given great importance in Early Childhood Education Curriculum (ECEC) prepared by Turkish Ministry of Education. Children who are ready for school are expected to have certain math skills including counting, number recognition, addition and subtraction by using objects, recognition of colors, shapes, and patterns (MEB, 2006a).

Kindergarten has become a bridge between preschool and primary education as school readiness is stated among the main goals of early education (MEB, 2006a). Those who cross the bridge without falling are the ones considered ready for the first grade. How congruent are the first grade standards with this readiness level? This study focuses on this question by making a comparison between early childhood education and first grade math standards.

Mathematics education is a part of PISA and TIMSS assessment programs. Sadly, performance of Turkish pupils in all three areas addressed lags far behind those from other countries. This repeated failure was given as one of the reasons for the recent changes in the 1-8 grade standards (Küçüktepe, 2010).

Turkish Early Childhood (MEB, 2009) and Elementary School Standards (MEB, 2006a) were developed separately in different years; the latter was prepared a year before. Even though it is stated that elementary school standards were taken into consideration during the preparation of ECEC (Oktay, 2010) congruence between these two set of standards needs to be carefully explored. Elementary Mathematics Curriculum is organized spirally (Ersoy, 2006), that is, new learnings are built on previous ones and cognitive readiness is taken into consideration (Bruner, , 1977; Demirel, 2007; Sönmez, 2007).

Research conducted in Turkey has shown that children who received early childhood education performed better in readiness evaluations than those

who did not (Dursun, 2009; Erkan & Kırca, 2010; Unakıtan Polat, 2007). Accordingly, a higher readiness level should be expected from new first graders than ever before parallel to a drastic increase in access to the preschool programs and as kindergarten education becomes a part of mandatory education. Therefore, the aim of this research was to analyze the congruence between math standards in ECEC and First Grade Curriculum. Specifically, the research questions were as followed:

1. What are the suggestions and explanations for cognitive readiness in ECE and First Grade Standards?
2. What early childhood objectives are the ones upon which the first grade mathematics skills can be built?
3. How much do the first grade mathematics standards build upon the early childhood standards?

Method

Mathematics objectives given in Kindergarten Yearly Plan prepared by MEB and in the first grade curriculum were compared through a qualitative document analysis in order to obtain both qualitative and quantitative data and (Cohen, Manion, & Morrison, 2007; Yıldırım & Şimşek, 2008). The documents analyzed in this study included Early Childhood Education Curriculum (ECEC) (MEB, 2006a) and Guideline for Teachers (MEB, 2006b) and Elementary Mathematics Standards for 1-5 Grades (MEB, 2009).

Yearly teaching plan for kindergarten given in Guideline for Teachers covers all the cognitive development outcomes listed in ECEC (MEB, 2006b). Math outcomes are listed under 21 different cognitive skills.

For our research, those outcomes were re-categorized in accordance with the first grade math curriculum content areas and were analyzed comparatively using descriptive and content analysis techniques in order to explore whether or how much spiral learning was established.

Results

School readiness. Comparison of the kindergarten and the first grade standards showed that school readiness is addressed in ECEC in detail and given as the second goal of early childhood education. Readiness is defined as easy and adequate learning without any emotional confusion and said to require not only maturation but also attainment of a certain set of skills and pre-learnings. Skills necessary for learning primary mathematics are listed within cognitive development goals. Under school readiness, the following skills are listed: object counting, number recognition, addition and subtraction using objects, colors, and shapes. There are short explanations given for some of those goals supplemented with sample activities. Except for two developmental goals, there is no mention of the strong relation between cognitive development goals and readiness for the primary school mathematics.

There is a total disregard for early mathematics learning and school readiness in elementary mathematics curriculum.

Early mathematics outcomes in ECEC. An analysis of the yearly teaching plans prepared by MEB revealed a distribution of early math outcomes for different age groups. In ECEC, there are 90 math outcomes listed under 18 different cognitive development goals. Among those goals, 18 are listed in the plans for the age group 5-6 while three cognitive goals are skipped for the age group 4-5, and seven are excluded from the plans for the age group 3-4. The percentages of the 90 math outcomes included in the teaching plans for different age groups are as followed:

- 43% for 3-4 year-olds
- 69% for 4-5 year-olds
- 90% for kindergartners

Four of the math skills are not listed in any of the teaching plans despite their importance for school readiness.

Spiral design. In terms of spiral design, three different patterns were detected:

A. Spiral learning was established in some content areas by taking into consideration children's readiness level and early learnings. Simple to complex rule was applied. 51% of the spiral relations fits into this pattern.
   - A1. Same outcome, only the range of the numbers is different.
   - A2. Simple to complex rule established, same outcomes for the same skills
   - A3. Simple to complex rule established, new skills

B. No spiral pattern. Spiral learning was disregarded in some content areas without any consideration of children's previous learning experiences and readiness. 27% of the spiral relations fits into this pattern.
   - B1. Outcome with the same skill

B2. Outcome with similar skill, not the same

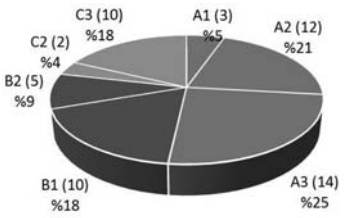
C. Reverse spiral pattern. From simple to complex rule was reversed in some domains where students' previous learnings were totally disregarded by inclusion of math outcomes that stay behind ECEC outcomes. Some ECEC outcomes, in fact, are oriented towards higher level cognitive skills than those included in Elementary Math Curriculum. 22% of the spiral relations fits into this pattern.

C2. Complex to simple spiral, there are outcomes oriented for the same skill

C3. Skills in ECEC are listed for the upper grades in elementary math curriculum.

Frequencies and the percentages of spiral relations are shown in Graphic 1.

Graphic 1.
Frequencies and percentages of the spiral patterns in ECEC and elementary math standards



Discussion

Comparison of Turkish Early Childhood Curriculum and First Grade Mathematics Standards in terms of spiral learning structures showed that the spiral structure was established only 51% of the early mathematics outcomes. These findings of the study reveals the failure of primary school curriculum in taking advantage of children's capacity built in early years. Out of 13 math goals listed in the first grade standards, six need serious revisions. Three of the goals including the ones about pies, spatial relations, and shape matching are just repeated in the first grade standards without any spiral learning structure. Pattern sense and tessellation subdomain, also, includes repeated outcomes in addition to the reversely structured spiral relation. There is no linkage established between two sets of standards in the domains of geometry and data analysis. In fact, recognition of geometric shapes and making object graphs are not included the primary grades' standards and appear in the standards for the upper grades (Baki & Gökçek, 2005; Eğitim Reformu Girişimi [ERG], 2005).

Learning occurs in sequences. A successful transition from an early childhood program to primary requires knowing where children are; building new learning and experiences on what children already know and capable of; and also providing learning opportunities that are challenging but achievable (NAEYC, 2009; EURYDICE, 2010a; Yeboah, 2002).

The study also pinpoints the urgency of the redevelopment of Elementary Math Curriculum in congruence with ECEC (BO, 2008; Fuson, 2004; NCTM, 2000). Cooperation and collaboration of early childhood and elementary education specialists is essential in creation of the standards that could help children reach their full potential. It is important for teachers to know the sequences of the acquisition of skills, concepts, and abilities. Teacher training programs should provide necessary knowledge base and experience that would help teachers see how early learnings make the basis for later acquisition of primary math skills.

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