The “Math Is Everywhere” Preschool Mathematics Curriculum

During a circle-time discussion of family pets, the teacher asks all children who have a cat to stand up. Dominique volunteers to count the children. She exclaims, “One, two, three, four, five. Five kids have cats! I bet more kids have dogs.” Her teacher responds, “Well, how would we figure that out?” The class has been using “Math Is Everywhere,” a flexible, activity-based curriculum designed to help preschool teachers integrate mathematics into their teaching. This curriculum has been shown to increase children’s achievement and interest in mathematics (see Arnold et al. 2002).

In developing this curriculum, we discovered that many teachers were uncertain of how to teach mathematics to preschoolers. Moreover, some teachers were not convinced that their students were capable of learning or even interested in mathematical concepts. Through workshop discussions, teachers realized that they already were doing activities relevant to mathematics and that they could improve the effectiveness of these activities with simple strategies to maximize children’s learning.

Strategies that are helpful for teaching in general are important for promoting mathematical concepts and processes. Teachers should use specific, immediate, enthusiastic praise to show children what they are doing right. Praise makes children feel successful and promotes the development of positive feelings about their capabilities. Both children’s beliefs about their self-efficacy and teachers’ positive expectations for their achievement are important predictors of academic success. Teachers should praise correct responses, effort, enthusiasm, interest, problem solving, creativity, and appropriate behavior, and help children problem solve when their responses are incorrect.

Other useful strategies include teaching mathematics in a way that is relevant to the child and integrated into the everyday activities of the classroom, making activities fun, and following the child’s lead. Opportunities to help children build interest and abilities in mathematics are everywhere in the preschool classroom; for example, table setting or sharing materials. To the surprise of many adults, children start school with a large amount of informal knowledge about mathematics, tend to be active in their learning, and are naturally curious about mathematical concepts (Baroody and Wilkins 1999). Teachers must recognize where children are on a continuum of mathematical learning and use that knowledge to provide appropriate scaffolding for children. Teachers should give children opportunities to use problem-solving strategies, to engage in reasoning, and to learn new ways to represent information. Activity choices within the curriculum should focus on expanding children’s knowledge, abilities, and interest.

The goal of our project was to design a curriculum of simple, fun, and developmentally appropriate activities to promote preschool children’s emergent mathematics ideas and skills. The activities needed to be “teacher-friendly,” requiring little preparation and fitting easily into the classroom routine. We hoped that teachers would have fun with the curriculum, feel more confident in their...
abilities to teach mathematics, and continue to focus on teaching mathematics, even after completion of the study.

The curriculum consisted of a book of eighty-five mathematics activities, from which teachers could select those best suited to their teaching styles and their children's interests and needs. We encouraged teachers to adapt the activities or create similar activities appropriate for their students. During the first three weeks of the program, we asked teachers to implement at least one circle-time activity each day. During the second three weeks, the teachers implemented two transition or meal-time activities and one small-group activity per day.

The activities included music, movement, discussion, and art projects. They were designed to hold children's interest while teaching numeracy concepts such as counting, one-to-one correspondence, comparison, and understanding of numbers and quantity. This curriculum focuses on promoting numeracy achievement within a short time period, so we did not include some concepts relevant to preschool mathematics, such as geometry and spatial relationships and measurement. Year-long curricula should include these areas. Our research group generated some activities and we based others on previously published curricula (see Arnold et al. 2002 for a more detailed list of activities and sources). Figure 1 describes sample activities.

We conducted implementation and testing of the curriculum in two urban Head Start preschool centers. Four of the participating classrooms implemented the curriculum and four classrooms were control classrooms. A total of one hundred twelve children ranging in age from three to five years old, with an average age of four, participated in the study.

We gave each child a standardized test of emergent mathematics concepts and processes (TEMA-2) and an assessment of his or her interest in mathematics activities. Teachers completed surveys about children's interest in mathematics activities and their own attitudes toward teaching mathematics: After teachers were trained to use the curriculum, they implemented the program for six weeks while tracking and rating their use of the various mathematics activities in the classroom. We repeated each assessment after the intervention ended.

Before the intervention, the children's average raw score on the TEMA-2 was 7.82, the twenty-third percentile nationally. After the six-week intervention, the children who participated in the intervention improved their TEMA-2 scores by 3.67 points; children not exposed to the curriculum improved by only 0.84 points. Responses to the intervention varied. Boys increased their scores more than girls did, and African American and Puerto Rican children increased their scores more than Caucasian children did. We were surprised by these differences, and at this point, we can only guess the reasons for them. Perhaps gender and ethnicity affected teachers' interactions with children in a way that favored boys and ethnic minorities. Perhaps some aspect of the intervention and its activities, such as its hands-on and cooperative nature, better matched certain children's learning styles.

Both the teachers and the children themselves reported that children's interest in mathematics significantly increased after exposure to the intervention. Teachers relayed stories of children's increased interest in mathematics and spontaneous use of mathematical concepts and processes, even outside of the curriculum activities. One teacher reported, "The children used to just put the counting bears in a cup and pretend they were coffee. Now they love to sort and count them."

The teachers' own attitudes about mathematics changed as well. After the intervention, more teachers described mathematics as fun to teach (four out of ten before the intervention versus eight out of ten after) and reported that they had improved their teaching of mathematics (four before versus six after). They used an average of two curriculum activities per day and rated eighty percent of those activities as "very good" or "excellent." When asked to evaluate the program, teachers reported an overall satisfaction rating of 9.5 out of 10 and gave the curriculum a rating of 8 out of 10 for ease of use. One particular asset of this program is its teacher-friendliness. It requires little preparatory time and is flexible, simple, and fun for both teachers and students.

Although unanswered questions about the program remain, particularly about the response of girls and Caucasian children, we consider "Math Is Everywhere" to be a success. In only six weeks,
Sample activities from the “Math Is Everywhere” curriculum

Estimation
Targeted concepts: Counting, estimation, writing numerals
Description: Fill a glass or clear plastic jar with a countable item, such as ping pong balls or counting bears. Give each child a chance to guess how many items are in the jar. Help children write their guesses. Count the items in the jar together.
Ideas for extension: Make a bulletin-board display for daily or weekly estimates. Let the children post their guesses next to their pictures.

Mealtime Seating by Numbers
Targeted concept: Recognizing numerals
Description: After each child washes his or her hands, give the child a card with one to six dots on it and have the child match the card to a numbered table setting to determine his or her seat for mealtime.

Number-Picture Match Game
Targeted concepts: Matching numerals to quantity, counting
Description: Make a set of cards for matching numerals and quantity. Half of the cards should have a picture of one item, two items, or three items, and so on. The other half of the cards should have a numeral. Have children count items on a card and match the card to the card that shows that numeral.
Ideas for extension: Make picture cards that show different quantities of objects, such as one balloon or two pencils. Mix the cards and have the children sort them by the number of items on each card.

Number Art
Targeted concepts: Recognizing numerals, writing numerals, matching numerals to quantity
Description: Have children make a number booklet or collage by cutting numerals out of magazines and calendars or by using different objects such as Popsicle sticks, straws, and yarn to form numerals. You can pick a target number for all the children to try or display models of all the numerals for children to copy. Children also can use stickers, drawings, or pictures of objects to represent a quantity.

Recipe Fun with Math
Targeted concepts: Recognizing numerals, matching number words to quantity, counting, measuring
Description: Use basic recipes with picture representations (make your own or use a cookbook aimed at young children) to direct children in making such things as play dough, finger paint, no-bake cookies, and so on. Be sure to have the children participate actively in measuring ingredients, counting, and problem solving.

Finding Your Feet
Targeted concepts: Recognizing numerals, matching number word to numeral
Description: In an area where children often line up, put pictures of footprints in line on the floor so that there are enough spots for all children to be in line. You can assign a number to each set of footprints and tell children to find their number when they get in line. Think about the children’s developmental level when deciding whether to number the footprints in order, starting from 1 and ending with the number of students, or to use only the numbers 1–5 or 1–10 and have the footprints be different colors. In the second example, you can ask a child to go to the blue number 2 footprints or the red number 5 footprints.


