

County Implementation Award Program (CIAP) Math and Science Lesson

<p>Unit Title: Slime Away!</p>
<p>Lesson Title: How Did That Happen!</p>
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<p>Grade Level: 5th Grade</p>
<p>Time Frame: Two 45-minute periods</p>
<p>Standard(s):</p> <p>Science</p> <p>5-PS1-3. Make observations and measurements to identify materials based on their properties. <i>[Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [Assessment Boundary: Assessment does not include density or distinguishing mass and weight.]</i></p> <p>5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances.</p> <p>Math</p> <p>5.NF.4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. a. Interpret the product $(a/b) \times q$ as a part of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. For example, use a visual fraction model to show $(2/3) \times 4 = 8/3$, and create a story context for this equation. Do the same with $(2/3) \times (4/5) = 8/15$. (In general, $(a/b) \times (c/d) = ac/bd$.)</p> <p>5.NF.6. Solve real-world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.</p>
<p>Short Description of Targeted Phenomenon: Teacher shows the video of the phenomenon of ‘elephant toothpaste and encourages students to generate questions regarding the properties and interactions of the two substances.</p> <p>Students will investigate whether or not they can create a new substance from mixing different substances together. They will analyze the characteristic of the initial substances in comparison to the new one.</p>

Three Dimensions of NGSS

Science & Engineering Practice/s (SEP): Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- *Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (5-PS1-4)*
- *Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)*

Crosscutting Concept/s (CCC): Scale, Proportion, and Quantity

- *Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-2), (5-PS1-3)*

Disciplinary Core Idea/s (DCI): PS1.A: Structure and Properties of Matter

- *Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3)*

PS1.B: Chemical Reactions

- *When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)*

Language Supports:

Key Vocabulary: matter, compounds, particles, smell, texture, color, fractions, mixture

Materials Needed: 4 small containers per group, borax, water, glue, food coloring, measuring cups

Objective(s): Students will be able to:

1. Observe and record the physical characteristics of matter.
2. Learn that new substances can be created by mixing two or more substances, in this case slime.
3. Make concrete observations of phenomena changes as it happens.
4. Come to a conclusion based on evidence they found through their observations.

How Math and Science concepts/skills/practices were integrated in this lesson:

Students use math models, multiplication and addition of fractions in order to create larger portions of a substance when given smaller amounts. Therefore, applying this addition and multiplication of fractions to a real-world situations/problem.

Possible Challenges /Misconceptions: It is important to make sure students know how to add and multiply fractions or can draw diagrams or build concrete manipulatives (i.e. fraction tiles) to figure it out.

Formative Assessment: Finished packet with written conclusions. Students must support their

conclusions with examples and research.

Lesson Opening

Teacher Actions

- a. Teacher shows students a [picture](#) of a strawberry and asks the students to describe its physical characteristics. Teacher draws an illustration of a strawberry and adds captions as the students list answers and have a whole class discussion on what are characteristics and which ones are the most important.
- b. Teacher shows the [video](#) of the phenomenon of “elephant toothpaste”.
- c. Teacher asks students to describe what is happening.
- d. Teacher asks students to describe what they are seeing in their investigation file.
- e. Teacher leads discussion on observation, students’ own personal interpretation, then asks students to write down what that makes them wonder.

Student Actions

- a. Students share their ideas after being given a minute to observe the picture.
- b. Students watch the video.
- c. Students discuss their observations with their shoulder partner.
- d. Students write possible answers in the Phenomena Observation Clip worksheet.
Possible answers are:
 1. When they mixed the chemicals, a large foam erupted.
 2. Something very different and larger came out when they mixed the chemicals.
- e. Students fill out the form for their investigation file.

Set-Up

Teacher Actions

- Prior to lesson, teacher sets up the materials for student use.
- Labels four small containers with the letters: A, B, C, and D. A will have $\frac{1}{4}$ teaspoon of Borax, B will Have $\frac{1}{8}$ cup of clear water, C will have $\frac{1}{8}$ cup of glue, and D will have $\frac{1}{8}$ cup of water that is mixed with food coloring.
- Sets up measuring spoons, measuring cups, and larger containers with the four substances for students to gather appropriate amounts (Students are not allowed to gather materials until they have appropriately calculated the amounts they need for each member of their group).
- He/she explains the experiments and goes over safety procedures. In this case, it

Student Actions

- Students listen to instructions before touching any materials.

<p>involves safe handling of liquids to avoid spills.</p> <p>Prior Knowledge: Teacher needs to make sure that students know what hardness, shape, odor, reflectivity, liquid, solid, gas, and multiplication and addition of fractions is.</p>	
<p>Body of Lesson</p>	
<p>Teacher Actions</p> <p>Task 1:</p> <ul style="list-style-type: none"> ● Once each group has the materials, teacher explains that they have is enough for only one team member and that they must calculate the appropriate portions for all members of the team. ● Teacher explains that students must show all their work in order to be allowed to gather the rest of their materials. ● This portion takes about 15 minutes, but it varies depending on the class. <p>Task 2:</p> <ul style="list-style-type: none"> ● Teacher will explain that it is very important to keep the substances separate at this point and that they must back up their conclusions with examples from their experiment. ● Teacher walks around the classroom asking questions and making sure that everyone has what they need. He/she also answers questions but does not provide answers. Students need to come up with their own solutions. <p>Teacher Actions:</p> <p>Task 3:</p>	<p>Student Actions</p> <p>Task 1:</p> <ul style="list-style-type: none"> ● Students work together to model addition or multiplication of the required quantities. ● Students add and multiply the required amount as described on ditto. ● Part 1 and Part 2 are separate and must be done independently of each other. <p>Task 2:</p> <p>Student 1: Gathers the materials Student 2: Reads the instructions Student 3: Clarifies instructions with the rest of the team. Student 4: Helps guide the experiment</p> <p>Each student selects a solution where they lead the discussion. For example, one team member will lead the discussion of solution A and so on.</p> <p>Students begin their observations of each substance, draw what they see, and fill in the Characteristics chart. Then will write down their observations, questions, and reflections on the lab. They will be given time to write what their observations make them wonder. At this point they will answer the questions using examples from their experiment.</p> <p>Student Actions:</p> <p>Task 3:</p>

<ul style="list-style-type: none"> ● Tell students to follow the directions written in their investigation file. Remind them that Part 1 and Part 2 have different materials and should be done separately. ● Remind students to take careful notes of what is happening in the mixture. 	<ul style="list-style-type: none"> ● Students work as a group to complete the task, groups of 4 works well. ● Students mix the materials for Part 1, then put it aside. Then they mix materials for Part 2. Finally, they mix both solutions until it thickens and becomes slime. ● Students draw what they see, it is important for them to write captions with the pictures. ● Students will complete the Characteristics chart for this new substance.
Lesson Closure	
<p>Teacher Actions</p> <ol style="list-style-type: none"> Remind students to write details description and analysis of what they saw and what it means in terms of matter. Have a class discussion about what happened, you can allow some groups to report to the rest of the class. Have follow up question: Do we need to pay attention to characteristics in matter? Why or why not? Are there other characteristics that we can look at? What? 	<p>Student Actions</p> <ol style="list-style-type: none"> Students will answer the questions on the Conclusions ditto. They must use examples from their experiments and logic for their explanations. See rubric. <p>Optional</p> <ol style="list-style-type: none"> After discussion students will write a short letter to their boss recommending other safe observations of matter with different characteristics.
<p>Summative Assessment: Scientific Lab Rubric, investigation file</p>	
<p>Other Teaching Resources:</p>	
<p>Lab Safety: Materials are not hazardous; they just need to handle liquid with care to avoid spilling.</p>	
<p>Extensions (if any):</p> <ul style="list-style-type: none"> ● Students can create a fictional story where the slime comes to life or the like. ● Students research what state of matter the slime really is, what makes it that, and explain using at least two credible sources. It is important that they cite the source and use academic language. 	

Phenomena Observation Clip

What do you see?

Draw an illustration.

I think this is happening because....

It makes me wonder...

Workplace Mystery

You started a new job and noticed that there are some weird things going on. Your employer is refusing to tell you what the names of the substances you will be working with. You're concerned because you want to make sure that the materials are safe to work with. So, you and your team, sneak into the lab to research 4 of the mystery substances. You are to observe the substance's Physical Characteristics and write down your observations in your secret file notebook. You must be very diligent in your observations. It is very important not miss a thing. After all, it's you and your team who are going to be working with these substances every day.

Illustrations			
Substance A	Substance B	Substance C	Substance D

Observations

Characteristic	Substance A	Substance B	Substance C	Substance D
Color				
Hardness				
Size				
Shape				
Odor				

Reflectivity				
Liquid, solid or gas				

What I observed...	What it makes me wonder...

Based on your observations, are these materials safe to work with? How do you know? Explain based on your observations. Back up your findings.

Based on your observations, what do you think the substances are? Why?

You show up to work the next day. Your boss tells you that you and your team must mix the substances following the instructions provided. It is very important that you make enough for each member of your team. Your boss wants a written report of your calculations and findings.

Materials for 1 team member:

Part 1 Materials: Solution A= $\frac{1}{4}$ teaspoon

Solution B= $\frac{1}{8}$ cup

Part 2 Materials: Solution C= $\frac{1}{8}$ cup

Solution D= $\frac{1}{8}$ cup

Calculate enough solution for each team member: First, use a model to get your answer and then find your solution in two different ways using numbers.

Part 1

Part 2

Strict Directions!

Your boss demands that you follow instructions to the dot. At this point you must already have the exact amount that you need for every team member.

Steps

Part 1: Materials and Instructions:

- a. Mix Solution A with Solution B, stir. Set aside.

Part 2: Materials and Instructions:

- a. Mix Solution B and Solution C, then stir.

Part 3: Mix all the ingredients together, stir with a spoon. Once you are done mixing, you need to do an illustration of the substance and make sure to write captions.

Illustration-What is happening?

Characteristic	Mixture
Color	
Hardness	
Size	
Shape	
Odor	
Reflectivity	

Liquid, solid, or gas.	

What I observed	What it made me wonder...

Conclusions

Is this a new substance? Did you create something new from the initial substances? Why or why not? What state of matter is this substance? Explain using examples from your observations and analysis.

What conclusions can you make about matter based on this experiment? Explain.

Further Questions and Analysis:

Slime Away!

Points for Each Activity				
5	4	3	2	1
Included descriptive details, observations and analysis, illustration has captions	Has details, examples, questions, and clear illustration with some captions	Included details and analysis, illustration is clear	Some information and illustration	Limited or no Information and Illustration
Introduction				/5
Characteristics Table (5 for complete and 0 for empty)				/5
Initial Substances Characteristics Observation and Illustration				/5
Initial Substances Safety Conclusions and predictions.				/5
Part 1 Math Calculations				/5
Part 2 Math Calculations				/5
Followed Mixture Instructions				/5
5	3	1		
Slime is smooth and flexible.	Slime is a little sticky or watery	Missing ingredients or slime is too watery or sticky		
Conclusions				
12	9	6	3	
Clear and concise analysis and explanations with examples from observations and mixture, suggestions and questions for future research	Clear explanation and analysis with examples from observation and mixture, some questions and suggestions	Explanation and analysis maybe some examples, no suggestions or questions	Almost no explanation, examples, questions, or future recommendations.	