Oobleck, Gloop, and Glurch

Lesson Overview

Throughout this lesson, students will use inquiry skills to identify states of matter, describe physical properties, and modify the recipe to change physical properties of a substance. Students will have the opportunity to work in groups, create a foreign substance by following a recipe, record qualitative and quantitative observations in a data table, and reflect on their experiences.

Standards Addressed

SC 2005

7-5.9 Compare physical properties of matter (including melting or boiling point, density, and color) to the chemical property of reactivity with a certain substance (including the ability to burn or to rust).

7-5.10 Compare physical changes (including changes in size, shape, and state) to chemical changes that are the result of chemical reactions (including changes in color or temperature and formation of a precipitate or gas).

SC 2014

7.P.2B.1 Analyze and interpret data to describe substances using physical properties (including state, boiling/melting point, density, conductivity, color, hardness, and magnetic properties) and chemical properties (the ability to burn or rust).

7.P.2B.4 Plan and conduct controlled scientific investigations to answer questions about how physical and chemical changes affect the properties of different substances.

NGSS

MS-PS 1-2 Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

MS-PS 1-4 Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

Disciplinary Literacy Best Practices

Highlighting
Think Pair Share

Lesson Plan

Time Required – Two-Four 60-minute Class Periods

Disciplinary Vocabulary : reactant, product, Law of Conservation of Matter, physical changes, chemical changes

Materials Needed:

Metric measuring spoons (1 set per student group)
Hand lens (1 per student group)
Safety goggles (1 per student)
Liquid starch (60 mL per student group)
Table salt (2 g per student group)
Cornstarch (150 mL per student group)
Water
Elmer's® white school glue (1 small bottle per group plus a large bottle to make the glue mixture)
Borax powder (1 box per class) (this can be found in the laundry supply aisle as 20 Mule Team® Borax)
Clear 16-oz. plastic cups (7 per student group and 6 for materials distribution center)
Paper towels (1 roll)
Zipper-type freezer sandwich bag (4 per student group)
Wax paper (about 1 m per student group)
Ruler (1 per student group)

Assessment: Completed Data Table

Teacher Advance Preparation:

1. Prepare a glue mixture by combining equal parts water with equal parts Elmer's white school glue so that each student group has 60 mL of the mixture. Be sure to use Elmer's white school glue, as it contains a polymer known as polyvinyl acetate that is at a specific dilution rate.
2. Prepare a borax solution by adding 20 mL of borax to a liter of water so that each student group has 90 mL. Some borax powder may settle to the bottom of the container, so be sure to stir the borax to dissolve as much of it as possible.
3. Prepare copies of the Oobleck, Goop, and Glurch student investigation pages for each student group.
4. Set up a materials distribution center so that students can easily collect the materials for this activity. Set out the borax solution, glue mixture, plain water, salt, liquid starch, and cornstarch in appropriately labeled 16-ounce plastic cups at the materials distribution center. Also set out the roll of paper towels, small bottles of glue, and the clear plastic cups for each group.

Engage

- Students will be introduced to foreign substances and will be given the recipe to make the mystery substances. Students will review the data collection chart and procedures. They will recall the physical properties of matter and understand the properties they should include in the data tables. Students will use the highlighting strategy to understand the quantities needed for materials and the order of mixing for the individual recipes.

Explore

- **SAFETY: Students must wear eye protection during this investigation. They should neither taste nor smell any of the materials.**
- Have students complete the Oobleck, Goop, and Glurch investigation pages. The recipe and data charts have been provided on their student sheet.
- Students should read the questions they will be answering before they begin as well.

Explain

- Students will examine the physical properties of their new substances and the ingredients of each. They will have to make an inference as to which ingredient determines the properties (or combination of ingredients) in order to complete the second part of the lab.

Extend

- Ask students to describe how they changed their recipes and report their results.
- Students will understand the concept of how a system is the whole picture and has input (ingredients) and output (the material) and changing the input into a system will change the output, or results.
- Students should try to think of other things they know that operate as input/output systems.

Teacher Reflections and Biographical Information

I tried to complete this lesson in two 60 minute class sessions. I should have extended it to three or even four days. However, I felt the crunch of time. Students in one of my classes did not actually make their new substance, they only made the prediction and was able to make the inferences of properties based on the ingredients.

In retrospect, I would have taken the extra day or two and completed the lab in depth. So many standards are covered and the concept of physical properties is difficult for them to grasp. We discussed physical vs chemical properties. We were able to talk about mixtures vs compounds, and elements.

It is wonderful that this inquiry is flexible in that you can cut it off or allow the time to explore. The students were actively engaged the whole time because the results were not what they expected.

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Name: _____ Date:_____

Oobleck, Goop, and Glurch Lab Investigation

Materials:

Set of metric measuring spoons Hand lens Safety goggles 30 mL liquid starch 30 mL glue mixture 1 table salt	75 g cornstarch 30 mL water 30 mL white glue 30 mL borax solution 7 plastic cups 3 zipper-type sandwich bags	1 m of wax paper Ruler Marker

Procedures:

SAFETY: Wear eye protection and do not taste or smell any of the materials.

1. At the materials distribution center, get **7 plastic cups.** Label the plastic cups with the names **starch, white school glue mixture, table salt, cornstarch, water, white school glue, and borax solution.** Place a small sample of each material in its labeled plastic cup (see the necessary sample amounts in the materials list above). Be sure to wash and dry the measuring spoon with water and a clean paper towel after each use.
2. Observe the physical appearance of each sample of material. Construct a table to record your observations of the physical properties of the starch, white glue mixture, table salt, cornstarch, water, white glue, and borax solution. Include descriptions of what you see, hear, and feel.

Solution/Mixture	Other Physical Properties	Color	Solid-liquid	Particle size
Starch				
White Glue Mixture				
Table Salt				
Cornstarch				
Water				
White School Glue				
Borax Solution				

3. Now you will observe how these materials interact with each other. Carefully follow the directions for each gunk recipe. Mix and test the Glurch recipe first. Then mix and test Oobleck, and finally mix and test Goop.

Glurch
30 mL liquid starch
30 mL glue mixture
1 g table salt
Mix the starch and table salt together in the sandwich bag. Knead the bag for 2-3 minutes until the substances are well mixed. Then add the white glue mixture, again kneading the bad until the substances are well mixed. When a lump forms and it is hard to knead, take the lump out of the bag and squeeze out any excess liquid into a waste container.

Oobleck
75 g cornstarch
30 mL water
Add the water to the sandwich bag. Next, slowly add the cornstarch a little at a time to the water. Knead the bag to mix the substances together, making sure all of the cornstarch is wet. You may need to add a little more or less cornstarch so that the oobleck has a consistency light enough so it will flow through your fingers but solid enough to squeeze.

Goop
30 mL white glue
30 mL borax solution
Squeeze approximately 30 mL of white glue [not the glue mixture] into one corner of a zipper-type sandwich bag. Add 30 mL of borax solution. Seal the bag and then knead the contents until a new substance is formed. Make certain both substances are thoroughly mixed together.

4. Test each gunk recipe three times using the science methods listed below.
Record your results in the table.

Roll Test
Roll your gunk into a snake on the wax paper and see how long a skinny snake you can make before it breaks. Measure the length to the nearest centimeter.

Pancake Test
Press your gunk into a pancake on the wax paper. Make the largest pancake you can, but you must be able to lift it off of the wax paper without it breaking apart. Measure the diameter of your pancake to the nearest centimeter.

Bounce Test
Roll your gunk into a ball and drop it from the height of your desk. Measure the distance, to the nearest centimeter, that it bounces back up from the floor.

Stretch Test
Roll your gunk into a ball and then pull it apart to see how far you can stretch it before it breaks. Measure the distance of the stretch to the nearest centimeter.

Glurch Test Results

	Test 1	Test 2	Test 3	Average
Roll Test (nearest cm)				
Pancake Test (nearest cm)				
Bounce Test (nearest cm)				
Stretch Test (nearest cm)				

Oobleck Test Results

	Test 1	Test 2	Test 3	Average
Roll Test (nearest cm)				
Pancake Test (nearest cm)				
Bounce Test (nearest cm)				
Stretch Test (nearest cm)				

Goop Test Results

	Test 1	Test 2	Test 3	Average
Roll Test (nearest cm)				
Pancake Test (nearest cm)				
Bounce Test (nearest cm)				
Stretch Test (nearest cm)				

5. Why do you test each recipe three times instead of just once?

6. On what test does Glurch do best?

Oobleck?

Goop?

7. How would you change the recipe for either Glurch, Oobleck, or Goop to make the results for one of the tests even better? Tell your teacher which substance (Glurch, Oobleck, or Goop) your group will modify. Record your new recipe below. Remember to change only one variable in your recipe. If you want to change more than one variable, make another recipe. Get the additional materials you need to test your recipe. Construct a table to report your test results.

8. Each new substance made from these recipes can be described as a system. Systems are made of parts. Pick one of the recipes and identify the parts that make up the system. Compare the parts of the system to the overall product. How are their physical properties different?

9. A system has inputs that produce outputs, and changing the input can alter the final output. Using this information on systems, explain how changing the input on one of the recipes would change the output. Compare this to changing the recipe for pizza, cookies, or sandwiches. How might the pizza, cookies, or sandwiches change?