

The Learning Cycle Model

Topic: Matter

Question: Is the substance a liquid or a solid? Can a substance be both a liquid and a solid?

Illinois Learning Standards:

11.A.1a Describe an observed event.

11.A.2d Use data to produce reasonable explanations.

12.C.2b Describe and explain the properties of solids, liquids and gases.

13.A.1c Explain how knowledge can be gained by careful observation.

National Science Education Standards

Properties of Objects and Materials

- Objects have many observable properties, including size, weight, shape, color, temperature, and the ability to react with other substances.
- Materials can exist in different states.

Grade level: 2-4

Process Skills: observation, communication, inferring, and experimenting.

Concepts:

- Matter has mass and takes up space.
- Solids are usually hard because their molecules have been packed together. The closer your molecules are, the harder the object. Solids also can hold their own shape.
http://www.chem4kids.com/files/matter_solid.html
- One characteristic of a liquid is that it will fill up the shape of a container. Another trait of liquids is that they are difficult to compress. Liquids have **cohesive** (sticky) forces at work that hold the molecules together.
http://www.chem4kids.com/files/matter_liquid.html
- Liquids do keep the same volume. The molecules of a liquid move around a lot.
<http://www.chemheritage.org/educationalservices/faces/poly/tutorial/states.htm>
- Newton said. The slower one layer slides over another, the less resistance there is, so that if there was no difference between the speeds the layers were moving, there would be no resistance. Fluids like water and gasoline behave according to Newton's model, and are called *Newtonian fluids*.
- A non-Newtonian fluid is a fluid whose viscosity is variable based on applied stress.
<http://antoine.frostburg.edu/chem/senese/101/liquids/faq/non-newtonian.shtml>

Materials needed:

Exploration: cornstarch, water, food coloring, bowl, spoon, straw, chart paper

Explanation: completed charts from exploration activity

Expansion: 9 t. liquid laundry detergent, 5 t. white glue, ¼ t. salt, Ziploc sandwich bags, spoons

Resources:

King, K. P. (2007). *Integrating the national science education standards into classroom practice*. Upper Saddle River, NJ: Pearson, Merrill Prentice Hall.

Dr. Seuss. (1949). *Bartholomew and the oobleck*. New York: Random House

Science, It's All Fun/Colorado State University Cooperative Extension 4-H Youth Development
www.colorado4h.org/k12/activity_sheets/ScienceisFun.pdf

Safety Precautions: Clean up any spills so that others do not slip and fall. Do not taste the mixture, and do not rub your eyes. Wear safety goggles.

I. Engagement:

A spaceship has returned from a newly discovered planet. This planet is covered with large, green oceans, and a sample of the ocean material was collected. It has been named "Oobleck" since it resembles the substance in the book *Bartholomew and the Oobleck* by Dr. Seuss. Preliminary studies have shown that Oobleck is safe to handle.

II. Exploration:

What will the students do?

1. Explore the properties of the Oobleck using all of your senses except taste.
2. Record observations on the chart paper.
3. Some possible explorations: Poke slowly with your finger, poke finger into the Oobleck quickly, try to roll into a ball, etc.
4. Describe the properties of the substance.
5. Place a star next to the most interesting characteristic of the Oobleck.

II. Explanation/Concept Development:

How will the ideas be connected and explained?

1. Examine each group's description of the Oobleck?
2. How can you explain the behavior of the Oobleck?
3. Is the material a liquid or a solid? Explain using your observations from the exploration phase.
4. What other ways could we test the Oobleck?

III. Expansion of the Idea:

How will the idea be expanded?

1. Use the laundry starch, salt, and glue to create another substance called "Glurch".
2. Compare the two substances.
3. How are they similar and how are they different?

IV. Evaluation:

Do you think that Oobleck is a solid, liquid, or other matter? Explain based on your observations.