Hidden Mathematics in the Preschool Classroom

With increased attention being focused on the youngest children in our schools, changes in mathematics instruction that have occurred over the past decade are most evident in early childhood education. This emphasis is especially true since the April 2000 release by NCTM of Principles and Standards for School Mathematics, in which mathematics for the prekindergarten child is included as part of the pre-K-2 grade band. By including three- and four-year-olds in its recommendations, NCTM recognizes and emphasizes the importance and value of mathematics instruction for young children. Subsequently, in drafting their own standards, many states are also recognizing the need for early childhood standards.

At these ages, children have gained most, if not all, of their mathematics knowledge through life experiences. Prior to entering prekindergarten, most children have received little if any formal or directed mathematics instruction. For this reason, mathematics instruction in preschool and kindergarten settings must include a continuation of life experiences that take place in the home along with more direct instruction having a specific mathematical content or intent. We call such informal experiences "hidden mathematics," for example, the mathematics that is demonstrated during snack time, playtime, or craft time. This mathematics emerges during natural interactions among children; it is often unsolicited and spontaneous, arising from the meaningful contextual base of the activity. Observing children during these times provides an incredibly rich amount of information about their mathematical understandings that is not available by testing or assessments. This article describes how mathematics instruction is addressed in an early childhood classroom and how it reflects state and national mathematics standards.

Mathematics is hidden in many ways in the prekindergarten classroom in which I teach. In each learning center, for example, are hooks on which the children hang their nametags to indicate the number of students that can work in the center at any one time. Children look to see whether a space is available for them at a particular center. I hear them say, "There is room for two more," or "No more room" if the center is full. By using numerals every day, students begin to recognize them by sight. By incorporating numbers into the daily routine, children use them without really thinking about them. These situations are instances of hidden mathematics.

Our daily snack is distributed through self-service. Each child helps himself or herself to a napkin and bowl. Students look at a card on which a numeral indicating the number of items or scoops they should take of the snack for that day. If students are unable to read the numeral, they can ask a friend. When they are wrong, other children will correct them as they arrive at the table. As shown in the photograph in figure 1, Corey looked at the numeral on the card and took two scoops of the Goldfish crackers for his snack. When the numeral is 4, I tell students to place a cracker on each corner of their napkin. The students know what a corner is, and I can see at a glance whether they have taken four items.

In preschool we measure with nontraditional units or measurement tools. We used ourselves to measure an eight-foot sunflower plant from my garden, for example. A lot of hands were needed to hold the sunflower stalk while others counted how many "people long" it was horizontally. Then we looked to see whether anyone was as tall as the sunflower was vertically.

In the housekeeping center, children set the table every day. They match placemats, dishes, and plasticware at each setting. When the housekeeping area becomes a "pizza restaurant" during our unit on food, new possibilities arise. In the center are...
notepads for taking orders, as well as menus to be read. Students prepare the pizza, determine the number of slices a customer wants, then serve the customers. They also deliver pizzas to the pretend address. They cut the pizzas into wedges. They talk about such considerations as how many slices will fit in the pan, how many slices will fit in the take-home box, and how many pizzas were ordered. At the culmination of our unit on food, we took a field trip to a local grocery store. As we looked at the meats in the butcher's case, children noticed the posted price numbers. We also found numbers in the aisles indicating where items were shelved. The field trip opened up the world of numbers for the students.

During daily activities, instead of passing materials to each child, I put them in a container and ask the children to take a given quantity or amount, then pass on the container. I can quickly see whether students are able to count out the correct quantity.

I keep sign-up sheets on clipboards in some of the very busy centers, such as the computer area. When children are eager to have a turn in the center, they sign up. This system makes waiting easier. In the beginning of the school year, I use blank sheets of paper for the sign-up sheets; then I gradually introduce numbered sheets with very wide spacing. Children see the numeral that appears beside their name. Even if they are unable to write their name, they can often identify the numeral beside it. They take comfort in knowing when their turn will be, and I am able to say that their turn is next, second, third, or the like.

One activity that is available during center time is a tic-tac-toe game. The game board is made of felt, and the design reflects the nearest holiday. I use colored hearts at Valentine's Day and trees and stars in December. The game is valued for the development of small-motor skills, counting, and placement strategy. I like hearing, "Tic-tac-toe, three in a row!" I place a notepad in the center for keeping score. The players quickly learn how to tell who has the most points.

I post large posterboard numerals 3, 4, and 5 in the room. At the beginning of the year, each child puts her or his photograph on the numeral that tells how old she or he is. On their birthday, students move their pictures over to the next-higher numeral. At a glance, a classroom observer can see how many three-, four-, and five-year-olds are in our class. Moving the photograph on their birthday helps students visualize what the new number looks like and observe who else's photograph is on the same number.
When we go out of the room for any reason, we form a line. We have line leaders who take the first position in line. We talk about who is second and who is last. Oftentimes, we walk with a partner. When we walk in twos, I count the children aloud by twos. Although students are not expected to be able to count by twos, they hear it being done and thus hear the numbers pronounced aloud.

Whether your dramatic play area is a grocery store or a flower shop, you can hide mathematics in similar ways. Sorting the materials by type, labeling prices, stocking the shelves, and checking out purchases are just the beginning of potential mathematical experiences. Place a clipboard near the telephone in the center for taking orders. Students use the cash register to collect customers' money, and they need to be sure to count out the correct change. They practice taking orders over the telephone and writing them down. They ask for the address for the delivery, and they should remember to say how long the wait for the delivery will be. Ideally an adult should facilitate the play, especially on opening day. We have a countdown to the day of the grand opening as it approaches, and we invite a special school administrator to cut the ribbon for us. We count seconds backward as we approach the time for the ribbon to be cut!

When conducting a coloring project or having students draw in their journals, I may say, for example, "Use the same number of colors as your age. If you're four, then use four colors. If you're five, then use five." When we drew portraits of our mothers for Mother's Day, I heard Francisco counting to himself the number of colors he had used to draw his mother's portrait. He asked, "Can we use more than five?" I said, of course he could, and I was happy to note his spontaneous use of mathematics.

When we use glue in projects, I tell children to count to ten while they are waiting for the glue to dry. They do so automatically with practice. I heard Jerry counting as he glued butterflies on his Mother's Day card. He said, "One, two, three, four, six, eight, nine, ten." I quickly made a note of his counting skills. Using hidden mathematics is a great way to assess students' skills during the daily routine. I keep a pad of sticky notes in a caddy at each table so that both my aide and I can record these kinds of observations when they spontaneously occur. After I write an observation, I move that sheet to the bottom of the pad, which is then ready to use for writing another note. When I have time, I sort the notes into the individual children's portfolios.

The writing center focuses on small-motor skills. The center houses materials for cutting, gluing, letter writing, stencil work, and so on, including several kinds and shapes of paper: construction paper, perforated computer paper, envelopes, and rolls of adding-machine tape. During center time, I saw Fernando take a long piece of adding-machine paper and hold it up over Scott's head to see whether it would fit. Later, wearing a large piece of paper around his neck like a robe, Scott told me he was King Midas. Fernando had measured his head with the adding-machine tape, then taped the ends together. Fernando told him that he was King Midas. Girls like to measure one another for bracelets, hats, and necklaces. Taylor, for example, is particularly fond of this activity. She holds the adding-machine paper around my arm; says, "It will fit"; decorates it; and staples the ends of the strip together. I try it on carefully, trying not to tear it. She says, "It's not big enough" and proceeds to make me another. I acquire a large collection of paper jewelry on the days that Taylor works at this center.

I was surprised by how much hidden mathematics I found in my classroom when I stopped to think about it. Everyday occurrences and events in the classroom furnish many rich mathematical experiences for children. These experiences give students a strong foundation in mathematical concepts that will be built on by many people as they progress though school. Through such experiences, our children naturally learn mathematics.

Bibliography


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