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Editorial

Introduction to the Special Issue “Mathematics Education: At Home and in the Classroom”

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Children’s mathematics achievements differ based on a variety of factors, including country of origin and cultural or economic background. Even when children come from similar demographic backgrounds, their home and school learning environments may contribute to individual differences in children’s mathematical skills. Such differences are apparent even before the start of formal schooling [1]. Therefore, it is critical to learn more about the nature of children’s mathematic experiences at home and at school and how these are related to children’s mathematical development. The twelve articles in this Special Issue highlight aspects of the home and school environment that are important to consider for children’s mathematical development.

The topics discussed and approaches taken by the researchers of these twelve articles greatly expand our knowledge of factors facilitating children’s mathematic development. Several of these articles emphasize the importance of considering cultural influences on children’s mathematics development. Participants do not just come from the U.S. and Canada, the more typical locales for samples, but also from Chile, China, Germany, Israel, Japan, and Mexico. Moreover, some of the studies compared responses across cultural groups. Several of the studies go beyond considering children’s activities to include parents’ attitudes towards children’s mathematics learning or the beliefs parents have about how children learn and their role in it.

Understanding what characterizes an effective home learning environment for mathematics is critical if we are to optimally facilitate children’s mathematics development [2]. However, much of the research has not found a relation between engagement in mathematics activities and children’s mathematics skills. This may be because many studies do not take a sufficiently granular approach when inquiring about the home learning environment.

In contrast, the first nine articles in this section consider different aspects of the math home learning environment: the amount of math language children hear, and the type and amount of math activities children engage in. These nine articles also consider characteristics of the family such as parents’ occupations, parents’ anxieties about math, parents’ gender, and the age of the child. In addition, they consider the relation between the home learning environment and the skills of children at different ages.

The first article of the nine is Dearing et al.’s [3] meta-analysis of studies with children between 2 and 6 years. They found a small effect between the amount of number talk children heard at home and parents’ education and income. Next, Leyva, Libertus, and McGregor [4], using middle-income, White parents of four-year-olds in the U.S., found that engagement in specific math-related activities at home was significantly associated with children’s specific mathematics skills. However, there was variability across activities and skills. Mues et al. [5] conducted a meta-analysis of 12 studies with 190 children and found a significant positive relation between parents’ STEM occupations and the home numeracy environment for kindergarten children in Germany. However, there was no direct association between parents’ STEM occupation and children’s numerical skills. Retanal et al. [6] explored why parents who exhibit math anxiety may not be effective



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helpers for their 11- to 14-year-old children. Based on results from a survey that parents completed, Retanal et al. [6] concluded it was the style of helping interaction exhibited by the parent that made for an effective helper. Parents who were more anxious did not engage in particularly positive interactions.

The four studies listed in the prior paragraph were correlational studies. In contrast, Scalise et al. [7] went beyond just documenting aspects of the home learning environment to using an experimental approach to investigate whether either of two game-playing interventions improved low-income children's mathematic skills. They randomly assigned 5-year-olds and their parents to play either a color/shape or a magnitude comparison card game for six weeks. Families received the same instructions about what to do to play the game in the assigned condition. Children in the color/shape condition improved their knowledge of shapes, while children in the magnitude/comparison condition did not improve their numerical skills. The authors speculated that differences in outcomes were due to differences in the amount of math talk families in the two conditions engaged in.

It is not enough to just consider the activities that children engage in. In addition, we need to consider the beliefs parents have. For example, the beliefs parents have about their children's learning predicts what activities they make available to them and children's skills [8]. Furthermore, the home learning environment that children experience is not limited to mathematics but includes literacy and other educationally relevant activities. Both Elliott et al. [9] and Sonnenschein et al. [8] considered parents' beliefs about children's engagement. Elliott et al. examined preschool engagement in literacy and numeracy. In contrast, Sonnenschein et al. [10] investigated elementary school children's engagement in literacy, writing, mathematics, and science. In both studies, parents emphasized literacy/reading more than mathematics. For example, parents viewed engagement in mathematics as less important than engagement in reading activities and were less confident assisting their children with mathematics.

Similarly, Skwarchuk et al. [11] explored the relations between the home learning environment and literacy and math skills of 8-year-old Canadian children. They noted that most current research has focused on younger children [8]. Of particular interest in their study was whether findings with the preschool age home learning environment and children's mathematic development extend to school-age children. Parents' reports of the frequency with which children practiced math facts and parents' own attitudes towards math were related to children's arithmetic fluency assessed by the investigators. Interestingly, and in contrast to findings by Retanal et al. [6] discussed above, they did not find a relation between parents' math anxiety and children's math performance. Additionally, Skwarchuk et al. [11] also compared how mothers and fathers socialized their children's literacy and math skills, an understudied topic. Interestingly, mothers focused more on literacy whereas fathers focused more on mathematics.

Although many of the studies expanded the sample behind the U.S. and Canada, they did not actually compare across cultures. The importance of cultural comparisons is illustrated by the article by Susperreguy et al. [12]. They compared parents' expectations for children's early math development with Mexican, Chilean, and Canadian parents of preschoolers. They also explored children's engagement in literacy and math activities. Of particular interest, Mexican parents had higher expectations for their children's development than the other groups of parents.

The three final articles focus on how different aspects of the school mathematics environment are or can be utilized. Two articles by Stites and her colleagues [13,14] consider whether preschool teachers in China, Japan, Turkey, and the U.S. use their classroom preschool libraries as a means of fostering children's math exposure and development. There was clear variability in the emphasis teachers gave to the preschool libraries as a mathematics venue, with most teachers not viewing the library as a means of such exposure. Teachers in China were most likely to use the library as a means of fostering children's mathematics skills.

The final study by Barki [15] focused on training preservice Israeli teachers, a critical component of effective teaching. Her results suggest that using authentic cases (e.g., problems high school students solved) was highly effective.

Given the variability in the findings of the importance of the home learning environment discussed in this issue, more research is needed with children of different ages and from different demographic backgrounds. We also need research on different types of math activities. We should consider further how parents' beliefs and attitudes play a role in children's home learning environments. Additionally, the articles about math in schools suggests interesting topics for follow-up. For example, will increasing math exposure in classroom libraries facilitate children's learning, and what are effective ways to train future teachers? Finally, few researchers have investigated relations between home and school activities. As Bronfenbrenner (1979) [16] suggested many years ago, children's development is facilitated if the relation between the home and school is good. In terms of children's math development, this would mean that there is ongoing communication between the two contexts about what activities are occurring in each. Although more research is needed, these twelve articles make an important contribution to the field.

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