Materials science engineers rely on chemistry when designing new materials. They use what they know about the properties of materials to decide where and how new manufactured materials would best be used. In this activity, you will create a new mystery substance and perform tests on it to learn about its properties.

**MATERIALS**
- Cup or glass
- Measuring spoons
- Measuring cup
- Baking soda
- Bowl
- Non-toxic craft glue
- Stirring utensil
- Food coloring (optional)
- Saline solution or contact lens solution (must contain boric acid or sodium borate in the ingredients)
- Several nickels or quarters (same denomination)
- Ruler or tape measure (for older students)
- Plastic bag or container with lid

Experiment continued on next page...
PROCEDURE

MAKE MYSTERY SUBSTANCE:

- In cup or glass, measure ¼ cup warm water. Stir in ½ teaspoon baking soda and stir until baking soda is completely dissolved. Set water-baking soda solution aside.
- Pour ½ cup glue in bowl. Add food coloring (optional) and water-baking soda solution. Stir thoroughly until combined.
- Add one tablespoon contact solution and stir to combine. Once glue mixture begins to pull away from the bowl, continue to knead by hand.
- Explore your mystery substance for two minutes. What are some words that could describe it? Make a list of the properties, or characteristics, of the mystery substance. When materials scientists make a new substance, they also make observations about the properties of the substance, and perform tests to find out more about the way the substance works.

TEST MYSTERY SUBSTANCE:

- Test to see how the mystery substance performs under certain conditions. How bouncy is it? Is it easy to compress or squish down? Is it sticky enough to pick up a paper clip or metal coin? What happens when you stretch it out? Discuss your observations with a friend or family member, and/or record your observations in your science notebook.
- Store the mystery substance in a plastic bag or airtight container. Be sure to wash hands after handling.

Experiment continued on next page...
TRY THIS

• What other tests could you perform on your substance to learn more about its properties? If you could re-design your substance, what would you do with it?

• Look around your home. What are some good materials you could use to build a chair? What are some good materials could use to build a trampoline? What is a test you could do to show that a material is sturdy? What is a test you could do to see if a material would be good for bouncing?

• Consider the following settings: farm, space shuttle (or cockpit), playground, construction site. Brainstorm a list of ways the substance you created could be used in each setting. How would you know if your substance would work for that particular use? What kind of tests could you perform?

DID YOU KNOW

How does slime work? It’s all thanks to chemistry! The glue is a polymer and is made up of long, repeating, and identical strands or molecules. These molecules flow past one another keeping the glue in a liquid state.

The borate ions in the saline solution serve as an activator. When the activator is added to the glue mixture, it starts to connect strands of glue molecules together. This process is called cross-linking. As these long strands tangle together, the substance becomes thicker and more rubbery.

Substances like slime are called non-Newtonian fluids. A non-Newtonian fluid is neither a liquid or a solid. It can be picked up like a solid, but it also will ooze like a liquid. Non-Newtonian fluids are used in paint, cosmetics, asphalt, glue and other industrial products.
K–2 GRADE EXPLORATION

Here are some questions you can explore together:

- Roll the slime into a ball. Hold the ball in the air and drop it onto a table or flat surface. How much does the ball bounce? What do you notice about the shape of the ball after you dropped it?
- With the help of a friend or family member, stretch the slime across the top of the cup and have one person hold the edges. Have another person carefully place one nickel/quarter at a time on the slime. How many coins can you add until it breaks?
- Using a round pencil or wooden dowel, roll the slime into a pancake shape. Is it easy to squish flat? How thin can you roll it?
- Roll the slime into a cylinder or snake-like shape. Slowly pull both ends of the cylinder away from each other. How far can you stretch it before it breaks? Reshape into a cylinder. This time, pull both ends away from each other more quickly. How far can you stretch it before it breaks when you pull more quickly?
- Roll the slime into a cylinder. Stretch it out a little bit, then lay it on a flat surface. Observe how the shape changes over time. Does it shrink? If so, how much?
- Place a few coins on a flat surface. Roll the slime into a ball and try using it to pick up the coins? Is it sticky enough to pick up a metal coin? How many coins can you pick up?
- What other tests can you perform to learn more about the properties of your slime?