NAVSEA
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#SeaworthySTEM

Making Waves

Grades K-2

Teacher Guide

Naval STEM-in-a-Box Series

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Making Waves

Teacher Guide for K-2

Naval STEM-in-a-Box Educator Kit description:

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 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 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 (2019). 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: Making Waves

Time:

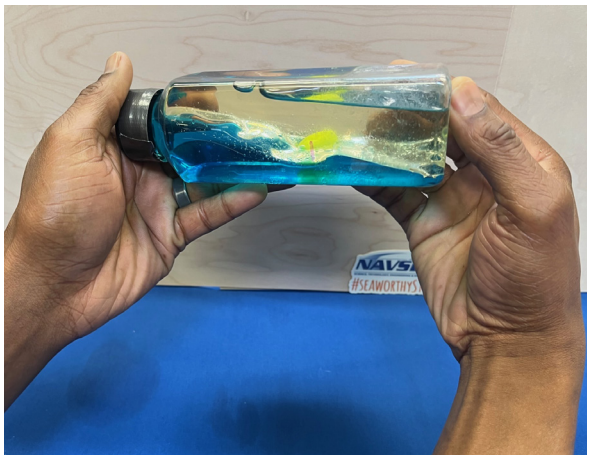
1 Class period (30-45 minutes)

Student Objectives:

Students will learn about energy and how the amount of energy can increase and/or decrease 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 learn the correlation between the wind and ocean waves. Students should also 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

"A cross-disciplinary approach can accommodate diverse learning styles!"

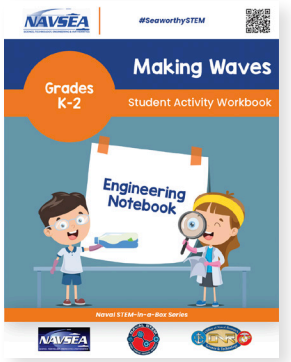
Notes

Materials and Equipment List (Per Student):

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

Student Activity Sheets/Handouts:

Making Waves Student Activity Workbook

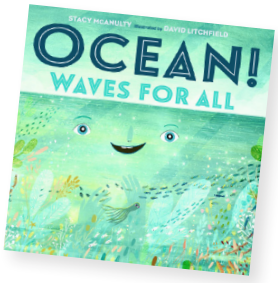


Technology Tools:

None needed

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.

(Helpful tip: Use a funnel!)

    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.

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 tilt and gently shake the bottle to make waves.

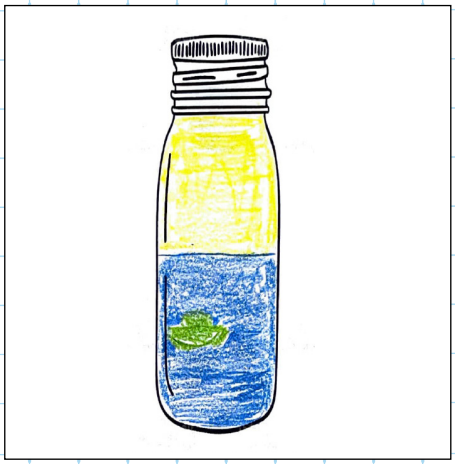
5 Have students observe the waves inside the bottle. Give students 5-10 minutes to explore and observe creating different size waves.

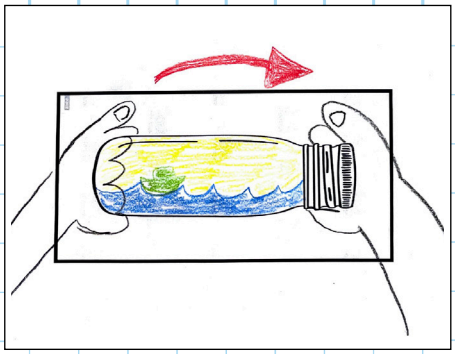
6 After observing, have each student fill in the student engineering notebook.

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?
- What happens if you put in more energy? (Less energy?)
- How do you think the ocean forms waves?

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





8 The teacher can use the following extension reading to give students more content on energy and ocean waves.

Vocabulary Terms:

- Energy
- Force

STEM Related Career:

- Ocean Engineering
- Marine Biology
- Marine Researcher
- Meteorologist

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.

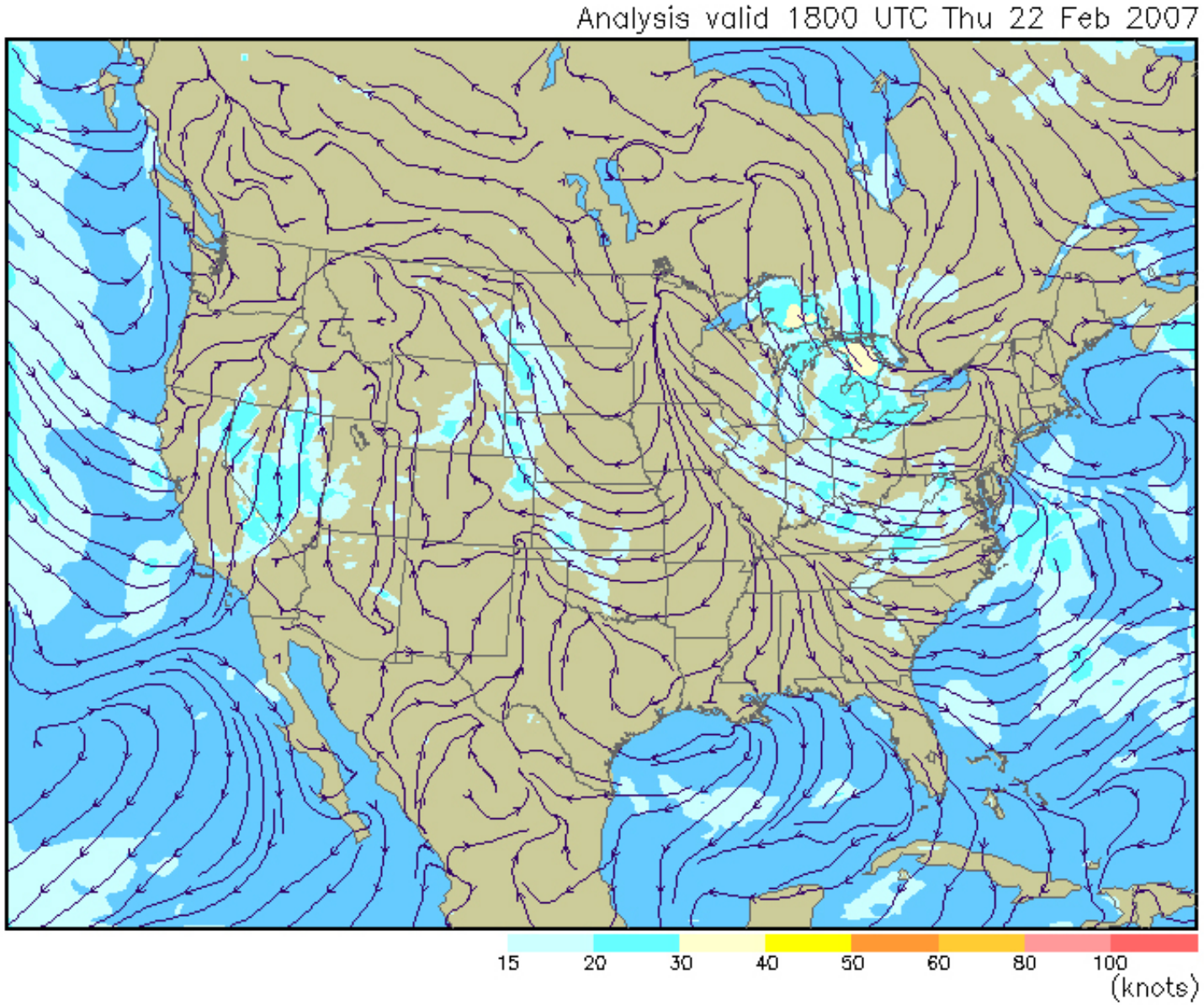
Reference Photos:

Full size reference photos are on the following page.

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—to provide weather-related information to the fleet.

Surface wind speed (kts) and streamlines



The Naval 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 and Stephanie Klixbull. 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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