Ooze Observations
Day 1

OVERVIEW

Students practice making observations, the most fundamental skill in conducting scientific research. Scientists make two types of observations: qualitative and quantitative. Qualitative observations describe how something looks, feels, behaves, smells etc. with adjectives. Quantitative observations describe something with numbers. This lesson uses Ooze, a mixture of cornstarch and water, as a medium for making both qualitative and quantitative observations.

Focus Question: *What is the difference between qualitative and quantitative observations?*

SCIENCE SKILLS

- ✔ Students will be able to make and record qualitative observations.
- ✔ Students will be able to make and record quantitative observations.

BACKGROUND

Background information describing the concepts in this lesson is presented in the following sections:

Section I: Research Q&H – ***Qualitative and Quantitative Observations***

MATERIALS

- ✔ 1 large bowl or container per student group (shallow containers such as dish buckets work better than deep containers such as regular buckets)
- ✔ 1 16 oz. box of cornstarch per student group
- ✔ 1 extra box of cornstarch
- ✔ lots of newspaper to cover desks
- ✔ masking tape
- ✔ food coloring (optional)
- ✔ water
- ✔ clean up materials (paper towels, sponge, bucket) - ooze cannot be poured down the drain.
- ✔ assortment of measuring equipment: silverware, strainers, yogurt lids, paper towels, toothpicks, measuring cups, stopwatches, funnels, scale, weights, plastic bags etc.
- ✔ student worksheet (provided)

DEVELOPMENT OF LESSON

Preparation: The teacher can prepare the room and the ooze beforehand to save time or students can cover their desks and mix the ooze during the lesson.

- ✔ Work tables can be covered with newspaper. This will work best if held in place with masking tape so it doesn't slip off.

✔ Ooze is just cornstarch and water. A few drops of food coloring can be added to the water for a little extra pizzazz. The proportions are approximately 1½ to 2 cups of water to 1 box of cornstarch. Add the water slowly, mixing the cornstarch by hand, until it has reached ooze consistency. It is ooze when it flows easily in the bowl when tilted and it appears solid when hit or rubbed on the surface. Add a little extra cornstarch if it gets too soupy. The mixture will solidify as the kids handle it so it is better to err on the slightly soupy side than to start with the mixture too solid.

When the students are ready to begin:

1. Divide the students into groups of 4-6 students at each workstation. Each group should designate a recorder. For the second half of the class, a new recorder will be designated so everyone has a chance to play with the ooze.

2. Explain to them that they are going to make observations about a very unusual substance. One of the first people to describe this substance was Albert Einstein in 1906 (Sneider 1993). Ask about the difference between quantitative and qualitative observations. It may help students to use the words quantity and quality to start. For group practice, students can make qualitative observations about the room, a poster, a person, or an odd object and then quantitative observations about the same item. Solicit enough examples to convince you that the students understand the basic differences. Extra examples are provided in the background materials section.

3. Set up a few ground rules for ooze. No throwing. No tasting. Ooze should remain over the table at all times (i.e. no carrying or holding over the floor). It should never be more than 1 foot above the table. Tell students NOT to dispose of ooze down the drain. Students should wipe hands and equipment with paper towels before cleaning in sink.

4. If the ooze and room have been prepared ahead, quickly remix each pot of ooze and deliver it to the tables. Otherwise, have the students prepare the room and ooze as described under the preparations heading at the beginning of this section.

5. Give the students a few minutes to explore the ooze.

6. Hand out the Ooze worksheet and ask each group to write down a list of 5 qualitative observations about the ooze. You may have to circulate from table to table to keep the process going as it will be difficult to stop and start the class once the ooze is on the table. Give students 5 minutes or so to make their qualitative observations.

7. Now ask the students to write down 5 quantitative observations about the ooze. This will be hard! Ask them, in groups, to brainstorm about some of the things that they could measure. It might help to show them the available equipment. Kids will have a hard time making quantitative observations about ooze and they will probably need a lot of input and ideas from you. To some degree, the equipment you provide will push their thinking. Some examples of things to measure are as follows: time for a ball to melt into a puddle, time for a certain volume to run through your fingers, time for a certain volume to run through a funnel, amount of weight that can be stacked on top of a yogurt lid before it starts to sink, weight of ooze that can be picked up with a fork, weight that can be picked up with a spoon, number of spoonfuls that can fit in another container, search time to locate sunken objects, weight of a certain volume of ooze, weight or volume of ooze that can sit on a paper towel before it breaks, height at which something can be dropped on the ooze and not splash, or volume of ooze that can fit in a plastic bag.

8. Circulate from group to group handing out the measuring equipment. Each group should be able to use a few pieces of equipment. Passing equipment between groups will get messy.

9. After the students have had about 10 minutes to make their quantitative observations, initiate the clean up.

10. Have each student record the group observations on his or her own worksheet for later reference.

11. ***Extra.*** **Have the students imagine a fancy machine for making a quantitative measurement about ooze. How would it work? What would it measure? Students can draw, diagram, and explain their measurement device. For example, a boxing glove on a spring that delivered a punch with an exact force or a cup on a pivot tray that tilted very slowly at an angle, or a mechanical nose that can measure smell.**

DISCUSSION QUESTIONS

1. Are qualitative or quantitative observations easier? Why? What kinds of things are easy to measure qualitatively? Quantitatively?

2. How can you tell if something is a qualitative or a quantitative observation? Can an observation be both?

3. How could you make a chart of qualitative observations? Could you graph them? How? What about quantitative observations?

4. Why might scientists rely on quantitative versus qualitative observations?

5. How could you take a qualitative observation and make it quantitative? Can you think of an example? *He is tall. He is 5 feet tall. Roses have a strong smell. On a scale of 1 to 10, the strength of a rose smell is an 8 or 9.*

6. If you were going to conduct an experiment and you were going to repeat it over and over to make sure you get the same results each time, would you want to be recording qualitative or quantitative observations? Why? Why might you want to repeat the experiment over and over?

REFERENCES

The following references provide valuable information about Ooze, also commonly referred to as Oobleck. The book by Sneider has a host of other fun projects to extend the lessons on Ooze and the two articles in Scientific American provide interesting information about its physical chemistry. The Dr. Suess book is a fun and relevant story.

Kerr, P.F. 1963. Quick Clay. *Scientific American*, **209**(5): 132-142.

Sneider, C.I. 1993. *Oobleck: What do Scientists do? – Teacher's Guide*. Lawrence Hall of Science, University of California: Berkeley, CA, 32 pages.

Suess, Dr. 1949. *Bartholomew and the oobleck*. Random House, New York, NY. 48 pages.

Walker, J. 1978. The amateur scientist: serious fun with polyox, silly putty, slime, and other non-Newtonian fluids. ***Scientific American***, **239**(5): 186-198.