



Grade K-2 STEM Challenge

Phases of Fun

Inspired by science careers in the Indiana Uplands.



GRADE K-2 STEM CHALLENGE

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Inspired by science careers in the Indiana Uplands.

Students will explore the phases of matter and complete a simple chemical experiment.



CAREER CONNECTION AND LESSON OVERVIEW

The Indiana Uplands are filled with opportunities for students who have a strong grounding in science, technology, engineering, and mathematics. Life science professionals like Dathan, Sarah, and Trey work to create products that improve and extend lives every day. Scientists, regardless of their specific field, need to understand the different phases of matter and how they interact.

In this activity, students will explore the three major phases of matter and complete a simple investigation to learn about how matter interacts. This is, fundamentally, the basics of chemistry: How do substances behave when they are mixed and why.

LESSON TIMELINE

DAY 50 Minutes

1

- Show the inspiration video, "Experimenting with Science."
- Introduce phases of matter
- Guide students in developing their own definitions of solid, liquid, and

DAY 50 Minutes

2

- Mixing Matter investigation
- Report out and discussion

Recommended Supplies

Materials per group:

- 2 small dixie cups (paper, bathroom size)
- 1 clear plastic 8oz cups
- 2 plastic spoons
- 2 sheets of paper towels

For each student:

- Pencil
- Solid, Liquid, Gas handout
- Phases of Fun Investigation Report or STEM notebooks



IN THIS CHALLENGE, STUDENTS WILL:

- Examine different substances and develop definitions for solids, liquids, and gases.
- Conduct a scientific investigation to learn about how different phases of matter can interact.

Standards

Science & Engineering Process Standards

SEPS.1 Posing Questions (for science) and defining problems (for engineering)

SEPS.3 Constructing and performing investigations

SEPS.4 Analyzing and interpreting data

SEPS.8 Obtaining, evaluating, and communicating information

English/Language Arts

K.SL.1, 1.SL.1, 2.SL.1 Participate in collaborative conversations about grade-appropriate topics and texts with peers and adults in smaller and larger groups.

K.SL.3.1 Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

1.SL.3.1 Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

2.SL.3.1 Determine the purpose for listening (e.g., to obtain information, to enjoy humor) and paraphrase or describe key ideas or details from a text read aloud or information presented orally or through other media.

Science Standards

K.PS.1 Plan and conduct an investigation using all senses to describe and classify different kinds of objects by their composition and physical properties. Explain these choices to others and generate questions about the objects.

1.PS.1 Characterize materials as solid, liquid, or gas and investigate their properties, record observations and explain the choices to others based on evidence (i.e. physical properties).

2.PS.1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

2.PS.2 Predict the result of combining solids and liquids in pairs. Mix, observe, gather, record, and discuss evidence of whether the result may have different properties than the original materials.

Planning and Implementation

PHASES OF FUN

Essential Vocabulary

- **PHYSICAL PROPERTY:** any property that can be observed using the five senses or can be measured without changing the matter. Common physical properties include mass, volume, weight, color, size, and texture.
- **MATTER:** anything that takes up space and has mass.
- **MASS:** a measure of the amount of matter in an object. Mass is usually measured in grams (g) or kilograms (kg).
- **REAGENT:** a substance added to a mixture to cause a chemical reaction.
- **PRODUCT:** the results of a chemical reaction.

In this challenge, students will:

- Watch "Experimenting With Science."
- Examine different substances and develop definitions for solids, liquids, and gases.
- Conduct a scientific investigation to learn about how different phases of matter can interact.

Day 1


Introduction to Phases of Matter (50 minutes)

Show students the "Experimenting with Science" video, available at www.regionalopportunityinc.org/experiment/.

To begin a discussion of the phases of matter, have a variety of objects at the front of the classroom that represent solids, liquids, and gases (a glass of water, an ice cube, and an inflated balloon are an excellent start, along with a few other classroom and household items). Identify the objects on the table as belonging to three distinct categories: solids, liquids, and gases.

Explain that each material on the table has physical properties, or properties that can be measured or described using the five senses. For example, weight, color, size, and texture are all physical properties. Give examples of physical property describing words and tools that might be used to measure the material to help students understand the concept.

Prompt the class to describe the properties of the materials in each category. Write their observations either on the board or invite them to record their observations on the SOLID, LIQUID, GAS observation sheet provided.



As a class, decide on a common definition for solids, liquids, and gases. Students may eliminate some of their original ideas as they discuss them. This is fine! Generally, students will develop definitions similar to:

- **SOLIDS:** can be hard or squishy, stays roughly the same size and volume, and don't have to be in a container to stay put!
- **LIQUIDS:** wet, sloshy, soft, etc. Liquids have a shape that easily changes depending on what you put them in.
- **GASES:** usually hard to see. Gases can expand to fit any container (like a balloon), have volume, and their shape changes easily.

Once students have agreed on some definitions, have them post their definitions of each phase of matter on the wall. If students are keeping a STEM notebook, invite them to add these words to their personal glossaries.

Day 2


Mixing Matter (30 minutes)

If necessary, start the day by revisiting the definitions of solid, liquid, and gas that the class agreed on. Explain to students that they will be doing a science experiment using the phases of matter and that they will be mixing two phases of matter together and recording what happens.

Provide each group of 2 students with the following:

- 1 small dixie cup containing 30 ml (approximately two tablespoons) of white vinegar
- 1 small dixie cup containing 30 g of baking soda (approximately two level tablespoons) of baking soda
- Clear 8 oz plastic cup
- Plastic spoons
- Paper towel

Encourage students to record down their observations of their two reagents, the vinegar and the baking soda. What do they look like? Smell like? Feel like? Sound like? Remind them that scientists use all of their senses EXCEPT taste in the lab!



Make sure students determine the phase of matter for each substance and record it on their Investigation Report under OBSERVE or in their STEM notebooks.

Once students have recorded their observations, they should make a prediction on what phases of matter will result from their experiment. Will they have solids, liquids, or gases (or some combination) when their reaction is complete? Have them record this is the PREDICT section of their Investigation Report.

Student should then carefully pour the contents of the two dixie cups into the clear cup and record what happens. Have them take note of what happens and how long the reaction goes on (is it instantaneous? does it go on for several seconds? several minutes? Record these findings in their STEM Notebooks or on their Investigation Report under EXPERIMENT.

Discussion and Reflection (20 minutes)

Once they have conducted their experiments and recorded their observations, guide them to to complete the REFLECT section of their Investigation Report. Prompt students to talk about what their initial observations were of their reagents.

- Solid: Baking soda powder
- Liquid: Vinegar

What happened when you mixed these things together?

- They produced bubbles! These bubbles are carbon dioxide, the same thing we breathe out. This is a good time to talk about how they were able to see the gas as bubbles here even though they can't see the carbon dioxide in their breath.

Guide students towards the understanding that mixing this powdered solid with this liquid caused a chemical reaction that produced a gas.

Safety Note: Remind students that while these reagents and the chemical product are not harmful they should never mix things “just to see what happens!”

Prompt students to complete the COMMUNICATE section of their data sheets.



Career Exploration and Extension

Prompt students to think about and research what a career as a scientist might entail.

- What does a scientist do all day?
- What kind of training would a student need to become a scientist?

Name: _____

Phases of Fun

Student Definition Sheet

SOLID	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
LIQUID	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
GAS	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/>

Name: _____

Phases of Fun

Investigation Report

OBSERVE

What do my samples look like?

Sample Number 1:

Looks: _____

Feels: _____

Smells: _____

Sounds: _____

This is a (circle one)

Solid

Liquid

Gas

Sample Number 2:

Looks: _____

Feels: _____

Smells: _____

Sounds: _____

This is a (circle one)

Solid

Liquid

Gas

Name: _____

PREDICT

What do you think will happen?

When I mix these two things together I think it will:

EXPERIMENT

Here is where the science happens!

1. Make sure you have a cup of dry material and a cup of wet material.
2. With your partner's help, CAREFULLY pour the contents of your small cups together into your clear container. Use the spoon to mix gently.
3. What do you observe? Record your observations in words and pictures!



Name: _____

REFLECT

You saw what happened, but WHY did it happen?

1. What happened when you mixed your materials?

2. What phases of matter did you start with?

3. What phases of matter did you end up with after you mixed your chemicals? which parts were which phase?

Name: _____

COMMUNICATE

Share your prototype with the class or another group.

What went well during this STEM challenge?

What part of this STEM challenge was difficult?

I learned _____

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Activities developed and written for Regional Opportunity Initiatives by

Emily Menkedick
Education Specialist

Adrienne Evans Fernandez
Education Specialist

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Amy Gordon
Elementary STEM Coordinator
Brown County Schools

Jean Schick
High School Science Dept Chair (Ret)
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Kelly Grimes
7th Grade Science Teacher
Richland-Bean Blossom
Community School Corporation

Alison Kern
6th Grade Science Teacher
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Katy Sparks
STEM & Computer Science Coach
Monroe County
Community School Corporation

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Academy of Science &
Entrepreneurship Principal
Monroe County
Community School Corporation

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Business & Computer Science Teacher
Monroe County
Community School Corporation

Tara Weisheit
4th Grade Teacher
Washington Community Schools

IMAGE AND CONTENT CREDITS

Images

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<http://www.regionalopportunityinc.org/experiment/>

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