What Works for Parents: How Parents Support Their Children with Math Homework in Rural Ghana

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Family and Consumer Sciences (FCS) programs target families in deprived rural and urban communities with the objective of equipping them with skills to improve family well-being, education, and relationships. In recent years, the focus of FCS in Ghana has been on parental styles and education that foster parents' involvement in their children's school work. Using a child-parent interactive model, a series of math activities were delivered to children between the ages of 6 and 10 years. Group activities were also facilitated by the FCS staff. Parents used local materials, such as small empty cans, bottles, leaves, stones, sticks, old newspapers, and sand, to explain math concepts. Staff, parents, and children used fun activities and role plays to demonstrate developmental processes that enhance effective child development. The lessons identified were tied to the understanding of appropriate parenting styles that foster acquisition of skills for basic math concepts. At the end of the 12-week program, parents reported increased interest and confidence in math and were more proactive in supervising their children to complete their homework. The importance of the model lies in its simplicity in conveying fundamental knowledge that relates to the interwoven aspect of developmental domains to ensure children experience maximal success with math-related activities. The model also promotes acquisition of basic math skills in a naturalistic setting.

Keywords: child development, parental support, math homework, rural Ghana, developmental processes

Introduction

Family and Consumer Sciences (FCS) outreach programs continue to foster parental education and involvement in the school work of their children. It is well acknowledged that parents play a key role as a guide for children to understand the world and to acquire knowledge outside the classroom (Marion, 2010). Research results reveal that children develop mathematical skills as they continually engage with people and objects; they construct their own understanding of the physical world and gain "number sense" that they transfer to the classroom (Clements, 2004). For example, children understand basic concepts of mathematics (e.g., counting, size, volume,

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shapes and others) through play activities. As children compare, measure, manipulate, and estimate objects, they form relationships in their minds (Clements, 2001; Cohen, 1992; Copley, 2010). Dehaene (1997) argued that humans are born with a genetic disposition for "number sense" that allows them to understand an approximate sense of quantity right from birth. Dehaene (1997) contended that as children grow older and increase their interaction with the environment, they refine this disposition with language and become more precise with "number sense." Similarly, because children are curious and have a keen desire to explore and experiment, they are described as mathematicians and scientists (Helping Children Learn at Home, 1997).

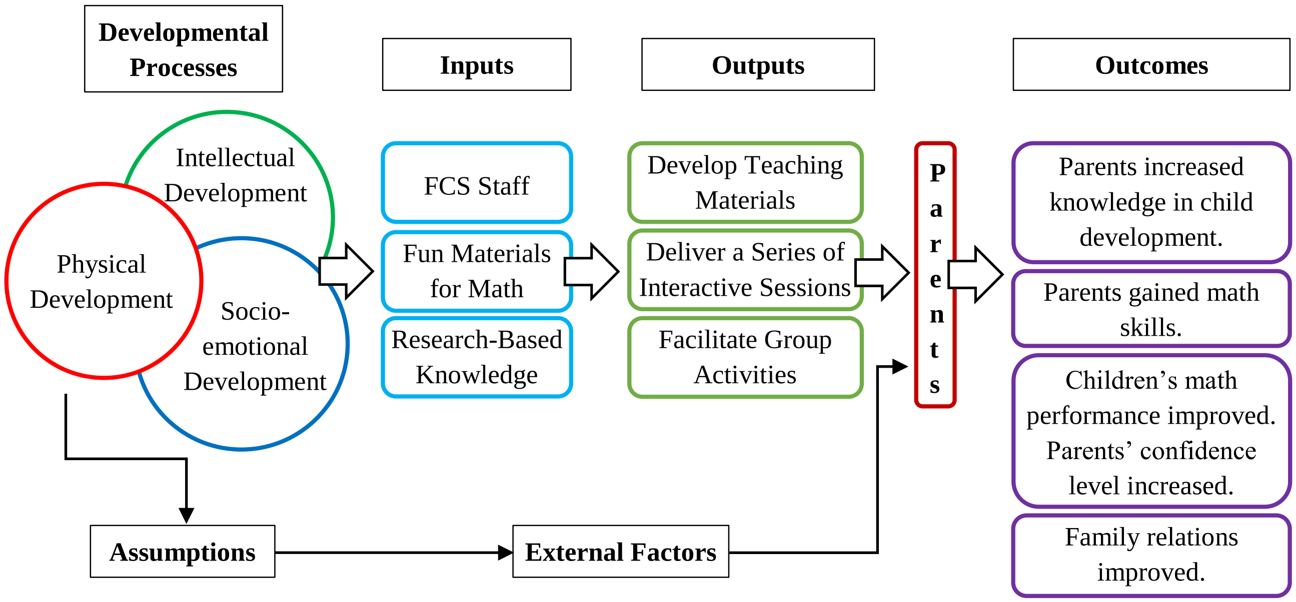
Against this backdrop of knowledge, parents and professionals are challenged to nurture children's intuition about numbers before introducing them to abstract rules or formulas for math. Studies also indicate that when adults understand the holistic approach of supporting children by taking into consideration developmental domains, child-parent interaction could be planned to support children to improve basic math skills useful across domains, such as problem solving, decision making, estimation, socio-emotional functioning, and motor skills (Santrock, 2012). It is imperative for children to be encouraged to solve contextual problems and share their insight about objects and situations before they are exposed to procedural skills, particularly in math.

Conceptual Framework

When children are given the opportunity to make things, look at things, and talk about the things they make, they are able to express their feelings, make choices, solve problems, and develop perceptual abilities; thus, children are able to experience success. Therefore, activities that promote hands-on applied math concepts in a naturalistic environment should be encouraged. Interactive play that allows for conversation facilitates spatial development in children (Ness & Farenga, 2007).

The model presented in Figure 1 depicts the relationship between developmental processes (i.e., physical, intellectual, and socio-emotional) of the child and external factors, including material for teaching math and interactive teaching methods. The model assumes that a teacher's interaction with parents in 'fun math activities' would enhance parents' understanding of basic math concepts because they are gaining hands-on experience when working in group settings. Again, parents gain an understanding of the main developmental domains and how that relates to children's involvement in activities and promotes their ability to comprehend and solve math problems.

Figure 1. Model for Improving Parental Styles and Enhancing Math Skills



Santrock (2010) stressed that children develop cognitive skills in a naturalistic environment when they focus on experimenting, exploring, discovering, and speaking and listening. Similarly, healthy socio-emotional development occurs when children are given opportunities to manipulate objects and interact with peers and adults, such as teachers. The model further assumes that children develop social skills through interaction by asking questions and sharing and discussing what they did with the materials. Santrock (2005) emphasizes that the three developmental processes (physical, socio-emotional, and cognition) are interwoven, and thus, development is promoted in all three areas simultaneously in a play/learning environment.

Application of Model

This paper describes a project based on this child-parent interactive model focused on enhancing skills related to the acquisition of basic math concepts among 6-10 year olds in Ghana. This project emerged as a response to address a preliminary issue reported by parents during a needs assessment interview. Parents reported that they had difficulty assisting their children with math homework because they did not understand the current course content in math. FCS staff in Ghana, therefore, designed this project as an intervention strategy to address the needs of parents.

The objectives of this project were to explore natural opportunities for parents to assist their children in learning math and also to find ways for parents and their children to acquire basic math skills through everyday experience. The project also aimed to engage parents and their children in selected math activities and to show the relationship, if any, between developmental processes and parents' involvement in learning math. The interactive nature of this program provided capacity building among the children, parents, and FCS staff.

Parents who participated in an FCS Extension program between 2010 and 2011 in the rural community of Teiman (near the University of Ghana) were invited to participate in the project. Twelve parents were selected, and they completed all sessions of the 12-week program. In addition, two FCS staff and 12 children were also involved in the project. Each session lasted approximately one hour.

Researchers have hypothesized strong conceptual relationships between developmental processes and materials for children during play activities (Jent, Niec, & Baker, 2011; Marion, 2010). Thus, the project had parents use local materials, such as small empty cans, bottles, leaves, stones, sticks, newspapers, and sand, to explain math concepts. These materials served as physical objects for children to manipulate to help provide hands-on experiences for learning math concepts (Kamina & Iyer, 2009). Additionally, fun activities and role plays were utilized to demonstrate developmental processes that enhance effective child development. These lessons were tied to the understanding of appropriate parenting styles that would foster math skills.

Description of Math Activities

The children in the current project engaged with bamboo plants, looked critically at the branches, and made interesting things such as a flute, the alphabet letter "A," and a ruler. The children became aware of different lines, sizes, and shapes. They were able to verbalize these mathematical concepts and have interesting statements and conversations during the session. For example, with the bamboo sticks, children stated: "I have a long flute that I am using for my music" or "I have made a square with my sticks." Children learn math better when they are driven by their own interest (Geary, 2006). Parents can help children understand how math ties into real life. Each of the following photos depicts an intervention providing math experiences that incorporated the senses of the children and allowed them to experiment with materials, such as bamboo, cabbages, mangoes, and tomatoes. It also allowed them to make observations and investigations about these objects.

Image 1. Measuring Bamboo Sticks

Image 2. Cutting Bamboo Sticks

Image 3. Counting Cabbages

Image 4. Picking and Counting Mangoes

Image 5. Picking and Counting Tomatoes

Image 6. Exploring with Bamboo Sticks

Image 1 shows FCS staff with the children standing around the bamboo tree. The children were reaching out their hands to cut sizeable bamboo sticks that they would use during the project. *Image 2* depicts FCS Staff, parents, and children sitting and cutting and molding bamboo sticks into various shapes during math activities. *Image 3* shows children counting cabbages. *Image 4* depicts FCS staff and children reaching out and plucking mangoes on the mango tree and counting mangoes as they drop. *Image 5* shows children picking and counting tomatoes from a nearby garden. *Image 6* depicts children, FCS staff, and a parent exploring with bamboo sticks, chatting, and having fun.

The child-parent interactive model assumes that as the participating children cut and arrange bamboo sticks into shapes and sizes and organize them into instruments, such as flutes and counting objects, they are essentially developing physically in terms of brain and neuron processes. Similarly, the children in the project develop fine motor skills through the manipulation of the bamboo sticks. The model therefore proposes that the provision of inputs, such as the bamboo sticks, have the likelihood to facilitate high level cognition, imagination, and social competence when children are encouraged to use such materials. Smith (2009) argued that physical objects selected in the environment must "match" the developmental level of children using the materials. The sizes of the bamboo sticks used in this project were therefore fit for the developmental level of the children. The bamboo sticks used were light in terms of weight so children could handle and manipulate them; the lengths were between 6 and 12 inches. The adults assisted the children in getting bamboo sizes that the children appreciated and were comfortable working with in the activities.

Cognitively, as the children engaged with the materials provided in the project, they were able to process information about the materials in their environment. This included their ability to evaluate the materials, compare the various shapes and sizes, and make decisions about the materials and actions to take with regards to the materials. They also became imaginative and creative through the manipulation of the materials. Children also recalled their experiences, asked questions, and reasoned about objects and the situations around them. In doing so, they were able to articulate their ideas, build vocabulary, and develop interpersonal communicative skills (Fujise & Deacon, 2008; Santrock, 2012).

Results

Both children and parents demonstrated eagerness and curiosity as sessions progressed. All participants arrived on time for each session, without any reminders. Participants (children, parents, and FCS staff) were grouped into sections, and the materials for the activities were shared among them. The participants familiarized themselves with the materials and talked to each other as the sessions were introduced.

Children in the project used fascinating vocabulary to describe shapes, sizes, and colors. One child stated: “Bamboo sticks are like sugar cane sticks, let’s count the joints and share.” The idea of sharing as verbalized by the children provided them the experience of dividing objects between or amongst them, which can represent the concepts of subtraction, division, and fractions. Similarly, they experienced math concepts, such as sorting different sizes of bamboo sticks, classification of objects, and familiarizing with symmetric, geometry, and numeracy skills. Another child pointed out, “Green color is everywhere because all the leaves are green.” Further, they were sociable and seemed to be connecting with nature and learning at the same time. This supports Fjørtoft’s (2001) findings that when children's daily learning environments approximate natural conditions, it results in increased interest to explore and a superior rate of knowledge acquisition. Parents reported that their children demonstrated certain skills for the first time. This includes impressive performance on fine motor skill activities that involve cutting and excelling on such activities as matching sticks. Additionally, counting fast and accurately measuring sand and water for the first time were reported by parents.

By the end of the 12-week sessions, children were able to act out roles that demonstrated their understanding of basic math skills, including counting, sorting, measuring, observing patterns, dividing, and describing situations. As shown in the photos, children and parents also gained math through everyday experiences. They were able to build vocabulary to express their mathematical experiences. Parents reported that their children had become more enthusiastic about homework and more adept at using materials from the community to understand math concepts. Parents did not only report increased confidence in assisting their children with homework, but also an improvement in quality of parent-child interaction. This was evidenced by statements, such as the following:

- “Now I understand how children gain skills when we do things together with them.”
- “I didn’t know that my child is capable of doing all these things.”
- “Now I know my child better. He is playing and learning math at the same time.”

Implications

Results from this project suggested that engaging parents, children, and their peers in learning activities enhanced acquisition of skill in various domains of development and may inform evidence-based practices in early childhood education. Observations from the project also indicated that using environmentally-based strategies that involve natural objects prior to introducing highly intensified and procedural strategies for learning math resulted in children approaching math with increased enthusiasm because of the associated fun activities. Additionally, thoughtfully arranged fun activities promoted natural interactive processes that enhanced the development of both cognitive and social skills. Parents’ roles as mediators and learners promoted group affection and co-operative learning as evidenced by previous studies

(Bunting & Cousins, 1985; Cohen 1992; Fjørtoft, 2001). In light of data from previous and current observations, it is expected that teachers would favor a multi-modal approach when introducing children to math while recognizing the positive impact of relying on practical objects, tools, and illustrations from the children's familiar environment. Additionally, FCS professionals need to encourage informal ways of learning new ideas, particularly in math and science, so parents who are less educated can be prepared with new skills to support their children.

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