**Matter**

**Lesson #6:** **Design Challenge with Solids, Liquids, and Gases**

**(Optional Lesson to be taught by the Classroom Teacher)**

**Time Frame:** Two 45 minutes classes

**Learning Standards:**

*Science*

Physical Science: States of Matter

1. Compare and contrast solids, liquids, and gases based on the basic properties of each of these states of matter.

*Technology/Engineering Learning Standards*

Materials and Tools

* 1. Identify materials used to accomplish a design task based on a specific property, i.e. weight, strength, hardness, and flexibility.

**Student will be able to:**

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

**Resources and Materials:**

|  |  |
| --- | --- |
| **Item** | **Amount** |
| Science notebooks |  |
| Matter design problem handout | 50-100 (in bin) |
| Different types of materials (not provided) | (in classroom) |

**Focus Activity:** Ask students to explain what a design is in their science notebooks using the following sentence. Write (and read) the following sentence on the board: The engineer changed the designs for the new skyscraper. Discuss as a class.

**Introduction:** Explain that a design is a process to produce plans that use materials to make a product that solves a problem. These problems often have many possible solutions. Discuss some different types of designs such as the design for a house or a building, the design for a new type of water bottle, the design for a piece of clothing, the design for a game or toy, etc.

**Activities:**

1. Pass out a copy of the Matter Design Project to each student. Explain that students will work on the following design problem: Design a container to hold each of the types of matter: solid, liquid, and gas (write on the board). Students will work either individually or in pairs to design a container for each of the three types of matter. Ask students to consider the following: size, shape, flexibility of materials (write these ideas on the board and refer to the handout).
2. Discuss the differences between different materials such as rubber, plastic, metal, wood, etc. You may show or share examples of each type of material with the class.
3. Review and discuss the different characteristics of each type of matter that might need to be considered in designing a container. Some questions to consider might be the following: How will the matter get in? How will it stay in? How will it get out? What would happen if the container was dropped?
4. Ask each student (or group) to make a large drawing of their container (possibly on a poster) and provide an explanation about how the container is designed to hold a particular state of matter. Students should all have 3 drawings and descriptions (one for each state). Students may make 3-dimensional models if they prefer.
5. Each student (or group) will present their ideas to the rest of the class by explaining their design (including the types of materials) and how the matter will get in and out.
6. Discuss the different designs as a class and the benefits and problems of different ideas.

**Closure:** Ask the students to write in the science notebooks and answer the following question: After learning and thinking about the other designs, how might you change your designs to better solve the problem?

**Assessment:** Science notebook responses, designs and explanations, presentations to the class

**Matter Design Project**

**Problem:** What kind of container can hold a solid? What kind of container can hold a liquid? What kind of container can hold a gas? Design containers to hold each state of matter.

**Things to think about:**

* **Size:** How big will the container be?
* **Shape:** What shape will the container have?
* **Flexibility:** How much should the container be able to stretch?
* **Materials:** What type of material should be used? Plastic? Rubber? Metal? Wood? Paper? Glass? Ceramic?
* **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?

**To do:**

1. Design, draw, and label the features of a container for each type of matter. Make your drawings big enough to show to the class.
2. Explain, by writing a few sentences, how your container is designed to hold a certain type of matter.