Beginnings Workshop

put away the science activity books and tune in to your science senses!

by Polly Neill

"I'm going to draw my truck with fire and smoke. That means it was goin' real fast, faster than the other one."

Tania holds some Unifix® cubes in her hand wondering, "What are these for?"

"That squirrel is hiding the acorn so other squirrels won't steal it."

Johanna took all the large nuts and screwed them onto all the large bolts.

"I think we'll need all the long blocks and all the short ones, too, to make the stage big enough."

"Uh-oh. When you take the top off the glitter that way, it comes out really fast. Try it the other way, like a salt shaker."

Each of these anecdotes represents an example of one of the six components of the preschool scientific method: OB=observing; CL=classifying; E=experimenting; P=predicting; DC=drawing conclusions; and CI=communicating information. When you finish the article, see if you can identify which component goes best with each anecdote. You will find the answers on page 64:

How often have you opened an early childhood book and read within the first few pages that from birth children are explorers, experimenters, and observers — in short, they are young scientists. In their aptly titled book, *The Scientist in the Crib*, Gopnick, Metzoff, and Kuhl (2001), refer to an infant as "the most powerful learning machine in the universe" (p. 1). In *Eager to Learn: Educating Our Preschoolers* (Bowman, Donovan, & Burns, 2000), the editors tell us that young children already have "considerable implicit knowledge about topics that are found in science books" (p. 207). And finally, Ruth Wilson (2002) writes:

Children are naturally curious about the world and want to find out as much as they can. . . . But they don't want adults to give them the answers. . . . They don't want science to be something that is imparted to them; they want it to be something they do. (Conclusion)

Knowing all this, from where then did we get the idea that a young preschool scientist, who is already a veteran at exploring and deciding would be content to confine her observations, investigations, and experiments to a science table occupied by a dusty bird's nest, a brittle snake skin, and a mysterious 'pod'? Digging for bugs, making goop, racing cars down block ramps, mixing paints, testing magnets, and the countless other 'scientific' events that occur all over the classroom and throughout the day, actively engage children in 'doing science' in the classroom. Seen in these terms, early science should not be viewed as a narrow subject learned in isolation from other subjects; but rather as a system of natural processes by which young children make sense of how the world and everything in it works. Kathleen Conezio and Lucinda French (2002) put it this way: "Science itself is not an activity, but an approach to doing an activity" (p. 17).

As children investigate their world, they use the same processes that adult 'scientists' use — the hallmarks of the scientific method: observing, classifying, experimenting, predicting, drawing conclusions, and communicating ideas (Marshall, 2005). We call these six processes the preschool scientific method. Although young children's scientific exploits may not appear systematic or ordered, all of these components are present and interrelated, for example:

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As observers, children put us to shame, for they observe with all of their senses as well as their whole bodies.

- Do you think Lira knows how much liquid glue she needs to stick two boxes together (prediction) if she has never used that kind of glue before? In the preschooler's world the processes of experimentation and prediction often become so interwoven that it is hard to tell which takes place first.

- Minette arrives one morning, looks in the fish tank (observing), then (drawing a conclusion based on something she sees) runs over to the teacher and says, "A fish is dead" (communicating information).

Six components of the Preschool Scientific Method

As you saw in the examples above, it is the preschoolers who decide when and where they choose to employ a component of their unique version of the 'scientific method.' With adult support, young children become more systematic and logical in how they use these processes (for example, changing their predictions based on what they observe). Opportunities to use and interconnect all six processes allow preschoolers to develop into competent 'scientists.'

Observing. Observing is how children assemble information to answer a question, to learn more about something, or to solve a problem. Children begin to look closely at something, that is, with intention. As observers, children put us to shame, for they observe with all of their senses as well as their whole bodies. Their world is rich with sensory experiences: sound both from the urban, suburban, or rural community (motorcycle engines, sirens, tractors, and mowers) and from the natural environment (thunder, animal sounds, twigs snapping); smells (newly cut grass, exhaust, pizza, garbage, perfume); textures (the scratchy, rough surface of a sidewalk, a soft fleece jacket, prickly pine cones); and tastes (salty popcorn, a sweet peach, sour grapefruit, bitter medicine).

In the block area, Leilani watches Kent and Kobe stack the big hollow blocks. (Maybe she is thinking about her experiences stacking smaller blocks.)

In the house area, Joey picks up one of the baby blankets, rubs the satin binding between his thumb and finger and says, "This is like my old blankie."

In the toy area, Len observes, "They're playing Candy Land® with Kay (a teacher). They keep picking up a card and moving their guys."

Classification. Classification is the process of grouping similar things together. This involves both identifying the relationships between things and the categories they do — and do not — belong to. Young children decide on their own system of classification and will sort and order the information they gather according to categories that are meaningful to them.

At the sand and water table, B. J. says: "I'm linin' up the frogs and bugs over here, and the fish over here." During outside time, Gabby runs up to Sherretta (a teacher) and says: "Some of the balls bounce and some don't."

In the art area, Linus and Mariah are poring over a container of sequins. Mariah says, "I want just the big and little red sequins and the really big snowflake sequins." "And some blue feathers," adds Linus.

Experimenting. Experimenting is testing an idea to see if it is true or trying a solution to see if works. Throughout the daily routine children encounter problems with materials in their play: "How can I get this blanket to stay over our house?" "The glue won't come out!" "This puzzle won't go together!" Often these are problems the children do not have answers for so they might try several ways to find an answer. When children go through this process, they are experimenting. In 'science talk,' this experimenting is part of asking a question or testing the hypothesis (the prediction).

Outdoors (asking a question): "Let's see how big we can blow the bubbles."

In the art area (testing a hypothesis): "If I tape these two strips of paper together, will my crown fit me?" Child tries it. "Nope, it's too small." He takes it apart and adds another paper strip. "No, no. Now it's too big. Like a necklace." He wonders out loud, "What can I do to make it fit just right?"

Predicting. To predict is to describe what you expect will happen. Even for children, predicting is more complex than simply guessing, because predictions are based on their knowledge and observations. To predict, children must be able to picture what happened in comparable situations previously, as well as imagine what might happen in the future as a result of their actions. Their predictions are based on experience and experimentation and trial and error. Children are accustomed to predicting what comes

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next in familiar storybooks so that may be a good place to try introducing the word 'predict.' Prediction skills improve through experience so the more opportunities children have to express their predictions; the better they will get at it (Church, 2003).

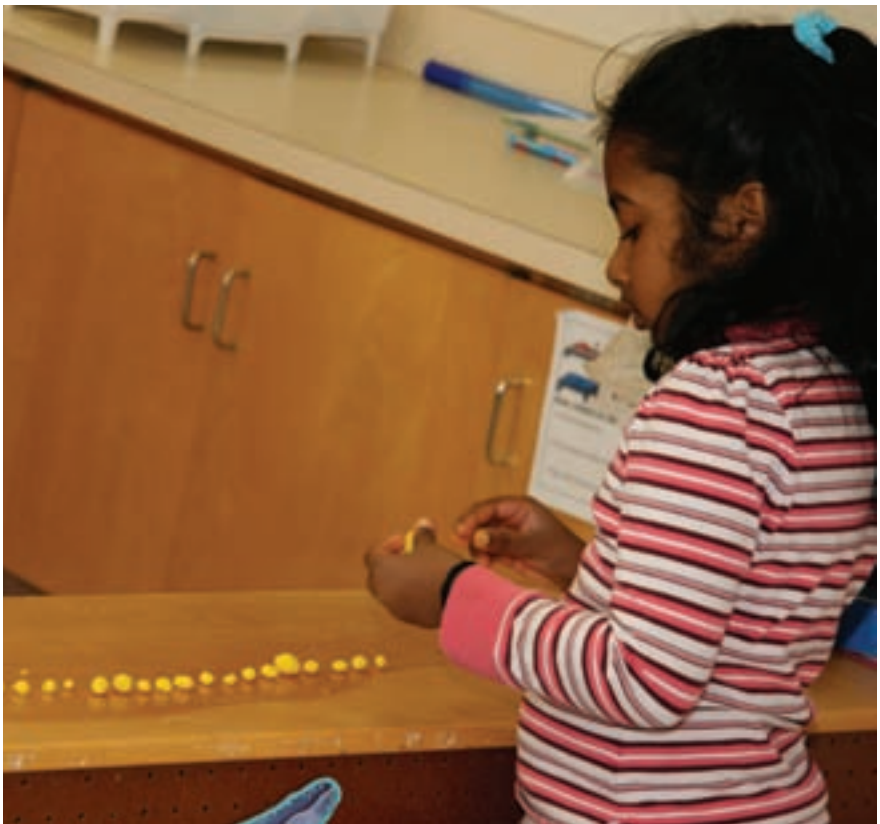
At the sand and water table: "Look! The water table has blue water on one side and red water on the other side. When we mix 'em up, we'll get dark red."

In the house area: Suraya and Frannie are playing mommies and are worried about finding a quiet place for their babies to sleep. Suraya says, "There is so much noise in the house, they'll never get to sleep in there!"

In the toy area: "If I add two more pegs, mine will be the tallest."

Drawing conclusions. Concrete evidence confirming a prediction leads to one type of conclusion; contradictory evidence means children have to change their ideas, and possibly gather additional information before reaching a different conclusion. Like adults, children make generalizations and form theories about how the world works based on these experiences.

In the art area: "Glue never, ever, ever, dries. I put glue on the paper to stick on a button and when it felt like it was dry, I pressed on it and glue came out the button holes!"



In the toy area: Cameron and Joey are playing with the magnet train. Cameron is having trouble attaching the freight car. Joey says, "Sometimes if you turn the car around the magnet sticks better."

In the block area: "Those are the heaviest blocks 'cause they're the biggest."

Communicating ideas. Communicating ideas means sharing one's questions, observations, predictions, and conclusions with others. Children are excited about sharing their discoveries and do so in many ways — through spoken language, drawings, written words and symbols, demonstrations, or gestures. In fact, communication sometimes even occurs on the fly, as with Edie who wanted to report on a discovery she made during outside time. First, she ran very fast, she slowed down almost imperceptibly near Rya (a teacher) and said, "Three worms!" before picking up speed and running off again.

Spoken language: Rachel told her teacher, "Mia and I used a cookbook. It said birthday cakes cook hotter than regular cakes."

Drawing: (Robert to his teacher, Joy, after he finished balancing the shells and the marbles on the scale) "I'm gonna draw a picture with the two shells on one side, then a line, and then six marbles."

Written words: Kobe asked his teacher, Sue, to take a photo and said: "Write on the back 'Kobe's Dog Elevator — Magnatiles.®' Then I can show it to my Mommy when she gets home."

Conclusion

Now that you have been introduced to the components of the scientific method used by children in and out of preschool classrooms, look for opportunities to 'fine tune' your science senses and locate the science that is happening around you. Keep in mind that much of what you see children doing in a classroom actually hones their ability to apply scientific processes. Based on the information they have gathered, organized, examined, and tested, they are ready to explain why some-

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thing happened the way it did and then share that information.

Remember that the environment you set up and equip is one of the most important things you can do for children, particularly young scientists. If your science senses are sharp and you are a supportive and equally curious partner, the 'science table' and activity books will be replaced by an entire classroom and outdoor environment filled with young scientists who will apply the preschool scientific method to play experiences that are relevant to their ever-expanding interests.

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Answers for page 61 matching activity:

CI, OB, DC, CL, P, E.