



Lesson Title: From Glue Sticks to Soap Sticks

Tagline: Use an empty clean Elmer's glue stick or glue bottle to make a bath soap or bath soap crayon

Grade Range:

Grades: 1-3 and 10-12 (see both lessons below in separate sections)

Please make changes to lessons and appendices as desired to fit the needs of your classroom.

Supports Subject Area(s) of:

Science- chemistry, environmental

Lesson duration 3 to 5 days

Grade 1-3

Standards: See complete list at end of lesson

Options for Assessment: Lab process, testing, finished product and explanation of process

Possible Objectives:

- Using the scientific method, students will experiment to develop the best soap product
- Students will implement laboratory safety rules
- Students will engage in discussion and dialogue as product is developed to determine best possible process to make best possible product
- Students will keep record of their findings for presentation
- Mixtures, solutions
- Matter- solids, liquids, gases
- Materials and properties
- Mixing and separating

Materials: (obtain enough for several groups of 4 students)

- Elmer's Glue sticks or glue bottles- empty and cleaned
- Mixing bowl
- Spoon
- 1 cup grated soap, soap flakes, or soap powder (not detergent) or finely grated Ivory soap bars or lye soap (at most hardware stores)
- 3 tablespoons to 1/4 cup warm water
- Food coloring (liquid, not paste) or washable tempera paints
- Four molds (glue sticks or glue bottles)
- Toothbrush, toothpicks and dish soap work well for cleaning out used glue sticks and glue bottles

Directions:

- Collect enough empty glue sticks or glue bottles from other classes around the school building to use for your experiment purposes
- Clean out the empty glue sticks by removing any left over glue with a toothpick. Using a toothbrush, warm water and dish soap clean out all parts of the glue stick (do not discard any parts of the glue stick) and let dry. As a time saver, assign each of your students the task of taking one or more glue sticks home to clean and bring back the next day.
- For glue bottles, cut off the top and bottom of the glue bottle length wise
- Split class into groups of 4 students

Lesson Steps:

Introduction:

If you have implemented the Elmer's Glue Crew Recycling program in your school, review the process with the students. If you have not, share with students information about the Elmer's Glue Crew Recycling program- elmersgluecrew.com. Before the glue sticks head to the recycling facility explain that you will be using some of the empty Elmer's glue sticks as soap molds for your science experiment. Review or introduce the vocabulary and or related scientific information: mixtures, matter, properties, mixing etc... Have students work through scientific method (appendix A) to perform making soap experiment.

Activity:

Making Bath Soap Crayon

Experiment Procedures-

1. Mix the grated soap, flakes or powder with the warm water.
2. Add a couple drops of food coloring or washable paint to the mixture. If I want dramatic colors use washable tempera paint. **Note:** paint or food coloring may temporarily discolor your bath walls. It would be best to advice parents to try first on a small area to see. Experiment with different dyes to see which ones work the best as soap crayons.
3. Continue mixing the soap crayon solution until it begins to thicken and hold its shape. Add more water or soap if needed. Knead by hand when it becomes too difficult to stir. Once the mixture is stiff and begins to harden, it's time to mold the bath crayons.
4. Mold the soap crayons into the empty glue sticks (twisted down) and glue bottles (tops cut off). Allow the crayons to dry at least 3 to 4 days. As soap crayons are drying, twist up the glue stick to allow for soap to be exposed to air to help drying process. For glue bottles, remove soap from glue bottle by cutting down the sides of the mold with scissors once the soap is molded so that it can continue drying outside of glue bottle.

Safety Tips: N/A

Wrap it Up

Students Report their findings in Appendix A document. Have students work to create and affix a label for the bath soap or bath soap crayon. Make enough soap for all students to take home a final product.

Extension

Elementary and High School students (see lesson below) may want to get together after conducting their experiments to share findings, similarities and differences between experiments.

Grades 10-12

Standards: See complete list at end of lesson

Options for Assessment: Lab process, testing, finished product and explanation of process

Objectives:

- Using the scientific method, students will experiment to develop the best soap product
- Students will review/study chemicals used in this lesson and discuss how they work together
- Students will have a clearer understanding of the everyday uses of acid/base reactions
- Students will implement laboratory safety rules
- Students will engage in discussion and dialogue as product is developed to determine best possible process to make a quality product
- Students will keep record of their findings for presentation

Materials shown in this project:

- Elmer's Glue sticks and glue bottles- empty and cleaned- tops and bottoms cut off of bottles length wise
- **Background Information:** see <http://www.cavemanchemistry.com/oldcave/projects/soap/>
- Protective eye wear
- Gloves
- Lab apron
- Scented oils
- Lard or some sort of fat
- 6N Sodium Hydroxide (NaOH)
 - or 28 g of commercial lye in 100 ml
- NaCl / table salt
- Ethyl - alcohol
- Glass beaker and stirring rod
- Means of heating solution
- Toothbrush, toothpick, dish soap for cleaning out used Elmer's Glue sticks and bottles

Directions:

- Collect enough empty glue sticks and glue bottles from other classes around the school building to use for your experiment purposes
- Clean out the empty glue sticks by removing any left over glue with a toothpick. Using an old toothbrush, warm water and soap clean out all parts of the glue stick (do not discard any parts of the glue stick) and let dry. As a time saver, assign each of your students the task of taking one or more glue sticks home to clean and bring back the next day. Cut the tops and bottoms off of the empty glue bottles length wise

Lesson Steps:

Introduction:

If you have implemented the Elmer's Glue Crew Recycling program in your school, review the process with the students. If you have not, share with students information about the Elmer's Glue Crew Recycling program elmersgluecrew.com. Before the glue sticks head to the recycling facility explain that you will be using some of the empty Elmer's glue sticks as soap molds for your chemistry experiment. Review or introduce the vocabulary and or chemical information, chemical process, predict reactions. Have students work through scientific method (appendix A) to perform making soap experiment.

Pre-lab questions:

1. What reaction is described by the word saponification? What are the products from this reaction and what are the required reactants? Identify reactants and products that would show an acid/base reaction
2. How does soap work to clean? Describe the role of polar and non-polar regions.
3. What part of the lab requires the most safety considerations? Why is it critical to clean up all spills immediately?

Lab Procedures-

1. Place 10 grams of lard (or any other fat, such as oil or butter) in a 150 ml beaker
 2. Working in a well ventilated area or a fume hood. Place beaker on a hot plate and heat until lard is completely melted. Remove from heat.
 3. SLOWLY AND CAREFULLY add 15mL of 6N sodium hydroxide to the 150ml beaker and stir with glass stirring rod.
 4. Add 50mL of ethyl alcohol to the 150 ml beaker and stir.
 5. Gently heat this mixture under low heat, stirring with a glass-stirring rod until the base has completely reacted with the lard (You will no longer observe separation of lard and solution- it should be one homogeneous mixture with a slight yellow color- it will take about 20 minutes). If the mixture looks to be boiling, remove from heat and adjust temperature appropriately.
 6. After the entire base has reacted remove mixture from heat, add 20mL of water and stir.
 7. At this point it is no longer necessary to work in the fume hood. Set mixture aside to cool. At this point $\frac{1}{4}$ of a teaspoon of any color tempera paint can be added to color the soap and liquid scents (available at any craft store) can be added.
- Using a 250ml beaker, add 12g of sodium chloride to 50mL of DI water. Slowly pour the cooled mixture of base and lard into the NaCl mixture (not the other way around), swirling the beaker gently to mix.
8. Let this new mixture cool completely (this is a good stopping point for 50 minute classes). The solid cake that forms is the soap (what's left, if you do it out chemically, is glycerol)
 9. Line a small tray or paper plate with paper towels and dump the contents of the beaker. Let the soap "dry" overnight.
 10. Have students pack small pieces of soap gently into the clean, dry recycled glue sticks and plastic glue bottle molds. Allow soap to cure in molds for 2-3 days. For glue bottles, remove soap from glue bottle by cutting down the sides of the mold with scissors once the soap is molded so that it can continue drying outside of glue bottle

Safety Tips:

Gloves, lab-coat and appropriate eye-wear should be worn at all times.

Great caution should be exercised when handling the 6N NaOH and lard/NaOH mixture until the reaction is complete.

Avoid breathing fumes of NaOH and products during heating.

Wash with vinegar should you get NaOH on your skin and then flush the area with water for 15 minutes.

Ethanol has a low boiling point and is extremely flammable. Do not use open flame at any time during this experiment.

Wrap it Up

Students Report their findings in Appendix A. Make enough soap for all students to take home a final product.

Extension

High School students may enjoy making the homemade bath soap crayons included in this lesson for grades 1-3 with a younger class exposing them to the science lab, and basic equipment.

Standards

K-4 National Science Standards

NS.K-4.1 Science as Inquiry: Abilities necessary to do scientific inquiry , Understanding about scientific inquiry

NS.K-4.2 Properties of objects and materials

NS.K-4.5 Abilities to distinguish between natural objects and objects made by humans

NS.5-8 National Science Standards

NS.5-8.2 Properties of objects and material

NS.5-8.6 Populations, resources, and environments

9-12th grade

NS.9-12.1 Science as Inquiry

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

NS.9-12.2 Physical Science

- Structure of atoms
- Structure and properties of matter
- Chemical reactions
- Motions and forces
- Conservation of energy and increase in disorder
- Interactions of energy and matter

Ask a Question

Research

Construct a Hypothesis

Test Hypothesis Through
Experimenting

Report Results