#SeaworthySTEM

Making Waves

Grades K-2

Teacher Guide

Seaworthy STEM™ in a Box Series

Making Waves

Teacher Guide for K-2

Seaworthy STEM™ in a Box Educator Kit description:

Seaworthy STEM™ in a Box activities are a Navy initiative to provide enhanced Naval-relevant, 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™ 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™ 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).

NAVSEA
SCIENCE, TECHNOLOGY, ENGINEERING & MATHEMATICS

Table of Contents

Lesson Title: Making Waves

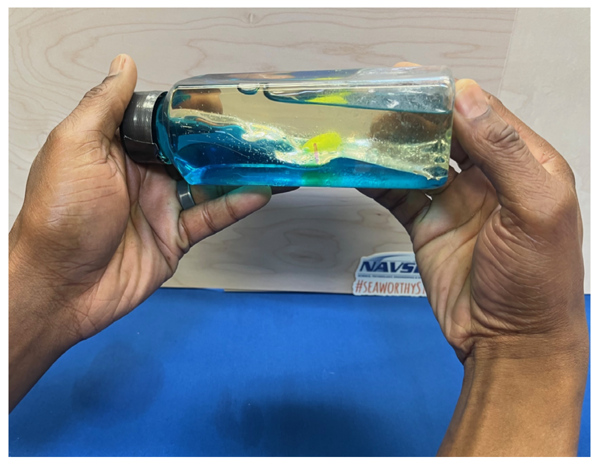
Time:
1 Class period (30-45 minutes)

Student Objectives:

Students will learn about energy and how the amount of energy can decrease the frequency and/or magnitude of the waves in the ocean. Students will explore making different types of waves by the amount of energy used. Students will observe the different types of waves created.

Lesson Overview:

Students will create an ocean in a bottle. Students will fill up the bottle with water, blue dye, and cooking oil. The water and oil will naturally separate. When the student tilts the bottle back and forth, "water" waves will be created. The waves are produced by the amount of energy student's give. Students can observe the change in the wave by the amount of energy given. With this activity, students should understand the amount of energy will change the outcome of a wave.



Next Gen Science Standards (NGSS):

K-ESS3-2
2-ESS1-1
2-ESS2-2
2-ESS2-3

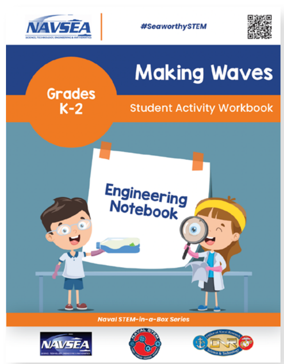
Notes

Materials and Equipment List (Per Student):

- ☑ 1 Smooth Plastic Bottle
- ☑ Food Coloring (Blue)
- ☑ Cooking Oil
- ☑ Water
- ☑ Funnel
- ☑ Tape
- ☑ 1 Pony Boat Bead
- ☑ Portable 3 speed fan

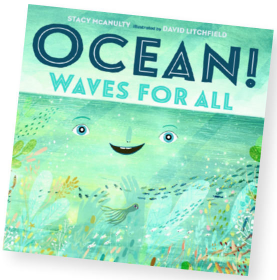
Student Activity Sheets/Handouts:

Making Waves Student Activity Workbook



Suggested STEM Related Literacy Book:

Ocean! Waves for All
by Stacey McAnulty



Procedure:

1. The teacher will give students an overview on energy and how waves are created by the given force of wind. The main concept on the lesson is for students to understand the amount of energy driven into a wave will increase or decrease the size of the wave. The teacher can lead a whole class discussion with the following introduction questions.
    - What is energy?
    - What is a wave?
    - Is water a living thing?
    - How do waves get bigger or smaller?

2. Each student will receive 1 empty bottle w/ lid, 1 funnel, blue coloring dye, water, cooking oil, and a boat bead.

3. The teacher will guide students in creating a wave bottle.*(Please note- depending on age level, teacher will scaffold the directions with building of the wave bottle.)*

    1. Fill the container 1/3 way with water.

    2. Add 2-4 drops of blue food dye coloring and have the student drop 1 boat bead inside the bottle.

Fun Fact!

The wind is the driving force of weather at sea, as wind generates local wind waves, long ocean swells, and its flow around the subtropical ridge helps maintain warm water currents such as the Gulf Stream. Weather ships were established by various nations during World War II for forecasting purposes, and were maintained through 1985 to help with transoceanic plane navigation.

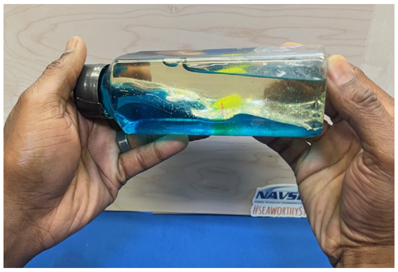
(Helpful tip: Use a funnel!)

3. Fill the remaining bottle with cooking oil.

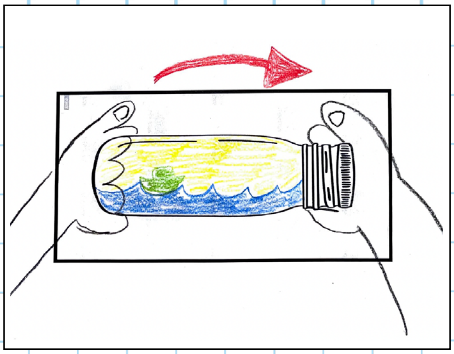
4. Close the lid, tightly!

5. Use the tape to secure the lid.

4 When students have completed creating the wave bottle. Have students gently tilt the bottle back and forth to make waves.



Check out these great examples of a student's observation!



5 Have students observe the waves inside the bottle. Give students 5-10 minutes to explore and observe creating different size waves.

6 After observing, have each student fill in the student engineering notebook.

7 To finish the activity, the teacher will ask guided concluding questions to students.

- How did you make a wave?
- Where did the energy come from?
- How can you create bigger/smaller waves?
- How do you think waves form in the ocean?

8 The teacher will model the way in which the wind helps with the formation of waves.

- Set up your container of water and have a portable 3 speed fan ready. Ask the question "What is wind?" Discuss with the class.

- Ask the students to predict which of the 3 fan settings will generate the most wind- Low, Medium or High. Have them record their prediction in their journals.

- Proceed through the demonstration with the class by angling the fan towards the water then turning the fan to its lowest setting, followed by the medium setting, followed by the highest setting.

- Have the students record in the workbook the answer to "Why did the highest setting on the fan create the strongest waves?"

Vocabulary Terms:

- Density: the mass of an object divided by its volume
- Energy: The ability to work
- Force: A push or pull on an object
- Wind: The movement of air

Misconceptions/ Science information:

Ocean waves are created by energy. Waves are created by wind that is disturbing the surface of the ocean. Small amounts of wind/energy will create ripples on top of the water surface. When energy is passing through the water, the ripples in the water will build upon each other and create bigger waves. If there is a gust of wind or severe storm, the waves will be increase in size due to increase of wind.

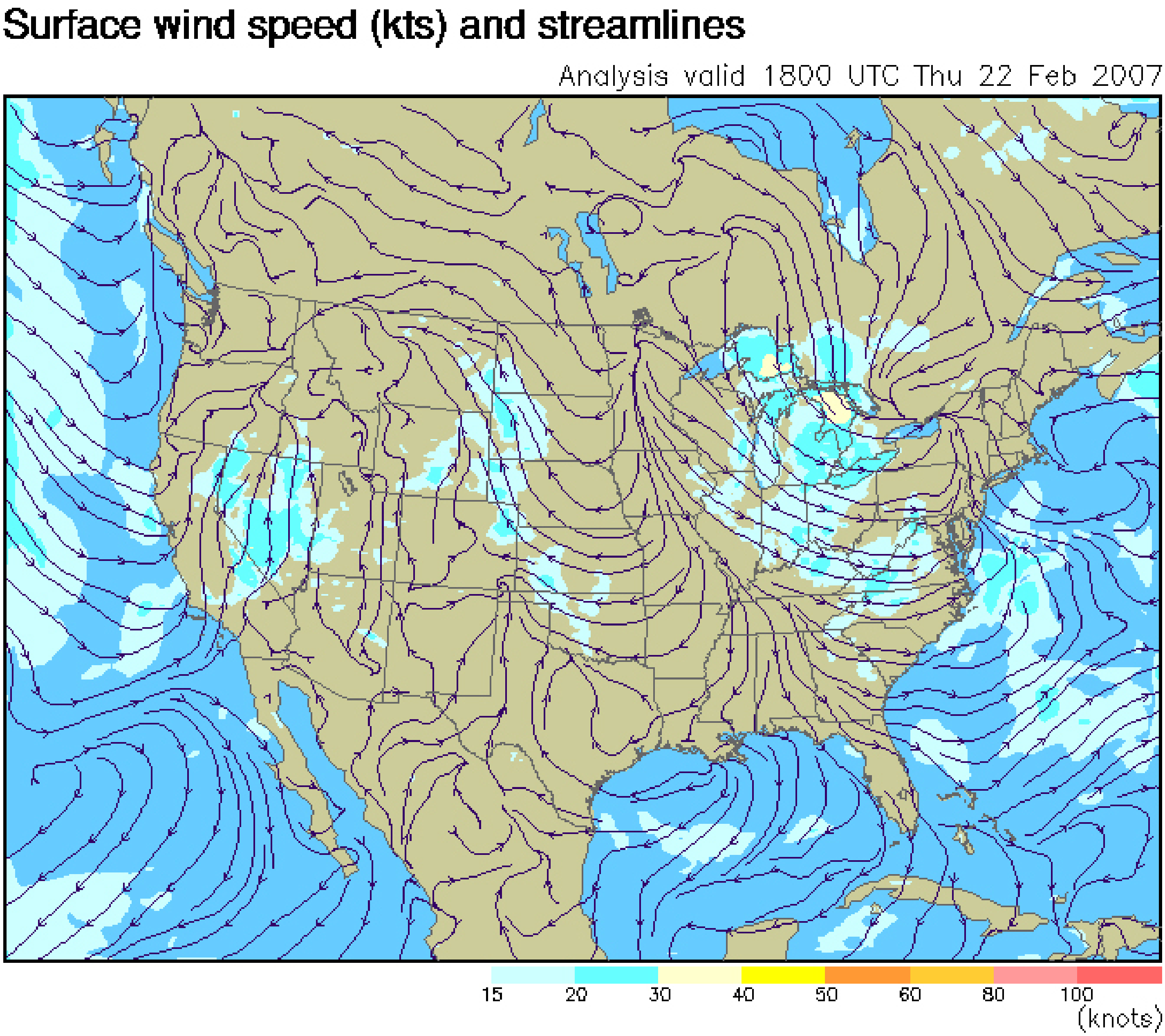
Fun Fact!

Today, the Navy relies on weather forecasting with the help of technology and meteorologists. A series of Meteorology and Oceanography Centers—Naval Meteorology & Oceanography Command—provide weather-related information to the fleet.

STEM Related Career:

- Ocean Engineering
- Marine Biology
- Marine Researcher
- Meteorologist

Reference Photo:



The Seaworthy STEM™ 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™ 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 STEM-centric 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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