Young Questioners

Children are often described as natural scientists and their curiosity as a basic human trait. They amaze adults with perceptive questions and extended explorations of the environment. Asking questions is part of the National Science Education Teaching Standards B and E, and Content Standard A, Science as Inquiry, for grades K–4. Because asking questions is central to inquiry and learning in general, science teachers are especially invested in having all their students use this process skill.

However, some students do not ask questions—perhaps because of shyness, not realizing that they are allowed to, or lack of experience. Due to the normal range in development in young children and the differences in their early interactions with caregivers, the ability to frame a question is not a given in children entering kindergarten. Children may not answer questions for the same reasons.

There are many strategies to support and increase children's capacity for curiosity, but suggestions about teaching science tend to be vague, along the lines of "The teacher elicits more observations and questions…." *How exactly can we develop and support questioning skills in students?*

One way to help all children learn to ask and answer questions is to invite the children to predict what they think will happen next in a book any time you read aloud. Practice is fun with the book *Fortunately* (Charlip 1993). The story has a pattern, and every page is an opportunity for students to ask (and answer) what will happen next in the book.

After reading a few pages, model asking a question: "I wonder if Ned is going to be able to get to the party?" or "I wonder if Ned is going to get hurt?" Be clear that you want the children to ask questions and make predictions by saying so and making sure they all have enough time. In a subsequent reading, have a student read the book and invite the students to ask and answer, "What do you think will happen next?"

Providing a space or time where children can ask questions supports students' questioning. Some structures that teachers use to show students that questions matter include a set quiet time for thinking, a question board (Pearce 1999), or a set of pages in a journal where children can post questions they have written down or dictated for future consideration. Working in small groups and pairing students work well for young children who lose their thoughts if required to wait very long to respond (Bailey and Brookes 2003). Showing respect for asking questions by listening and recording the questions encourages more questioning. Check your responses to children's questions for statements showing approval of asking questions, such as, "I like hearing your questions" and "You can really find out about things when you ask questions and try to answer them."

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With practice, children will make asking questions and trying to answer them a habit that carries over to other activities, as seen in statements like, "What's going to happen when I put this really big block on the top?" and "Why do the worms lie on the sidewalk when it rains?"

In the following activity, many questions may be asked and answered in small groups, one-on-one, or at a workstation for children to do independently.

Resources

Bailey, B.A., and C. Brookes. 2003. Thinking out loud, development of private speech, and the implications for school success and self-control. *Young Children* 58(5): 46–52.

Charlip, R. 1993. *Fortunately*. New York: Aladdin.

National Research Council. 1996. *National science education standards*. Washington, DC: National Academy Press.

Pearce, C.R. 1999. *Nurturing inquiry: Real science for the elementary classroom*. Portsmouth, NH: Heinemann.

Name That Object

Objective:

To practice asking questions and use reasoning along with the senses of touch and sound to discover the identity of a hidden object.

Materials:

For each child:

- An opaque container with an easily closed lid (quart size plastic yogurt containers or small cardboard boxes work well).

For each small group of students:

- A group of objects of various weights and surfaces, small enough to fit into the containers: a Ping-Pong ball, a plastic egg, various blocks, a large coin, a small paper cup, a feather, a cotton ball, and a marble. Use objects that are familiar to the students.
- A tray to hold the objects.
- A towel to cover the objects.

Procedure:

1. Show the children a tray of three to eight small objects, and invite them to touch the objects, exploring their properties.
2. Ask each student to talk about one object and then compare two. *What do you feel? Is it soft or hard? How heavy is it? How are they alike and how are they different?*
3. Next, play a "what is it?" game: guessing the identity of an object hidden inside the container. To keep students from seeing the object, cover the tray with the cloth while you pick up the object.
4. You can leave the cloth covering the remaining objects or remove it. Some children will ignore the objects left on the tray, but others will use them to determine what is not in the container. Acknowledge their use of this strategy by saying, "You are using a strategy that scientists also use. You asked the question, 'What *can't* be inside the container?', and answered by looking at what things were left on the tray. Scientists learn about the identity of an unknown thing by eliminating possibilities." To make the game more challenging, after a few rounds keep the remaining objects covered.
5. For students who need guidance, model how to ask questions about what you feel and hear to determine what is inside the container. *Does it feel heavy? Does it roll or slide when I tip the container?*
6. The students will shake the containers to hear the sound the object makes as it moves. Encourage them to do slower movements, turning the container slowly side to side and top to bottom, to listen to the way the object moves and to feel its heft or weight. Ask, "What can we tell about the hidden object—which properties of the object can be discovered—by listening to it move? How heavy is it? If it feels heavy, can it be the feather? How does it move? Is it a roller or a slider?" A small paper cup and a Ping-Pong ball sound much alike and weigh about the same amount but can be distinguished by the way they move. On the other hand, two blocks with identical shapes but different colors cannot be differentiated. Give each child a turn to tell her or his guess and share why they think that *before* opening the container.
7. Switch roles with the students, allowing them to put an object into the container while you cover your eyes. Keep the impetus for asking questions on the students by saying, "What questions should I be asking to learn about the hidden object?"

Many children will, in the first round of the game, guess their favorite object, usually the ball or coin. Don't correct even improbable answers. Instead, encourage thoughtful questioning about the properties of the hidden object by listening to all guesses and modeling the asking of questions. They will soon see if their guess is correct or not, and, in further tries, will use their reasoning.

This activity and column were inspired by a segment of *3, 2, 1, Contact!* a children's television science program, where the young hosts challenged Nobel Prize–winner chemist Linus Pauling to describe the object they had put in a small box. As he shook and turned the box, he listened to the sounds and told the children what he was thinking. His passion for discovering the unknown was obvious.

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The Early Years

What's happening at *http://science.nsta.org/earlyyearsblog.*

How do I grab interest and enthusiasm at the very beginning of the year?

I teach a second-grade unit on birds. Every child can relate a story of a bird they have seen—even if it is just the common robin. Birds are the context to learn about habitats, classification, and observation. By the end of the four weeks, we have also made birdfeeders to hang at home, gone on bird walks, and dissected an owl pellet. But, what has been most satisfying is hearing from a parent that their child is asking questions and pointing out birds at home. If the topic fascinates you, they will find it difficult not to be enthralled. How do you teach them that science is everywhere? Start with something they think they know a lot about and delicately show them how much of a delight it is to discover more.

Kathy Park
Home School Co-op Teacher
Phoenixville, Pennsylvania

I start the year out having the students learn how to use the basic tools of the science lab: plastic eyedropper, magnifying lens, and double-pan balance—and I do use these tools even with my preK classes. The use of droppers strengthens their index finger muscles and gets them ready for using pencil and paper (a Montessori technique). I use the real terms and don't make my primary lessons babyish. The kids appreciate being treated intelligently.

Susan Beren
Science Resource Teacher
Weston, Florida

Online, your colleagues are also discussing ...

- PreReaders, Literacy Skills, and Science
- What "tools" have really impacted your science teaching?

Read more and join the conversation at *http://science.nsta.org/earlyyearsblog.*

Teacher's Picks

Mary Ann Hoffman

Mary Ann Hoffman is an English as a Second Language Teacher in Alexandria, Virginia, and the parent of four young children. She believes that children acquire language skills and are inspired to ask questions when they investigate new concepts using as many senses and methods as possible.

Books

The Icky Bug Counting Book. Jerry Pallotta. 1992. Charlesbridge.
Wonderful for preK–2, this resource introduces interesting new "bugs," teaches about camouflage and counting, and ends with a challenge question for the reader. It is high interest with simple text and a rhyming pattern that makes it a winner for integrating math and science.

Bzzz, Bzzz! Mosquitoes in Your Backyard. Nancy Loewen. 2005. Picture Window Books.
Students learn more about these common insects as they read all about the life cycle of a mosquito in simple language. The illustrations are clear and nonthreatening for young children and help them understand the importance of mosquitoes in the balance of nature.

Why Mosquitoes Buzz in *People's Ears: A West African Tale.* Verna Aardema with illustrations by Leo and Diane Dillon. 1975. Dial Books for Young Readers.
One of my favorite fiction books and a 1976 Caldecott medal winner, this African legend has colorful illustrations and an amusing ending. It allows the teacher to integrate curriculum and connect with another culture, and it is a great complement to nonfiction insect books.

Internet

Classify Insects: Zoom in on True Bugs
http://teacher.scholastic.com/activities/explorations/bug/level1/investigate.htm
Click on the name of a tool to see a photograph of it being used by an entomologist.

DeBug
www.rothamsted.ac.uk/pie/DeBug/index.html
For many questions to explore about insects (with accompanying photographs), visit this website of Rothamsted Research of the United Kingdom, and click on "Quiz."

Insectweb
http://projects.edtech.sandi.net/encanto/insectsK/t-index.htm
A San Diego City School District teacher-designed "webquest" for kindergarten teachers and their students. Click on "Process" to see six steps to introducing insects to your class.