RAFT IDEAS

Topics: Chemistry, Material Properties, Viscosity, Fluids

Materials List
- ✓ Cornstarch
- ✓ Water
- ✓ Watertight containers
- ✓ Mixing spoons, craft sticks, or paddles
- ✓ Small toys and objects to use in experimentation

This activity can be used to teach:
- Properties of materials (Next Generation Science Standards: Grade 2, Physical Science, 1-1, 1-2; Grade 5, Physical Science, 1-3)
- Mixtures (Next Generation Science Standards: Grade 5, Physical Science, 1-4)
- Changes of state (Next Generation Science Standards: Middle School, Physical Science, 1-4)

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Ooh, Ooh, Oobleck

Our favorite non-Newtonian fluid

Appeal to sensory learners at every level with this amazing substance that sometimes behaves like a liquid and sometimes behaves like a solid!

To Do and Notice (Dispose of end product in the garbage, NOT down the drain.)
1. In a watertight container, add 2 parts cornstarch to 1 part water.
2. Mix slowly and well.
3. Add more water, as needed, to achieve a mixture with the viscosity of thick syrup when a spoon is dragged slowly through the Oobleck. The mixture should also resist, or appear more like a solid, when rapped quickly with the back of a spoon.
4. Explore the attributes of the substance. When does it flow? Does it ever appear to "break"? What happens to small objects that get placed on the Oobleck surface? Do they all sink in? Slowly or quickly?

The Content Behind the Activity

Most liquids follow the same "rules": they flow, take the shape of their containers, and have defined volumes. They also have the same resistance to flow (viscosity) in all pressures. Substances that "play by all the rules" are called Newtonian fluids. Some substances, however, exhibit a variety of non-standard behaviors, making them non-Newtonian fluids. Oobleck, a starch suspension, is one of these special substances, along with quick sand, blood, shampoo, and ketchup! Starch suspensions exhibit increased viscosity with increased pressure… so if the surface is hit hard enough, the Oobleck appears more as a solid. This specific type of non-Newtonian fluid is called dilatant.

Cornstarch is an organic polymer, a polysaccharide containing joined sugar monomers, with the chemical formula $(C_6H_{10}O_5)_n$. These long-chain molecules can stick together easily, and even get "tangled up", if the conditions are right. Mixing cornstarch in water suspends the cornstarch molecules, creating a colloid. When pressure is added, the water shears (moves away), leaving the cornstarch molecules to stick together.

Taking it Further

- The common name for this cornstarch suspension, Oobleck, is taken from the popular children's book ***Bartholomew and the Oobleck***, by Dr. Seuss (1949, 56 pages). For younger students, make the literary connection by incorporating this story into the science lesson.
- Take this activity to a whole new level with a large-scale demo. With enough Oobleck, people can walk (quickly) on this watery substance. But, if they walk too slowly or stop, they will sink right in.

Web Resources (Visit www.raft.net/raft-idea?isid=540 for more resources!)
A great video of teachers with the Exploratorium walking across a vat of Oobleck can be found at: https://www.youtube.com/watch?v=O84QNrMnaak

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