

WAMC Lab Template

Math Concept(s): Ratios with Slime

Source / Text: Holt McDougal, [Teaching Engineering](#), and [How to Make Slime with Laundry Detergent](#)

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Attach the following documents:

- Lab Instructions
- Student Handout(s)
 - Pre-Assessment
 - Post-Assessment
- Rubric and/or Assessment Tool

Short Description (Be sure to include where in your instruction this lab takes place):

- In this lab students will be making slime with an engineering lens focus. This lab can be completed within a standard classroom.

IB Components

SOI: Generalized Relationships in models to understand markets can lead to community service possibilities.

ATL: Self-Management and Communication

LPT: Open Minded

Inquiry Question: Generalized relationships in models to understand markets can lead to community service possibilities.

Lab Plan

Lab Title: Sigma Slime

Prerequisite skills: Simplifying Fractions and Writing Equivalent Fractions

Lab objective:

- Describe the effects on the properties of slime due to changing the component proportions.
- Use their 5 senses to make relevant observations.
- Describe what “optimization” is and why it’s important in engineering.

Standards: (Note SPECIFIC relationship to Science, Technology, and/or Engineering)

[Mathematics K–12 Learning Standards:](#)

- Students understand proportional relationships: • write ratios and find equivalent ratios 6.RP.3a • apply qualitative and quantitative reasoning to solve prediction and comparison of real-world problems involving ratios and rates 6.RP.3

[Standards for Mathematical Practice:](#)

- 6: Attend to Precision

K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):

- 6.RST.6- Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
- 6.RST.7- Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table)

K-12 Science Standards

- MS-PS1-2 Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

Technology

- N/A

Engineering

- MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Leadership/21st Century Skills:

21st Century Interdisciplinary themes (Check those that apply to the above activity.)			
<input type="checkbox"/> Global Awareness	<input type="checkbox"/> Financial/Economic/Business/Entrepreneurial Literacy	<input type="checkbox"/> Civic Literacy	
<input type="checkbox"/> Health/Safety Literacy	<input checked="" type="checkbox"/> Environmental Literacy		
21st Century Skills (Check those that students will demonstrate in the above activity.)			
LEARNING AND INNOVATION	INFORMATION, MEDIA & TECHNOLOGY SKILLS	LIFE & CAREER SKILLS	Productivity and Accountability
<u>Creativity and Innovation</u>	<u>Information Literacy</u>	<u>Flexibility and Adaptability</u>	<input type="checkbox"/> Manage Projects
<input type="checkbox"/> Think Creatively	<input type="checkbox"/> Access and Evaluate Information	<input checked="" type="checkbox"/> Adapt to Change	<input type="checkbox"/> Produce Results
<input checked="" type="checkbox"/> Work Creatively with Others	<input type="checkbox"/> Use and manage Information	<input checked="" type="checkbox"/> Be Flexible	<input type="checkbox"/> Leadership and Responsibility
<input type="checkbox"/> Implement Innovations	<u>Media Literacy</u>	<u>Initiative and Self-Direction</u>	<input type="checkbox"/> Guide and Lead Others
<u>Critical Thinking and Problem Solving</u>	<input type="checkbox"/> Analyze Media	<input type="checkbox"/> Manage Goals and Time	<input type="checkbox"/> Be Responsible to Others
<input checked="" type="checkbox"/> Reason Effectively	<input type="checkbox"/> Create Media Products	<input type="checkbox"/> Work Independently	
<input type="checkbox"/> Use Systems Thinking	<u>Information, Communications and Technology (ICT Literacy)</u>	<input type="checkbox"/> Be Self-Directed	
<input type="checkbox"/> Make Judgments and Decisions	<input type="checkbox"/> Apply Technology Effectively	Learners	
<input checked="" type="checkbox"/> Solve Problems		<u>Social and Cross-Cultural</u>	
<u>Communication and Collaboration</u>		<input type="checkbox"/> Interact Effectively with Others	
<input checked="" type="checkbox"/> Communicate Clearly		<input type="checkbox"/> Work Effectively in Diverse Teams	
<input checked="" type="checkbox"/> Collaborate with Others			

Teacher Preparation: (What materials and set-up are required for this lab?)

Materials

- Elmers Glue
- Tide Free & Clear or Simply Clear & Fresh (specifically one of those).
- Random if wanted supplies: Food Coloring, Sparkles, Beads, etc to decorate the slime.
- 1 cup for detergent and 1 cup to make slime.

- Measuring cups (They will need a whole bottle of glue, 4 mL, and 1 tablespoon, according to the detergent recipe).
- Forks

Set-Up Required:

- Pour enough detergent into one cup for each group

Lab Organization Strategies:

Expectations:

- Be respectful, be responsible, be engaged, and be safe.

Lab Instructions:

- 1) Before the activity, ask the students to come up with words to describe the best slime. What does it look like? What does it feel like? What makes it the best slime compared to other slime available?
- 2) What do engineers do?
 - a. Engineers use their five senses to help them make **observations** and figure out the properties, so today I need you to put on your engineer glasses and think about these questions while making slime. BE SURE TO WRITE some of your observations down for ingredient you add.
 - b. The reason we are doing this activity today is that I need your help as engineers to solve a problem I have. I want to open a slime store but first I must figure out the best way to make slime. I came up with a recipe for slime, but I am not sure it is the best recipe. I need your help to figure out how we can make the recipe better to engineer the best slime in the world. Making something better is something engineers do all the time and in science words, it is called “optimization.” When we optimize something, we figure out ways to improve it.
- 3) **Background**
 - a. According to the Law of Definite Proportions, mixing the same components in the same proportions/ratios gives the same properties. Likewise, changing those proportions changes the properties of the chemical compound.
 - b. In this activity, slime is our chemical compound, and the components are glue and a slime activator. We call this type of compound a polymer. Thus, mixing these two in different proportions or amounts makes slime with different properties. These properties can be carefully measured and quantified with precise tools. Additionally, useful qualitative observations can be made with our senses. Since water, glue and slime have unique functions in the make-up of slime, changing each component has unique effects on the slime. Let us examine each component in more detail:
 1. *Glue*: glue forms the main body of the slime. It is the base polymer in slime. It is also responsible for giving the slime its characteristic adhesive quality. Adding too much glue makes the slime “stickier” and more likely to self-adhere or adhere to your hands and other surfaces.
 2. *Slime Activator*: slime activator is the “crosslinker.” In other words, it forms the bonds that hold the polymer (glue) together. It is what makes slime “slimy”. It

brings the slime together and helps it hold its shape. Controlling the quantity of the slime activator in the mixture controls the consistency of the slime—how stretchy it is. More slime activator equates to rubbery, jelly-like consistency (more “squishy”). The less slime activator that is added to the mixture, the less the slime can hold its shape and the less stretchy it is.

Post Lab Follow-Up/Conclusions:

After this activity, students should be able to:

- Describe the effects on the properties of slime due to changing the component proportions.
- Use their 5 senses to make relevant observations.
- Describe what “optimization” is and why it’s important in engineering.
- Tell the class the ratio of detergent to glue they believe makes the best slime.

Pre-Assessment

Write each fraction in simplest form:

1) $\frac{6}{9}$	2) $\frac{4}{10}$	3) $\frac{15}{20}$
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Write the equivalent fraction:

4) $\frac{12}{15} = \frac{?}{5}$	5) $\frac{5}{6} = \frac{?}{30}$	6) $\frac{16}{24} = \frac{4}{?}$
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Post-Assessment:

<table border="1"> <tr> <td>Color of socks</td> <td>white</td> <td>black</td> <td>blue</td> <td>brown</td> </tr> <tr> <td>Number of socks</td> <td>8</td> <td>6</td> <td>4</td> <td>5</td> </tr> </table>	Color of socks	white	black	blue	brown	Number of socks	8	6	4	5	1) White to brow socks.
	Color of socks	white	black	blue	brown						
	Number of socks	8	6	4	5						
2) Blue socks to nonblue socks.											
	3) Find two ratios equivalent to #1.										