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IMPACT

STEM/STEAM

**Scrub a
Dub Lab**

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Scrub a Dub Lab

***“Dive into the Art and Science of
Sugar Scrubs with a STEAM Twist”***



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Goals and Objectives



The purpose of “Scrub a Dub Lab” is to give students a deeper understanding of the science behind exfoliation, emulsification, and solubility while applying their knowledge of chemical and physical changes to create personalized sugar scrubs. Students will experiment with various combinations of exfoliants, carrier oils, and essential oils to optimize texture, scent profile, and skin benefits. They will learn how to formulate a safe, high-quality scrub with ideal consistency and skin compatibility using scientific principles, mathematical ratios, and critical thinking. Through this hands-on sugar scrub creation experience, students will integrate multiple STEM/STEAM concepts into the lesson, including biology (skin health), chemistry (ingredients interaction), and engineering (product testing). Additionally, students can discover the calming properties of aromatherapy, the role of self-care in mental wellness, and the entrepreneurial possibilities of product branding and marketing.

Florida Standards

Science

SC.5.P.9.1 – Investigate and describe that many physical and chemical changes are affected by temperature.

SC.6.N.1.4 – Identify test variables (independent variables), outcome variables (dependent variables), and constants in an experiment.

SC.7.L.17.3 - Describe and investigate various limiting factors in the local ecosystem and their impact on native populations.

SC.8.N.1.1 - Define a problem from the eighth-grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations, and analyze data.

Mathematics

MA.5.NSO.2.2 - Multiply and divide multi-digit numbers, including decimals, to solve real-world problems.

MA.6.AR.1.1 - Apply ratio reasoning to solve problems involving part-part and part-whole relationships.

MA.7.AR.1.1 - Determine whether two quantities have a proportional relationship, using equations and graphs.

MA.8.AR.2.1 - Graph proportional relationships and interpret the unit rate as the slope of the graph.

Course Overview – Scrub a Dub Lab



Scrub a Dub Lab is a dynamic way to introduce students to the properties of mixtures, solubility, emulsification, and the science of skin care while infusing creativity and entrepreneurship. Key concepts that will be covered during the lesson include:

Physical and Chemical Changes: Students will observe how combining different oils, exfoliants, and essential oils results in physical mixtures or chemical reactions. They will experiment with ingredients like sugar, salt, coconut oil, and emulsifiers to create consistent scrubs with effective exfoliation and hydration properties.

Emulsification and Solubility: Students will explore how water and oil interact in emulsions, using natural emulsifiers and observing when mixtures separate or remain stable. They will conduct 3 trials using different emulsifier ratios to determine the most effective blend for ingredient integration and shelf life.

Ratios and Formulation Science: Applying real-world math, students will use ratios to adjust sugar-to-oil proportions and scale their recipes for different batch sizes. They will test scrub formulas with sugar-to-oil ratios of 3:1 and 4:1, analyzing consistency, texture, and moisture retention.

Aromatherapy and Scent Blending: Students will learn about essential oil safety and aromatic properties, then blend oils such as lavender, peppermint, and citrus to craft personalized fragrance profiles. They will evaluate the calming, energizing, or clarifying effects of each blend and create scent cards for user testing and feedback.

Packaging and Sustainability: Students will explore eco-conscious packaging solutions by testing scrub containers for durability and user experience. They will use Canva or Cricut to design labels, incorporating branding, ingredient lists, and aromatherapy benefits.

Lesson Plans and Overview

This lesson introduces students to the science and art behind exfoliants and skincare through sugar scrub formulation. Students will explore solubility, emulsification, texture design, and sustainability, while practicing real-world math applications related to ratios, measurements, and conversions.



Pre-Lesson Activities

Sensory exploration: Have students test and describe the feel, scent, and texture of different exfoliants and oils.

Ingredient profile cards: Students research the properties and skin benefits of carrier oils and essential oils.

Sustainability spotlight: Mini research on eco-friendly alternatives to microbeads and commercial packaging.

Lesson Plan – Mathematics Component

- Calculating Ingredient Ratios and Fragrance Oil Percentage
- Scaling Recipes for Multiple Batches
- Creating a Cost per Unit Breakdown for Entrepreneurial Pricing

Lesson Plan – Science Component

- Discovery Education Video: “How Skin Works” or “The Science of Solubility”
- Physical vs. Chemical Change Investigation Lab
- Emulsification Exploration: Do oil and water mix? Try it and record the results.

SUGAR SCRUB SAMPLE WORKSHEET

Sugar Scrub Ratio Math Worksheet – Show your work

Name: _____

Date: _____

Scrub a Dub Lab: Math in Motion – Sugar to Oil Ratio Practice

Objective: Apply ratio reasoning to calculate and scale ingredient quantities for sugar scrub formulations.

Part A: Understanding the Ratio

(Reference ratio: 3 parts sugar to 1 part oil)

1. If you use 6 tablespoons of sugar, how many tablespoons of oil do you need?

2. If you have 12 oz of sugar, how much oil is needed? _____

3. You used 4 oz of oil. How much sugar should be added? _____

Part B: Scaling the Recipe

1. You want to triple a recipe that uses 9 tablespoons sugar and 3 tablespoons oil. What are the new amounts? _____

2. You're making scrubs for 8 students. Each batch requires 6 tablespoons of sugar and 2 tablespoons of oil. What's the total quantity? _____

Part C: Challenge Problems

1. You have 24 oz of oil. How much sugar do you need to maintain a 3:1 ratio?

2. If your total batch must weigh 40 oz, how much sugar and oil should you use at a 3:1 ratio? _____

3. A test batch used 18 oz of sugar and 6 oz of oil. Did it follow the correct ratio? _____

Answer Key

Part A: Understanding the Ratio

1. **6 tbsp sugar** → **2 tbsp oil**
2. **12 oz sugar** → **4 oz oil**
3. **4 oz oil** → **12 oz sugar**

Part B: Scaling the Recipe

1. Original recipe: 9 tbsp sugar: 3 tbsp oil
Tripled recipe: **27 tbsp sugar, 9 tbsp oil**
2. Per student: 6 tbsp sugar + 2 tbsp oil
For 8 students:
Sugar: 48 tbsp, Oil: 16 tbsp

Part C: Challenge Problems

1. $24 \text{ oz oil} \times 3 = \mathbf{72 \text{ oz sugar}}$
2. Let $x = \text{oil} \rightarrow 3x = \text{sugar}$
Total: $x + 3x = 40$
$$\frac{4x}{4} = \frac{40}{4}$$
$$x = 10$$

Sugar = 30 oz, Oil = 10 oz
3. $18 \text{ oz sugar} \div 6 \text{ oz oil} = 3$
✓ Yes, it follows the 3:1 ratio

Name: _____

Date: _____

Scent Theme: _____

Batch #: _____



Ingredient Ratios

- Exfoliant Type (e.g., sugar, salt, coffee): _____
- Amount Used: _____
- Carrier Oil (e.g., coconut, almond, grapeseed): _____
- Amount Used: _____
- Essential Oil(s): _____
- # of Drops / ml Added: _____
-



Texture Notes

- Texture/Consistency: _____
- Ease of Application (glide, smoothness): _____
- Absorption / Residue Observed: _____



Fragrance Profile

- Scent Blend: _____
- Strength (1-5): _____
- Mood/Energy Effect: _____



Adjustments & Observations

- What did you change or experiment within this batch?

- How did this affect the texture, scent, or performance?



Sugar Scrub – Engineering & Innovation Guide

STEM/STEAM Lesson Plan Guide to be included in the Engineering Notebook (Grades 6 – 8)

TEAM: _____

Date: _____



Define the Problem

What was the biggest challenge or flaw you noticed in your sugar scrub design (formula, packaging, scent, etc.)?



Improve the Design

What specific changes did you make (or wish you could make) to improve your product?



Test and Evaluate

How did your changes impact the outcome of your sugar scrub? What evidence or feedback helped you decide this?



Extend or Evolve

If you could extend this project, what would be your next design goal (e.g., sustainability, cost, aesthetics, specialty skin needs)?

SCRUB A DUB LAB



THE ENGINEERING DESIGN PROCESS



ASK

What problem did I observe with my sugar scrub?
Was the texture too oily? Did the scent fade too fast?
Was the label hard to read?

IMAGINE

What materials or ingredient changes could solve the problem?

Can I try a different oil? Add more exfoliant?
Use a new scent or eco-friendly packaging?



PLAN

What specific changes will I make in my next design?

Write down your revised sugar-to-oil ratio or new packaging idea.

CREATE

Make your improved scrub.

Mix your new batch, assemble the new packaging, and apply your updated label.



TEST

Try out your new version!

Use it, test the texture, analyze the scent strength—gather feedback.

Scrub a Dub Lab – Change Detective Challenge

Physical vs. Chemical Changes Activity

Objective: Identify and explain physical and chemical changes through hands-on sugar scrub investigation and optional test extensions.

 Lab Activities:

Part A – Core Formulation Steps (Physical Changes)

1. Mix sugar and oil. Observe texture and blending.
2. Add essential oil. Smell and stir.
3. Mix in optional food coloring or emulsifier. Note texture and color.
4. Warm the mixture in a water bath. Look for melting or oil clarity shifts.

Part B – Optional “Chemical Change” Demonstration

5. Mix baking soda with lemon juice or citric acid. Look for fizz.
6. Heat a spoonful of sugar gently until it browns and smells like caramel.
7. Place an iron nail into a scrub mix and leave for several days to observe rusting.

Student Response Chart:

Step	Change Observed	Physical or Chemical?	Why?
1	Sugar blends into oil		
2	Fragrance increases		
3	Color and consistency change		
4	Oil melts in warm water		
5	Bubbles form when baking soda and lemon mix		
6	Sugar turns brown with caramel smell		
7	Nail shows rust after time		

ANSWER KEY

✓ **Teacher Answer Key (Sample Justifications)**

Step	Change Observed	Physical or Chemical?	Why?
1	Sugar disperses into oil	Physical	No new substance; reversible mix
2	Strong scent added	Physical	No reaction; only scent introduction
3	Slight color/ texture shift	Physical	Still a blend; not chemically altered
4	Oil melts	Physical	Reversible phase change
5	Bubbles form	Chemical	New substance (gas) formed from acid–base reaction
6	Sugar browns	Chemical	Caramelization: new substances and irreversible change
7	Rust forms	Chemical	Oxidation creates a new substance

Emulsification Lab Exploration: Do Oil and Water Mix?

SAMPLE

Hypothesis

What do you think will happen when you mix oil and water?

Materials

- Clear glass or jar
- Water
- Cooking oil
- Food coloring (optional)
- Spoon or stirrer

Procedure

1. Fill the glass halfway with water.
2. Add a few drops of food coloring to the water (optional).
3. Slowly pour an equal amount of cooking oil into the glass.
4. Observe what happens before stirring.
5. Stir the mixture with a spoon for 10 seconds.
6. Observe what happens after stirring.
7. Let the mixture sit for a few minutes and observe again.

Observations

Record what you see before, during, and after stirring the mixture.

Conclusion

What did you learn from this experiment? Did oil and water mix? Why or why not?



Scrub a Dub Lab – Student Reflection & Design Journal

Name: _____ Date: _____



Part 1: Reflect on Your Creation

1. Describe your final sugar scrub.

What ratio of sugar to oil did you use? What scents did you choose?

2. What did you enjoy most about this lab?

(Examples: scent blending, packaging design, teamwork, or getting messy!)

3. What science or math skill did you use during this project?

(Examples: measuring, calculating ratios, testing for physical changes)

4. What would you change or improve if you made your scrub again? Why?

References – Website

Discovery Education – Packet Physical Science Series Mixtures and Solution

<https://gtm->

[media.discoveryeducation.com/videos/Mixtures%20and%20Solutions/142_TG.pdf](https://gtm-media.discoveryeducation.com/videos/Mixtures%20and%20Solutions/142_TG.pdf)

YouTube Video – Physical vs. Chemical Change

<https://www.youtube.com/watch?v=MBmBknteSrQ>

DIY Sugar Scrub – How to make every type of sugar scrub

<https://www.youtube.com/watch?v=nYWoxFpydag&t=311s>