

Grades

K-2

**#SeaworthySTEM** 



# Sponge Boat!

### **Teacher Guide**









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## Teacher Guide for K-2



#### Seaworthy STEM™ in a Box Educator Kit description:

Seaworthy STEM<sup>™</sup> in a Box activities are a Navy initiative to provide enhanced Navalrelevant, standards aligned, hands-on activities to K-12 teachers and students. Components of this program include, curated sets of classroom activities that aim to build deep conceptual understanding in Naval-relevant content areas. The kits also includes comprehensive lesson plans, material lists, scientific background information, STEM related literacy books, and student activity sheets. The Seaworthy STEM<sup>™</sup> in a Box program is designed to support teachers as they select content, acquire materials, and implement more hands-on STEM activities in their classrooms. Increasing student access to hands-on STEM activities, also increases awareness of STEM career paths, engage students in STEM, and support development of student's abilities in STEM content.

The Seaworthy STEM<sup>™</sup> in a Box kits were designed to guide students through the scientific inquiry-based theory and the engineering design process. The content and Naval-relevant activities are aligned with the Next Generation Science Standards. The topics and content covered within the lessons are connected and scaffolded based on distinct grade bands (K-2nd, 3rd-5th, 6th-8th, and 9th-12th).



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# Lesson Title: Sponge Boat



Time: 1 Class period (45 minutes)

#### Student Objectives:



Students will use the engineering process to design and build their own sailboat. Students will be able to experiment by placing the sailboat in water and observe how the boat moves with the use of wind created by a fan. Students will re-design to improve the model of their sponge boat.

#### Lesson Overview:

Students can explore different shapes for their boat and the sail. They can modify where to place their sail and the size/shape of the boat and sail. Students will be able to build their boat and then test it out in the water. The fan will be place by the water to create wind for the sail boat. The main goal of the activity is for students to observe how their boat moves in the water and to modifying the boat after experimenting. Students should direct the majority of allocated time to re-designing to continuously improve their boat model.

#### Next Gen Science Standards (NGSS):

K-PS2-1. K-PS2-2. 2-PS1-2.





#### **Materials and Equipment List:**

- 💟 Sponges
- Scissors
- Markers
- Swizzle sticks or toothpicks
- Table cover, (Plastic)
- Vater
- 🚺 Fan
- I Fish tank or water container
- Mole-puncher
- 🚺 Timing Device

#### Student Activity Sheets/Handouts:

Sponge Boat Student Activity Workbook



#### Technology Tools:

**Timing Device** 

#### Suggested STEM Related Literacy Book:

Toy Boat by Randall De Seve





Note

The measurement that ships use for navigation is the nautical mile. One nautical mile per hour is called a "knot".

#### Pre-Activity Setup:

- Take Table cloth and cut into 1 ft X 1 ft squares for each student.
- 2 Pour water into the foil pan. The pan should be half full. Then place the fan by the end of the foil pan.

#### **Procedure**:

- The teacher will give a brief introduction into sailboats. The teacher can use the guided questions in the side panel to open a whole class discussion.
- 2 The teacher will explain the main goal of the activity. The teacher will model how to design the sail sponge boat.
- <sup>3</sup> The teacher will give each student the following materials that are listed: 1 sponge, 1 swizzle stick or toothpick, 1 square of table cloth, 1 pair of scissors, and markers.



- a. Draw the shape of your boat on the sponge.
- b. Use scissors to cut sponge and create the shape.
- c. Draw the shape of your sail on the table cloth.
- d. Decorate the sail using markers.





- e. Use scissors to cut out sail.
- f. For step G, the teacher will need to make a hole at the top of sail and bottom of sail.
- g. Use the guided holes in the sail to place the swizzle stick through the sail.
- h. Stick the swizzle stick into the sponge, standing up. (Teacher guided help)
- i. Place boat in the water.
- Students will observe how their sponge boat moves in the water. The student(s) will record the time of each version of their sailboat to see which design moves the fastest.
- 5 Students can re-design the sail, create a new sail, have multiple sails, and modify the placement of sail.



- 6 The teacher can guide students in cleaning up and use the following guided conclusion questions to finish the lesson.
  - "Did your boat move in the water?"
  - "Did you observe if you boat change in direction or speed when modified?"
  - "Do you think engineers change and modify their boat models?"

- "If given another sponge, how would you change your sponge boat?"
- Which designs were the fastest? What do you notice about the fastest boats?
- If you were given another sponge- how would you cut it? If you were given another sail- how would you cut it?" The students can draw their future designs to demonstrate growth.
- 7 The teacher can conclude the lesson using the following guided STEM literacy reading resource.

#### Vocabulary Terms:

- Energy: the ability to do work. Wind in a sail is a form of energy
- Force: A push or pull on an object

#### **Misconceptions/ Science information:**

Wind is a form of energy. Sailboats use the forces of the wind on the sail. The wind blows against the sail and will get lift like the wing of an airplane. The shape of the boat combined with the sail will push the boat forward. In most cases, the more wind the sail is able to capture, the faster the sail boat will move. For a sail boat to move, the sail needs to be angled against the wind. The sail boat will be pushed perpendicular to the wind direction. For students to achieve a working sail, the sail should not be like a flat sheet of cloth but rather curved, like a wing of a bird. This allows the sail to "capture" the wind. This activity was created to have students use the engineering design process and in particular to use the re-design step. Students should be able to design and experiment with different types of sails to achieve the best solution to capture the wind from the fan.

#### STEM Related Career:

- Materials Engineer
- Meteorologist
- Wine Turbine Technician

#### Fun Fact!

Even though the Navy started experimenting with steam-powered ships as early as the War of 1812, ships of sail remained the backbone of the fleet until the Civil War. The Navy still has one sailing ship in commission, the USS Constitution. Check out the USS Constitution on page 10!





The Seaworthy STEM<sup>™</sup> in a Box curricula was developed through collaborative efforts of a team of individuals at the Naval Surface Warfare Center Carderock Division and Albert Einstein Distinguished Educator Fellows via an inter-agency agreement with the U.S. Department of Energy for the Albert Einstein Distinguished Educator Fellowship (AEF) Program. We are grateful to the following Content Specialists who contributed their knowledge and expertise by researching and writing on selected topics: Suzanne Otto, Stephanie Klixbull, and Thomas Jenkins. We'd also like to acknowledge the contributions of AEF participant Ms. Deborah Reynolds, the inaugural AEF Educator at Carderock that helped inspire the design of Seaworthy STEM<sup>™</sup> in a Box content. With the help of Albert Einstein Fellow, Melissa Thompson, and Carderock Outreach Specialist, Ashlee Floyd, special additions to the curriculum such as career portfolios, workforce trading cards, and in-house short story publications are included that reflect the diversity of NAVSEA Sites.

It is the goal of the SeaWorthy Curriculum to embrace NAVSEA technologies from sites nationwide to empower the youth of our nation to purse STEMcentric career pathways. The views and opinions of the Content Specialists expressed herein do not necessarily state or reflect those of the AEF Program, the U.S. Department of Energy, or the U.S. Government. Reference herein to any specific commercial product, process, or service by trade name, trademark, service mark, manufacturer, or otherwise does not constitute or imply endorsement, recommendation, or favoring by the AEF Program, the U.S. Department of Energy, or the U.S. Government.







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Seaworthy STEM<sup>™</sup> in a Box Series





