Documenting Learning

By Peggy Ashbrook

Children’s work documents their thinking and the details they note as they learn more. Over time, by drawing, dictating, or writing about their observations, children can reveal and deepen their understanding of science concepts.

Include drawing and writing as part of every science activity and model how to document observations. Documenting work to further understanding and sharing information is part of the National Science Education Teaching Standard B: Teachers of science guide and facilitate learning and Content Standard A: Science as Inquiry.

Children’s initial observation drawings and dictations may be more like what they think they should see—popular representations, what the teacher or book says the observation should look like—than what they actually see (hear/feel/smell). A child’s drawings of a beetle with a happy face or a tree with a round circle of leaves on top of a straight trunk are typical representations, which are more like symbols than actual observations. With repeated observation and documentation, children include more details and provide fuller dictations, even if they are not able to draw accurately. A typically developing child who spent a lot of time observing and handling Tenebrio beetles at 4 and 5 years old created wobbly drawings and offered detailed (dictated) descriptions. While drawing the larva at age 4, the child said, “It only has legs in the front,” but at age 5 drawing the beetle the child dictated, “I saw the wings come out. And they have protector wings like ladybugs and the real wings that make it fly are under the protector wings. The underwings are clear. When it was on my hand it flew.”

When I asked a three-year-old to describe how salt and water changed when mixed together, he drew a picture to show me: A circle for the jar filled in with white crayon for the salt, another jar with blue crayon for water and white for salt, and then white again for when the two were mixed together into a solution. The drawings represented a process which he dictated while drawing: “First we put the salt in a jar. Then we poured in water and mixed it in and it [the salt] dissolved.” (Dissolved was a new term.)

With small objects such as grains of salt or crawling beetles, have the children use magnifiers. Ask questions to focus children’s attention on specific aspects of the object or action—“Do all the small pieces or grains of salt have the same shape?” “What do beetles use to move?” Note that different levels of accuracy in detail may exist within the same drawing (i.e., drawing shows the three-part body structure, but has an inaccurate number of legs and a happy face).

Your questions can direct children to the parts of the observation in which their drawing and dictation showed incomplete understanding and to make additional observations to learn more.

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Internet Resources
Children’s Literacy and Science Project (CLASP)
http://clasp.education.purdue.edu/
Inquiry in Action
www.inquiryinaction.org/
Melting and Dissolving
Science Notebooks in K–12 Classrooms
www.sciencenotebooks.org

Reference
Properties of Salt, Sand, and Water

Objectives:
To observe and document the properties of salt, sand, and water separately and after being mixed together.
To observe that not all solids dissolve in water.

Procedure:
1. Have everyone put on goggles. Have the children each take a pinch of salt and put it on a piece of paper to examine with a magnifier, then draw or photograph, and write or dictate what they see on the paper or in the cup at each step. Ask questions such as, “What do these materials look like to you? Have you felt something like this before?”
2. Repeat the observation and recording with a pinch of sand on the second piece of wax paper and have the children discuss any differences or similarities they observe between salt and sand. Children often note that the salt grains look alike and the sand grains are different from each other.
3. Have the children examine and touch drops of water on their paper. Repeat the questions and recording of observations. Productive questioning, including teacher wonderings, prods children to describe their observations without feeling pressured to give the “right” answer: “I wonder how I can make a picture of the water’s shape.”
4. Ask the children to speculate what might happen to the salt and sand if they are mixed with water. Children often say “It will get wet” and “It will disappear.”
5. Have the children add their pinches of salt and sand (not both) to separate cups of water and stir.
6. Discuss children’s observations of the mixtures and about their documenting. If children document their procedure and observations using photography, print photos within a few days. Ask, “What do you notice about the salt/sand and water in your cup?” “Did the same thing happen to everyone’s sand/salt?” Open-ended questions reveal the children’s thinking rather than their ability to repeat back vocabulary such as dissolved. Children will find out that substances that dissolve may “disappear” but that is not the same as “went away.”
7. The children may want to add another pinch of salt or sand to see whether the same thing happens again. Have them record this on another page as part of their documentation. Have your students use a notebook so that together you can look back at earlier work and talk about how their understanding has changed over the year. Reflecting on their documentation gives children a way to compare results and to understand the difference between those two ways of changing materials.

Children cannot answer the question “Why did the salt dissolve?” until they learn about atomic structure, but they do learn that some substances dissolve in water and some do not. Use dissolve when mixing the salt into the water and solution to describe the resulting mixture of salt and water. At this age it is best to define by examples. Provide additional activities in which children can experience mixing to dissolve and raising the temperature to melt substances. Children often confuse the two and experience is helpful in developing understanding.

Materials
- Two tbsp. salt/sand, extra for a big pinch
- Two bowls
- Two squares of wax paper for each child
- Pipette
- Two clear plastic cups filled halfway with water for each child
- Craft sticks for stirring
- Magnifier for each child
- Drawing and writing materials
- Goggles for everyone

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