

OSP Interactive Educational Programming

Lesson Title: Pioneer Life in the Okefenokee Swamp (History & Science Connections)	Grade Level: 5/8/9 Very adaptable
OSP Educational Programming: Enhance our focus on Native American and early Okefenokee settler cultures.	Teacher: L. Ranew Duration: 20-30 minutes at OSP; possibly 2 lessons in a classroom environment
Essential Question(s)/Objective(s): How/where did soap making originate? How did Native Americans and pioneers utilize their resources in the Okefenokee Swamp in soap making? What are the sources of lye? What are the essential ingredients in soap making? Differentiate between the hot process and cold process. Demonstrate accurate measuring in following the soap recipe. Describe tare and trace.	

Grade 5 GSE Physical Science

S5P1. Obtain, evaluate, and communicate information to explain the differences between a physical change and a chemical change. a. Plan and carry out investigations of physical changes by manipulating, separating and mixing dry and liquid materials. b. Construct an argument based on observations to support a claim that the physical changes in the state of water are due to temperature changes, which cause small particles that cannot be seen to move differently. c. Plan and carry out an investigation to determine if a chemical change occurred based on observable evidence (color, gas, temperature change, odor, new substance produced).

Grade 9 GSE - SC6. Obtain, evaluate, and communicate information about the properties that describe solutions and the nature of acids and bases. a. Develop a model to illustrate the process of dissolving in terms of solvation versus dissociation. b. Plan and carry out an investigation to evaluate the factors that affect the rate at which a solute dissolves in a specific solvent. c. Use mathematics and computational thinking to evaluate commercial products in terms of their concentrations (i.e., molarity and percent by mass). d. Communicate scientific and technical information on how to prepare and properly label solutions of specified molar concentration. e. Develop and use a model to explain the effects of a solute on boiling point and freezing point. f. Use mathematics and computational thinking to compare, contrast, and evaluate the nature of acids and bases in terms of percent dissociation, hydronium ion concentration, and pH. (Clarification statement: Understanding of the mathematical relationship between negative logarithm of the hydrogen concentration and pH is not expected in this element. Only a conceptual understanding of pH as related to acid/basic conditions is needed.) g. Ask questions to evaluate merits and limitations of the Arrhenius and Bronsted-Lowry models of acid and bases. h. Plan and carry out an investigation to explore acid-base neutralization.

Grade 9-12 Chemistry GSE -SC4. Obtain, evaluate, and communicate information about how to refine the design of a chemical system by applying engineering principles to manipulate the factors that affect a chemical reaction. a. Plan and carry out an investigation to provide evidence of the effects of changing concentration, temperature, and pressure on chemical reactions. (Clarification statement: Pressure should not be tested experimentally.) b. Construct an argument using collision theory and transition state theory to explain the role of activation energy in chemical reactions. (Clarification statement: Reaction coordinate diagrams could be used to visualize graphically changes in energy (direction flow and quantity) during the progress of a chemical reaction.) c. Construct an explanation of the effects of a catalyst on chemical reactions and apply it to everyday examples.

Key Vocabulary	Babylonian, Mt. Sapo, Saponification, colonial industry and potash/lye/sodium hydroxide, acids & bases, tare, trace, gloves, goggles
Teacher Materials	Knowledge of terms PPT - optional Handout w/ recipes, notes, equipment Have younger students measure with sugar always. Monitor grades 9-12 carefully.
Student Materials	Handout – Recipes, Notes and Equipment. Water, scale, sugar/lye, jars, dropper, spoons, gloves, goggles,

Teaching Strategy/Procedures	<p>Show the PPT – optional.</p> <p>The lye must be near 100 degrees at the beginning of the lesson. Allow for this, mixing lye and water for actual soap making 1 & ½ hours ahead of time. Introduce the activity with a summary of the first 5 vocabulary.</p> <p>Demonstrate safety precautions and equipment use for lab work. Describe the ingredients of soap. Demonstrate safe soap making.</p>
Differentiation	<p>To be determined by the classroom teacher.</p>
Summarizing Strategy	<p>Arrange historical events chronologically on a timeline. Students number the significant tasks in the order in which they should occur.</p>
Assignment(s)	<p>Arrange historical events chronologically on a timeline. Students number the significant tasks in the order in which they should occur.</p>
Assessment For and/or Of Learning	<p>Arrange historical events chronologically on a timeline. Students number the significant tasks in the order in which they should occur.</p>

Soap Making Materials/Equipment

Safety:

Goggles/glasses

Gloves

Vinegar in a spray bottle

Other:

Immersion/stick blender

Large, stainless steel pot

Thermometer

Digital scale

Large glass jars

Paper plates

Spatula

Spoons

Stove top for melting lard

Containers for holding soap

 Lined glass, cardboard or

 Silicone molds

Thick cardboard for covering soap molds

Towel

Large cardboard box for storing soap while curing

Needlepoint canvas for lining large cardboard box

Cutting board for large loaves/bars

Butcher knife or soap cutting tool

Notes:

Do not cook in or with any of these things once used for soap making.

Soak all materials in the pot in the yard, then rinse. Dishwasher clogging can occur.

Fats can be at room temperature, or within 20 degrees of lye water temp.

Lye water must be at 100 degrees. Can be put in refrigerator to speed this up; otherwise it will take from 1-2 hours, depending on conditions.

Trace can occur between 5 and 15 minutes, depending on conditions.

Soap can be turned out of molds and cut in 24 hours.

Curing takes 3 weeks.

Saponification and the Okefenokee Swamp

1. The term saponification is the name given to the chemical reaction that occurs when a vegetable oil (coconut, olive) or animal fat (lard, beef tallow) is mixed with a strong alkali (lye).
2. Pioneers used potassium hydroxide (potash), which is from plant ash. Sodium hydroxide, derived from salt, was later used.
3. The products of the reaction are soap and glycerin, which is often extracted from our soap today and used in other products. The water in soap recipes does not enter into the chemical reaction, but serves as a vehicle for the alkali, which is otherwise a dry powder. Swampers would have used rain water, but distilled water is what soap makers today use.
4. Not long after the Okefenokee Swamp's formation, the Babylonians were making soap (2800 B.C.E. = @ 5,000 years ago). This is based on the finding of a soap-like material in clay cylinders.
5. Soap supposedly got its name from Mount Sapo in Rome. The word sapo is Latin for soap. There is documentation of the Romans making soap in the second century. They preferred soap from Spain and Gaul (Spain), but it was expensive. By this time, humans had been living in the swamp for 2,000 years, but not yet building mounds.
6. Soap making became more affordable in the 1700s when French scientist Nicholas Leblanc found a way to make lye/caustic soda/sodium hydroxide from salt. During this time, Georgia was colonized on Yamacraw Creek land (1733) and acquired part of the Okefenokee Swamp (1763).
7. The cold process method is the most popular soap making process today, while some soap makers use the historical hot process of swamp pioneers.
8. If swampers get and afford it, they used Red Devil Lye beginning in the late 1800s. This company is no longer around.

Soap with Lard

- **5.4 oz lye/sodium hydroxide**
- **13.5 oz distilled water**
- **40 oz (2 pounds, 8 oz) lard**
- **Essential oil**
- **Colorant**

Soap with Olive Oil & Goat Milk

- **7.41 oz lye/sodium hydroxide**
- **10.3 oz distilled water**
- **5 oz (3 pounds, 2 oz) olive oil**
- **6 oz evaporated goat milk**
- **Essential oil**
- **Colorant**

Soap with Coconut Oil

- **9.7 oz lye/sodium hydroxide**
- **24.25 oz distilled water**
- **54 oz coconut oil**
- **Essential oil**
- **Colorant**