

STEM Lesson Plan:



Exploring Matter: Understanding Solids, Liquids and Gases Through the Eyes of Military Children (Grade 1)

LEARNING OBJECTIVES:

- Students will understand the three states of matter (solids, liquids, and gases).
- Students will engage in STEM activities to explore matter and learn how matter can change from one state to another.
- Students will reflect on the experience of military children who may encounter new environments with different weather, and how matter (like water) can change when moving to a new place (e.g., hot or cold climates).

NEXT GENERATION SCIENCE STANDARDS:

PS1.A: Structure and Properties of Matter

- K-2: Different kinds of matter exist and can be described by their properties. o 3-5: Matter exists in different states—solids, liquids, and gases—and can change from one state to another by heating or cooling.

PS1.B: Chemical Reactions

- 3-5: When heating or cooling, substances change state through physical processes (e.g., melting, freezing, condensation, evaporation).

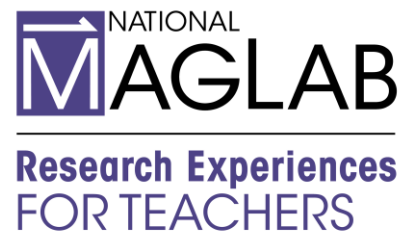
TIME: 45 minutes

STEM RATIONALE FOR THE LESSON:

The lesson "Exploring Matter: Understanding Solids, Liquids, and Gases Through the Eyes of Military Children" is embedded in the foundational principles of STEM (Science, Technology, Engineering, and Mathematics) education, concentrating on the scientific exploration of matter while integrating real-world applications. The rationale for this lesson is built upon several key aspects:

- (1) Science - Exploring the Properties of Matter - Understanding the three states of matter—solids, liquids, and gases—is a core scientific concept for young learners. Completing hands-on activities, students will engage with these concepts by observing, touching, and manipulating materials in different states. They will discover how solids hold their shape; liquids take the shape of their containers, and how gases spread out to fill their space. This investigation

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delivers the foundation for understanding the physical world around them, which is crucial for their developing scientific thinking.

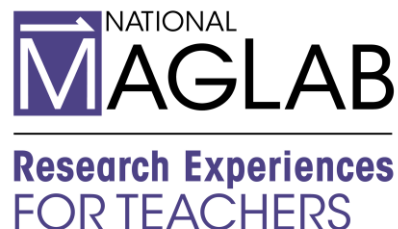
- (2) Technology - Real-World Connections to Military Families. Incorporating technology and real-world experiences enhances the learning process. By examining the experiences of military children, students can relate scientific principles to practical situations. For instance, military families often experience different climates, temperatures, and altitudes, which affect the behavior of solids, liquids, and gases. Videos, virtual military base tours, or digital resources highlighting life in different environments can help students understand how science is applied in everyday life. This connection to technology makes the lesson more engaging and relevant for young learners.
- (3) Engineering – Applying Knowledge to Solve Problems. The engineering aspect of the lesson comes from applying scientific knowledge to solve problems. For instance, students will explore how the different states of matter may change when moving between various climates or during military deployments. Through hands-on activities, such as observing how water freezes or boils under different conditions, students will be asked to think critically and design simple experiments or solutions. This inspires them to think like engineers, testing and observing how different materials behave and why that matters in real-world situations.
- (4) Mathematics. Measuring and quantifying changes in States of Matter. Mathematical thinking supports understanding the physical world. In this lesson, students will measure temperature changes and observe how those changes affect the states of matter. By measuring the temperature of ice water as it melts or boiling water as it turns to steam, students can make connections between temperature and the state of matter. Basic math skills, such as counting, comparing, and measuring, will be used to quantify changes and record observations, thus reinforcing early mathematical skills while learning about matter.

CULTURALLY RESPONSIVE CONNECTION:

This lesson incorporates STEM concepts with culturally responsive practices by acknowledging the unique experiences of military families and their children. It connects the physical changes in matter (solids, liquids, gases) to the emotional and social changes military children face when adapting to new environments. The lesson upholds empathy, adaptability, and resilience—skills that are important for both understanding scientific principles and supporting peers in diverse situations. By recognizing the lived experiences of military families, students are encouraged to value diversity and learn from the challenges and opportunities different environments bring.

MATERIALS:

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- Ice cubes
- Plastic cups or containers
- Water
- Hot water (teacher-supervised)
- A balloon (to demonstrate gases)
- A thermometer
- Pictures of different environments (military bases in different climates, showing hot, cold, or humid environments)
- Chart paper, markers, and a whiteboard
- Books or video clips about military families (optional, to explain change and adaptation)
- STEM activity sheets for reflection

PREVIOUS KNOWLEDGE:

The lesson begins with a series of inquiry questions that will activate the prior knowledge of the students. Questions are as follows:

- What are some examples of things around us that are solids, liquids, and gases? Have you ever noticed how water changes when it gets cold or hot? What happens to it?
- If you were to move to a new place, what kind of changes in the weather or temperature might you experience? How do you think that might affect what you see or feel?
- What do you think would happen to a balloon filled with air if you took it to a very high place or a very cold place?

INTRODUCTION: (10 minutes):

(1) Warm-Up Discussion:

- a. Start by asking students:
 - i. "What are some things you know about moving? Have you ever had to change schools or homes?"
 - ii. "Why do you think people have to move from one place to another? Can you think of anyone who moves often?"
- b. Introduce military families: Explain that military families often move to new places because their parents work in the military. These children sometimes must adapt to new homes, schools, and even different weather or climates.
- c. Show pictures of different environments: Some places are very hot; others are cold or rainy. Ask students how they think matter (like water) changes

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when moving to these different climates (e.g., water might freeze in cold weather or steam up in hot weather).

(2) Introduce the Concept of Matter:

- a. "Today, we're going to explore matter! Matter is anything that takes up space and has weight. Matter can be in different forms. Can anyone name a few different forms of matter you know?"
- b. Write on the board: Solid, Liquid, Gas.
- c. Briefly explain the three states of matter:
 - i. Solid: Something that keeps its shape, like a rock or ice cube.
 - ii. Liquid: Something that can flow and takes the shape of its container, like water or juice.
 - iii. Gas: Something that is invisible and moves all around, like air or the steam from boiling water.

INSTRUCTION: (10 Minutes)

(3) Exploring Solids, Liquids, and Gases:

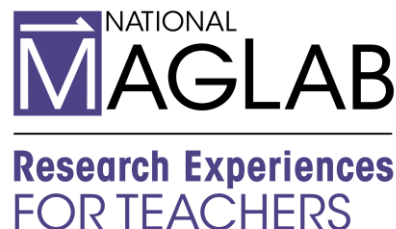
- a. Show an ice cube (solid) and ask, "What happens if we leave this ice cube out in the warm room?"
 - i. Place the ice cube in a plastic cup and observe.
 - ii. Discuss: "When the ice melts, it turns into water. Water is a liquid. Why does this happen?"
 - iii. Use the thermometer to measure temperature and explain how heat changes the state of matter (ice to water).
- b. Show hot water (liquid) and have the students observe steam rising from it. Hold up a balloon and explain how the gas (steam) fills up the balloon.
- c. Ask: "Why is steam invisible? How does it change from a liquid to a gas?"
 - i. Reinforce that heat causes solids to change to liquids, and liquids to change to gases.

STEM ACTIVITY: (15 minutes)

(4) Hands-On Experiment: Changing Matter

- a. Objective: Students will observe how matter can change between different states.
 - o Divide students into small groups and give each group an ice cube, a plastic cup, and access to hot water.
- b. Steps:
 - i. Students will first observe the ice cube (solid).
 - ii. Then, have them place the ice cube in the cup and observe what happens when it melts into liquid.

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- iii. For the next step, the teacher will pour hot water into a container and allow students to observe how steam (gas) rises from the water. Discuss how heat causes this change.
- c. Reflection: After the experiment, ask the students:
 - i. "What happened to the ice when we put it in the warm water?"
 - ii. "How do you think military children might see water change when they move to a very hot or very cold place?"
 - iii. "Do you think it's easier or harder to play outside in very hot or very cold weather? How does that affect military children who move to new places?"

DISCUSSION & CONNECTION TO MILITARY FAMILIES: (5 minutes)

(5) Linking STEM to Military Children's Experiences:

- a. "Just like matter changes when we add heat or cold, military families have to adjust when they move to new places. Sometimes the weather is very different from what they're used to. For example, moving to a very cold place might mean water freezes, but in a hot place, water might evaporate quickly."
- b. Discuss how military children might adapt to these changes by learning new ways to play and explore in different environments. For example, in a cold climate, they might build snowmen, and in a hot place, they might need to drink more water to stay cool.
- c. Ask: "What are some ways military children might feel when they move to a new place with different weather? How can they stay strong like the matter that keeps changing?"

CLOSURE/WRAP UP DISCUSSION: (5 minutes)

- Have students share what they learned about matter and how it changes. o Reflect on how changes in matter (like water freezing or boiling) can be similar to the changes military children experience when they move to new places.
- Encourage students to think of ways to be kind and helpful to classmates who might be military children by recognizing that moving can be hard but can also bring new adventures and opportunities to learn.

ASSESSMENT:

Formative Assessment: Observe student participation during the experiment and discussion. Make sure the students understand the changes between solids, liquids, and gases.

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Summative Assessment: Have students draw a picture showing how changes (solid to liquid to gas) matter and write a short sentence about how moving can be like matter changing states.

EXTENSION ACTIVITY:

Journal Activity: The students write or draw how they might feel if they had to move to a new home. Connect it to the changes in matter they observed.

Classroom Climate Poster: The students will create a poster that shows the different climates military children might live in and how the weather affects matter (e.g., water freezing in cold climates, evaporating in hot climates).

ACCOMODATIONS:

- Use visual aids such as pictures, diagrams, and videos to illustrate the properties of solids, liquids, and gases.
- Provide tactile materials (e.g., ice cubes, water, balloons) for hands-on exploration to engage students through multiple senses.
- Include videos that show how weather and environmental changes (common in military families' experiences) affect states of matter.
- Extended Time

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