

SE LASER - STC Kit the STEM Design Challenge developed for : 1st Grade Solids and Liquids

STEM Design Challenge Project Title: Marble Boat Float

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STEM Design Challenge Project Placement and Pacing

Placement: After Lesson 6 “ Investigating Solids in Water”

Pacing: 1 day about 60-90 minutes

Overview: Students determine the best structure/material to float (hold) the most marbles.

Objectives:

- The students investigate what happens when solids are placed in water.
- The students describe observations of the solids in water.
- The students perform a test to determine which solid material will most effectively hold the greatest amount of marbles above water.
- The students discuss which material worked the best and why it did.
- The students discuss the similarities of the materials that worked most effectively.

STEM Design Challenge Problem:

The State of Washington is holding a contest in which elementary schools can be entered into a drawing to win a piece of playground equipment shaped as a boat. In order to have a chance to win this fabulous structure each class is asked to design a boat made of everyday household items that can hold the most marbles. It is your job to discover what material would create the best boat. You and a partner must design a boat-like structure out of the 4 materials provided. Determine how many marbles your boat can hold before it sinks. The boat must stay afloat for at least 3 seconds to be considered successful.

Materials List:

For each every pair of students

- 3 squares of 6x6 wax paper (1 for each trial)
- 1 square of 6x6 aluminum foil (can be reused for each trial)
- 1 square of 6x6 cardboard (can be reused for each trial)
- 2 oz modeling clay (can be reused for each trial)
- 1 clear rectangular 5 quart container (shoe box size)
- 25 marbles
- 2 copies of Data Table to record results

Materials List continued...

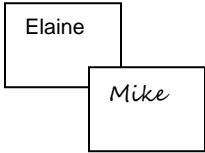


For the class

- Marbles (about 375 marbles for the whole class)
- Sticky Note (one for each student)
- Clear tape
- Water
- Paper or cloth towels for clean up

Preparation:

1. For each student make 1 copy of the data table.
2. Optional : Read "***Who Sank the Boat***" by Pamela Allen
3. Create a class chart to record student predictions on which material will float the most marbles. Students will place a sticky note in the column of his/her prediction.

Sample chart of class prediction chart...

clay	cardboard	wax paper	aluminum
			

4. Make sure each material is precut to 6x6 for the investigation.
5. Fill each clear rectangular 5 quart container (shoe box size) half full of water.
6. Decide if you want to post the procedure prewritten (see step 5 in **Procedure**), or create together as a class.

Procedure:

1. Ask student to think about boats they may have seen in the water. Describe what they remember seeing about the boat design. Discuss shape, structure, no holes etc...
2. Introduce and Read aloud the STEM design challenge problem to students.
3. Review "SINK" and "FLOAT" vocabulary and provide examples of each.
 - Sink- to go to the bottom of a liquid
 - Float- to rest in or on the surface of a liquid
4. Students make predictions of which material they believe will float the most marble. They write their name on a sticky note and place in the appropriate column of the prediction chart.

5. Post Procedure or write together as a class.

Procedure

1. Take 1st material (clay ,cardboard, wax paper, aluminum)
2. Shape into a boat.
3. Place gently on the water.
4. One at a time, place a marble in the boat, after each marble wait 3 seconds before placing the next.
5. Keep track of the # of marbles with tally marks on data table.
6. When the boat sinks record the previous # of marbles.
7. Repeat steps 1-6 for each material and trial.

6. Allow each pair of students to complete the investigation and record findings on Data Table.
7. Clean up
8. As a class, whole group discussion, on results
 - Was your prediction correct?
 - Which material floated the most marbles?
 - Why do you think that material worked the best?
 - What would you change in your design?
 - What else did you discover?
9. Final Conclusion Statement: Can be written in science notebook, discussed, or written on class prediction chart.

We discovered that _____ was the best material to float the most marbles.

Extension Options:

1. Technical Drawing – Students draw and label the boat with the successful design.
2. Writing – Students write 1-2 sentences explaining which material worked best and how many marbles it held.

Finley Elementary Design Challenges- Washington STEM Grant

Resources: (Websites, videos, books, recipes, memos, etc....)

1. STC Solids and Liquids
2. STC Floating and Sinking
3. ***“Who Sank the Boat”*** by Pamela Allen
4. Image of Students from Crayola.com

Evidence: (Data tables, letters, conclusion statements, reflections, responses, graphs, any other evidence of learning)

- Data table (included)

Data Table

Name _____



Marble Boat Float (Number of Marbles)

Material	Trial 1		Trial 2		Trial 3	
	Tally	Total #	Tally	Total #	Tally	Total #
Wax Paper						
Cardboard						
Aluminum Foil						
Clay						