Investigable Questions

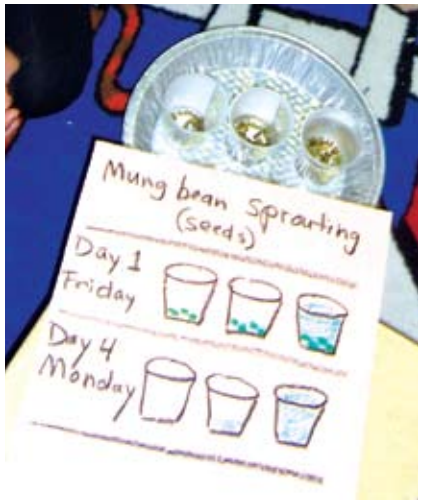
By Peggy Ashbrook

Does curiosity provoke a question? Children and many others are curious about what is new. Galinsky (2010) discusses Dr. Laura Schulz's research on the role of young children's curiosity in learning from direct evidence, finding that children are also curious when something contradicts what they expect (their prior understanding) about the world, and if they see evidence that fails to distinguish among competing beliefs (when evidence doesn't make it clear why something works). An example from my experience, young children try repeatedly to blow bubbles with bubble solution that has become too sudsy to sustain a large bubble. They know the solution "worked" previously and try blowing harder, dipping faster, and using a new wand but are not able to form bubbles or understand why.

Children often ask "about" or "what is" questions, such as, "What kind of seed is this?" Pearce (1999) says that young children often ask "Can I…" questions when first stating investigable questions, such as "Can I blow a big bubble with this tool?" He suggests that teachers can deepen those questions by asking children to rephrase into a quantifying question, such as "How big a bubble can I make with this tool?" which also leads to learning about measuring. For students who are readers and writers, Pearce offers a testable question worksheet containing sections for recording observations, recording questions, completing stems such as "How can we…?" and comparing one situation to another ("When comparing sunflowers with suet, which will attract the most birds?").

Teachers may not need to teach children to ask questions, just develop that safe place where questions can be voiced, observe children to see the questions in their actions, and develop a culture that appreciates and records questions. An investigable question is rare in the preschool years but with questions so readily voiced, this is the time to begin making children aware of what they can and cannot answer through investigation. With a classroom culture of welcoming questions and providing time and resources to find out, the young child's "Why?" turns into a more complex question, such as, "Do roly-polies change as they grow the way butterflies do?"

December may seem an unlikely time to observe seed sprouting but some classes are indoors for longer periods of time (with time to water and observe). Developing understanding before the spring will prepare children to garden when the temperature allows. A class discussion on the needs of seeds to be able to grow will raise the need for water. Most children know this through hearing it or direct experience. But they may have different opinions on how much water is the right amount for best seed sprouting. Of course how much water depends on many things: type of seed, humidity of the air, surface area of the container, whether the container has a cover, and if it is in sunshine or shade. Control these variables by using the same container, in the same place with the same kind of seed, and vary one thing—the amount of water. ■



Student drawing documenting growth.

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References

Galinsky, E. 2010. "Critical Thinking." In *Mind in the Making*, 224–28. New York, NY: HarperCollins.

National Research Council (NRC). 1996. *National science education standards*. Washington, DC: National Academies Press.

Pearce, C.R. 1999. *Nurturing Inquiry: Real Science for the Elementary Classroom*. Portsmouth, NH: Heinemann.

Internet Resource

Question Search
www.learner.org/workshops/inquiry/support/A65A68.pdf

How Much Is Enough?

Objective:

To introduce the idea of investigating a question.
To investigate how much water is best for mung bean sprout growth through a fair test.

Materials

- Mung bean seeds (or another quickly sprouting and growing seed)
- 3 clear 5–9 oz. cups
- Label for each cup with a drawing depicting these words: "No water" (empty cup); "A little water" (identical cup with 1–2 cm water on bottom); and "A lot of water" (identical cup filled 2/3 with water). Make ahead or incorporate as part of the activity.
- Pitcher of water
- Permanent marker
- Writing materials

Procedure:

1. Hold a class discussion on what makes a seed sprout. Entertain and record all ideas and then focus on the question of how much water do seeds need to sprout "best." Children most likely define *best* by the presence of vigorous green growth. Tell the class that they can investigate the question by making a fair test of how much water is best. Children may want to record each step of this procedure as a poster.
2. Show the labeled three cups and discuss the meaning of the words and pictures to be sure the students all understand how much water goes in each cup.
3. Talk about how everything in a fair test is the same except for one thing. You are using the same size cup for each amount of water, the same kind of seeds, and the same amount of seeds. The cups will go in the same place (windowsill or desk), so they will be getting the same amount of light and be at the same temperature. Only the amount of water will be different to test for the best amount of water for seed growth.
4. Have the children pour the appropriate amount of water into each cup (none, a little—1 or 2 cm, and a lot—2/3 full).
5. Ask children in which cup they think the seeds will sprout and grow best, reminding them that scientists do not all have to agree. As a rough assessment of their prior knowledge about seed sprouting, have students drop a seed into the cup that they think is best for seed sprouting and growth. Children may select for reasons other than asked.
6. After each student has a turn, have them count the number of seeds in each cup. Add seeds where needed, reminding students that for a fair test, each cup must hold the same number of seeds. Use a permanent marker to mark the water level so more can be added as some evaporates.
7. Have students check on the seeds every day for a week or two for signs of growth. Using droppers, children can add water up to the marked level if necessary. Record seed growth in drawings labeled with the date.

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The three labeled cups.

Spoiler alert! The seeds in the "no water" cup will not grow. The seeds in the "a little water" cup will sprout and send up a stem and set of second leaves. The seeds in the "a lot of water" cup will sprout, begin to grow, and then stop growing and ferment. Stop the fair test when children have determined a clear best amount of water for growth.

Discuss the results of the experiment while reviewing the drawings documenting growth. Wonder aloud about the results and encourage children to share their ideas. They may not realize that plants need air, just like people. Remind them that they cannot breathe underwater and tell them that many plants cannot either.

NSTA Connection

For more resources, visit the Early Years blog at *www.nsta.org/EarlyYears.*