Investigating Slime

Work in groups of four. Your table mates are your lab partners. If you divide the workload up, you can complete the practicum much faster than you can if everyone works on the same thing.

Have your science notebooks ready to record data and observations.

Each table will need:

- One kitchen scale (shared)
- One digital thermometer (shared)
- One container of glue, either
    - One 5oz bottle of Elmer's clear glue, OR
    - One 4oz bottle of Elmer's school glue
- Water, in the same amount as the glue
- Borax solution (provided for the class, but if you ever need to make it, here's how:)
    - Dissolve 1 level tablespoon of Borax in 1 cup of hot tap water.
    - Stir until the mixture dissolves thoroughly (solution will be clear when borax is completely dissolved in the water. Having hot water helps a bunch)
    - Let cool to room temperature before use
- One 16-oz bowl, paper or Styrofoam
- One plastic cup to hold the borax solution
- Stirring implement (chopstick or plastic spoon)
- Food coloring (optional)
- Ziploc bags (to store the Slime when done)

Preparation

1. Empty the entire container of glue into the bowl.
2. Fill your empty glue container with water, cap it, shake it, and then add the water to the glue already in the bowl.
3. Stir the water and glue thoroughly, being careful not to spill.
4. Weigh the glue, water, and bowl together. Record the weight in your notebook.
5. Measure and record in your notebook the temperature of the glue/water mix.
6. Obtain about ½ cup of borax solution from the instructor. Weigh the solution like this:
    a. Place the empty cup on the scale.
    b. "Tare," or zero out, the scale so the cup's weight does not show.
    c. Pour about ½ cup of borax solution into the cup. Record the weight in your science notebook.

Mix, Measure, Record

1. **Slowly** pour the borax solution into the glue/water bowl mix while stirring with your implement. Did the mix change in some way? Record the change in your notebook.
2. Measure and record the temperature of the new material. Compare the temperature of the combined materials the glue/water mixture from before.
3. Weigh the combination of the bowl and glue/water/Borax mix. Compare that weight to the sum of the glue/water/bowl weight and the Borax weight before mixing.
4. Add food coloring (optional). Use sparingly: a little goes a long way.

Researching Terms on the Internet

Using on-line resources, look up the following terms, and write a suitable definition for each in your science notebook. Some of these will be important for the discussion later:

- Element
- Compound
- Mixture
- Physical Change
- Chemical Change
- Non-Newtonian Fluid
- Viscosity
- Buoyancy
- Material Property (solid, liquid, gas)
- Endothermic Reaction
- Exothermic Reaction

Material Properties Investigation

Record the results of each test you perform, and decide which material property (solid, liquid or gas) applies best for your Slime.

Test	Observation / Result	Closest property (S, L, G)
Slow finger poke		
Quick finger poke		
Slow pull apart		
Fast pull apart		
Conformity / Viscosity		
Bounce		
Rolling		
Applied Pressure		
Applied Heat		
Buoyancy		
Student's Choice 1		
Student's Choice 2		

Discussion Questions

Referring to your research terms and your notebook observations, answer the following questions:

1. Do you think "Slime" is an element, a compound, or a mixture? What evidence do you have that supports your statement?
2. Imagine breaking down your Slime into smaller and smaller pieces, until they were too small to see without a microscope. Would the smallest piece still be Slime, even if you couldn't see it?
3. Do you think the creation of slime represents a physical change, or a chemical change?
    a. Did the mass change after mixing? Would you expect it to? Why or why not?
    b. Did the temperature change after mixing? If so, did it indicate an endothermic, or exothermic, reaction? Was there an example you found in your research about endothermic and exothermic reactions that might support your observation?
    c. Evidence of a chemical change in a vinegar/baking soda mix might be the release of carbon dioxide into the air (what makes the foamy eruption in science fair volcanoes). What was the biggest change you observed when mixing glue and Borax that might be further evidence of a chemical change?
4. Is the material that makes up glue or slime denser, or less dense, than water? What experiment(s) did you perform that support your conclusion?
5. Using what you learned in your on-line research and observations, decide whether or not you think Slime is a non-Newtonian fluid. Defend your claim with your evidence.

Compare Your Slime with Someone Else's

Partner up with a group whose Slime was made with a different type of glue (if you had white glue, pair up with a team who had clear glue, and vice-versa). Observe and record how your Slime is different from that of your partner group. Do you think their slime is physically different, chemically different, or both? What is your evidence to support either claim?

Clean Up

When finished, divide up the slime and place in Ziploc bags to take home. Do not leave the bags in your backpack; instead, carry them with you after school. Throw out all bowls and plasticware. Wipe down all tables with cleaning wipes to remove gunk and glue.

Further Reading

If you're interested, there's a lot of stuff out there to read about Slime:

http://elmers.com/slime Lots of projects from the people who make the glue.

https://www.acs.org/content/dam/acsorg/education/resources/highschool/chemmatters/articlesbytopic/solidsliquidsgases/chemmatters-dec2004-slime.pdf An article from the American Chemical Society discussing more of the science of Slime.

https://www.scientificamerican.com/article/bring-science-home-playing-with-polymers/ A well-written article from Scientific American talks about polymers and recipes.