

# Matter- STEAM PROJECT – Grade4

## Design Challenges with Solids, Liquids, and Gases



### Learning Standards:

#### Science

4-PS1-1: Plan and conduct investigations to describe and classify different kinds of materials by their observable properties.

4-PS1-2: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

4-PS1-3: Ask questions and predict outcomes about the changes in materials when different materials interact.

#### Technology

Information and Communication Technologies (ICT): Using Digital Media and Environments

4-T.6: Use digital tools (e.g., computers) to access and retrieve information relevant to specific tasks.

#### Math

Measurement and Data

4.MD.1: Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.

#### Arts

Visual Arts: Creating

4.VA.Cr.2.3: Create original artwork, using film, photography, computer graphics, or video, that communicates ideas or emotions.

#### English Language Arts (ELA)

Reading Standards for Informational Text

RI.4.9: Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.

**Learning outcomes - Students will be able to:**

- 1) Design, draw, and describe a container for each type of matter (solids, liquid and gases) considering the size, shape, and flexibility of the materials used.

**Due:** Presentation due on Wednesday 28<sup>th</sup> February.

## **Matter Containers Design Project**

**Objective:**

To design and compare containers for holding solids, liquids, and gases to understand the basic properties of matter.

**Problem:** I have 50ms of liquid and 10 cubes that I need to store, and I don't have any containers to put them in. I need your help to design an appropriate container to hold either of these materials safely. (BASE 10 CUBES)



**Things to think about:**

- **Size:** How big will the container be?
- **Shape:** What shape will the container have?
- **Strength:** How strong will the materials be?
- **Materials:** What type of material could be used? Plastic? (3D Shape) Rubber? Metal? Wood? Paper? Glass? Clay?
- **Other Questions:** How will the matter get in? How will it stay in? How will the matter get out? What will happen if the container is dropped? Do we test to see what happens if it drops?

## STEPS TO FOLLOW OVER THE NEXT THREE WEEKS

### To do:

- 1) Design, draw, and label the features of a container for each type of matter.  
Label your drawings clearly.
- 2) Explain, by writing a few sentences, how your container is designed to hold a certain type of matter and why is one matter easier to design for?

Your container needs to hold a certain type of matter.

1. Liquid- Your container needs to be able to hold 50mls of water.
2. Solid- The container needs to be able to hold 10 cubes.

### 3. Gas- Extension- Research- 6 marks- (Written only)

- Design a container that would hold gas- remember to label your picture. (3 marks)
- Can explain why it needs to use a specific material to hold the gas. Can also explain the shape of their container and explain how the gas can be sealed within the container.

(3 marks)

**1. Prediction-** What material will be the strongest or the most appropriate for either your solid or liquid? Why are some materials better to use?

**2. Design Phase-** In your group you will discuss the ideas you have for a container- Share your ideas, choose a final design as a group.

- Containers can be drawn on paper and then will be designed on the STEAM – using 3D modelling -CAD software -Makers Empire before we begin creating.

### **3. Materials Discussion**

- As a group you will be given materials

#### **How can we design a container using these materials?**

- Wood- Ice Block Sticks

- 3D prints -Plastic (3D shape designed using 3D software – Makers empire)

- Clay

- Could we use a mixture of materials- would this create a better design? What materials could we use?

### **4. Testing Phase:**

- Conduct simple experiments to test the designed containers.

- For solids, we will use the cubes -10 (base 10) to see how many can be held?

- For liquids, use water and measure leakage.

### **5. Data Collection:**

- Record observations and measurements using basic tools like rulers, cups, and simple scales, photographs of testing, or video footage.

## **6. Analysis:**

- Compare the performance of different containers for each state of matter.
- Discuss which containers worked well and why.
- Consider how size, shape, and material flexibility affected the containers' success.

## **7. Presentation:**

- Prepare a presentation on a 'Science Board' summarizing the design process, testing procedures, and results. We will discuss this with a simple framework.
- Present findings to the class and parents, linking this with 'real-world' containers and materials used to hold specific states of matter.

## **8. Conclusion:**

- Reflect on what was learned during the project individually and as a group.
- Discuss how the experiment helped understand the importance of design in containing different states of matter.

**Assessment: Rubric:**

	Developing	Achieving	Exceeding
<b>Design (5)</b> <ul style="list-style-type: none"><li>- <b>Creativity</b></li><li>- <b>Practical</b></li></ul>	Shows little evidence of planning and designing.	Shows step by step evidence of planning and designing.	Shows details step by step evidence of planning and designing.
<b>Collaboration (5)</b> <b>Teamwork</b>	The team struggles to communicate and work together.	The team works together but may have some issues with communication.	The team works together and communicates throughout the entire challenge
<b>Scientific Understanding of 'States of Matter'</b>	Understands the basic properties of S, L and G and can explain some properties of the materials.	Can explain the properties of S, L and G and can give a range of properties to describe the materials.	Provides a clear understanding of S, L and G and explain why certain materials are used for different states of matter.
<b>Overall Project results.</b> <ul style="list-style-type: none"><li>- <b>Presentation</b></li><li>- <b>Reflection</b></li></ul>	Attempts to define purpose and subject; provides weak understanding of container properties relating to the status of matter.	Is beginning to have clear purpose and understanding of container properties relating to the status of matter.	Provides clear purpose and subject of container properties relating to the status of matter.

# Group Members

<b>Group 1</b>			
<b>Group 2</b>			
<b>Group 3</b>			
<b>Group 4</b>			
<b>Group 5</b>			
<b>Group 6</b>			