

Strange States of Matter

4th Grade

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Benchmarks:

Explain that matter has different states (e.g. solid, liquid, gas) and that each state has distinct physical properties.

Objectives:

Show students that not all things fit “neatly” into the categories given by the “Three States of Matter”. Force students to think clearly about why something may not fit in an obvious group, and actually belong to another group.

Materials

Ingredients for Oobleck

- Cornstarch
- Water

Shaving Cream

Ingredients for Slime

- Glue (white glue)
- Borax
- Small cups (bathroom size)
- Popcicle sticks (or other sirrers)
- Water
- Sealable plastic baggies

Preparation:

Prepare for slime:

- Make a 1:1 solution of white glue and water. Fill one bathroom cup slightly less than half full for each student. Place stirring stick into this cup.
- Make a saturated solution of Borax by putting Borax into the bottom of a sealable container (2Liter bottle is fine), filling it with water, then pouring the solution off the top. Fill one bathroom cup per student with this solution. (If you do this often, just add Borax or water to the bottle as needed – it is okay if there is extra Borax in the bottle, as long as you do not pour it into the cups when you decant the solution.

Initial Observation/Demonstration:

Show students Oobleck. In front of them, combine starch and water to make the oobleck. (This is a “non-Newtonian” fluid, and is classically used to show students a fluid that does not behave as expected.) Allow some students to touch and play with this stuff, and try to describe it to other students using the terms “solid, liquid, gas, fluid”.

Initial Observations:

Students will observe that the Oobleck is a liquid. Allow students to play with it and wait for them to discover that they can make it behave as a solid.

Initial Model:

After the students have shown that a material can have properties of a liquid and a solid, its time to make slime (slime can also be used in a discussion of polymers). For this demonstration, explain to students that they will be using two liquids (glue and Borax) to make a polymer – linked chains of molecules.

Procedure:

Instruct the students to carefully pour the clear solution into the cup of glue. Then stir it gently. Show the students how to “wring our” the slime, and encourage them to play with it. Have paper towels on hand to clean up messes, and baggies with students names (in permanent marker) on them for the students to keep their slime in.

Lead the students in a discussion regarding what kind of matter slime might be, and why.

Finally, show students shaving cream. Point out that it can hold shape like a solid, but if you deflate the bubbles in it the foam becomes a liquid.

Discussion/Summary:

What did the students find? Leading questions to incite further questions and inquiries.