Making Waves

http://www.eduplace.com/rdg/gen_act/ocean/wave.html

Focus on Inquiry

The student will design and conduct a scientific experiment by creating surface winds and observing the energy of their motion.

Lesson Overview

Students will discover that some waves are generated by wind and not from within the water (a common misconception). Students will discover that wind pushes against water and that as this energy (of the wind) is absorbed by the water, it creates waves.

Duration	Setting	Grouping	PTI Inquiry Subskills
65 minutes	Classroom	Cooperative groups of 3 to 4	2.6, 3.6, 3.7, 4.3, 5.2, 5.3, 5.4, 7.2

Lesson Components	Estimated Time	Inquiry Subskills Used	Technology Used	Level of Student Engagement	Brief Description
Engage	10 min	5.2	Video (Internet)	2	Students watch a video on waves and brainstorm what causes waves.
Explore	25 min	3.7	None	3	Students conduct an experiment to see what creates surface waves.
Explain	15 min	3.6, 3.7, 4.3, 5.4	None	3	Students make connections between the wind and the waves.
Expand	15 min	2.6, 4.3, 5.3, 7.2	None	3	Students conduct a mini-experiment to simulate a wave's energy movement.
Evaluate	None	None	None	N/A	Throughout the activity, students complete a lab sheet that can be used for evaluation.

Level of Student Engagement

1	Low	Listen to lecture, observe the teacher, individual reading, teacher demonstration, teacher-centered instruction
2	Moderate	Raise questions, lecture with discussion, record data, make predictions, technology interaction with assistance
3	High	Hands-on activity or inquiry; critique others, draw conclusions, make connections, problem-solve, student-centered

National Science Education Standards – Inquiry

Use appropriate tools and techniques to gather, analyze, and interpret data.
Develop descriptions, explanations, predictions, and models using evidence.
Think critically and logically to make the relationships between evidence and explanations.
Communicate scientific procedures and explanations.

National Science Education Standards – Earth Science

Water, which covers the majority of the earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the "water cycle."

Louisiana Grade Level Expectations – Inquiry

Gr. 8, Inquiry GLE#7 - Record observations using methods that complement investigations (e.g., journals, tables, charts) (SI-M-A3)
Gr. 8, Inquiry GLE#12 – Use data and information gathered to develop an explanation of experimental results (SI-M-A4)
Gr. 8, Inquiry GLE#13 - Identify patterns in data to explain natural events (SI-M-A4)
Gr. 8, Inquiry GLE#16 - Use evidence to make inferences and predict trends (SI-M-A5)
Gr. 8, Inquiry GLE#22 – Use evidence and observations to explain and communicate the results of investigations (SI-M-A7)

Louisiana Grade Level Expectations Earth Science

None

Materials List (per group)

- 1 large, flat pan 4-5 inches deep (dishpans or larger)
- 1 battery operated (hand held fan OR a paper fan
- food coloring (optional)
- 5 large marbles or ball bearings

Advance Preparation

1. Obtain materials listed in the materials list.
2. Prepare battery operated fans OR make paper fans
3. Copy **Blackline Master #1** for each student.
4. Set up a pan filled with 2-3 inches of water at each group station.
5. Preview the UnitedStreaming video, "Where the Water Meets the Land" (optional – if your school has an account)

Other Information

Learning Objective

The learner will…

- understand that surface waves are actually generated by wind and not from within the water.

Prior Knowledge Needed by the Students

- None

Procedure

Engage

1. Watch the United Streaming video: Where the Water Meets the Land
2. Ask the class what causes waves? Accept all answers and record answers on the board.
3. Ask the students, "Can the wind from a fan create a wave?" Tell students that today they will conduct an experiment to answer this question.
4. Have students make a prediction on what will happen when the fan blows across the water's surface on **Blackline Master #1** in the appropriate section.

Explore

1. Groups should stand around their pan at their activity station. The pan should be filled with 2-3 inches of water with an electric fan about 1 foot from the narrow side of the pan. Note – If you do not have access to enough electric fans, have students make paper fans and substitute the paper fans for the electric fans throughout the instructions.
2. Groups should start with their fan on the lowest speed.
3. Ask the students to make observations and record there results on **Blackline Master #1**.
4. After recording their observations and answering the questions posed on **Blackline Master #1**, students should now start the fan on its second speed. Note – it is best if students do not use the fan's highest speed as the water may slosh out if the fan is on too high.
5. Students should make observation and record there results in the appropriately titled section on **Blackline Master #1.**

Explain

1. Have the students prepare answers for the following questions and then host a group discussion after:
    a. What is the connection between the wind and the waves?
    b. Why didn't the waves bunch up at the end of the pan?
    c. Have them explain how the winds energy causes the water to move.
    d. Have the students write a lab report on how wind produces waves.
2. Each group should draw an illustration showing how the wind creates waves in both high wind and low wind conditions. Illustrations should be labeled.

Expand

1. Have each group go back to their pan. Give each group a set of 5 marbles.
2. Have students place 4 of the marbles on a table, lined up in a row with each marble touching its neighbors.
3. Ask students to predict what will happen if the fifth marble is gently rolled at the marble at one end of the row. Students may write their predictions on the back of their **Blackline Master #1**.
4. After students have made predictions, have one student in each group roll the fifth marble. The marble at the far end of the row will roll away and the others will not move. Have students repeat the experiment several times.
5. Ask students to discuss with their groups how this movement of the marbles relates to the energy in waves.
6. Discuss the idea that the energy in the rolling marble went into the marble it hit, and from that marble to the next, until the energy reached the last marble. The energy made that marble roll away. Wave energy moves through water the same way.
7. Ask students once again, what causes waves? Discuss their answers, relating the answers to the wave experiment. Ask them if water moves sideways inside a wave, or if the water stays in one place while the wave moves through it? Discuss the answers, relating the answers to the wave experiment and to the marble experiment.

Evaluate

1. The **Blackline Master #1** will be used as an evaluation.

Blackline Master

1. **Making Waves Lab Sheet**

Supplementary Resources

Education Center Activity: Let's Make Waves
http://www.eduplace.com/rdg/gen_act/ocean/wave.html
The original lesson can be found in its entirety here, as well as this site offers a great background section that offers some common misconceptions on waves and how to clarify them.

Science and Technology Focus: Ocean in Motion Waves
http://www.onr.navy.mil/focus/ocean/motion/default.htm
This site offers an abundant amount of information and teacher resources on the ocean.

Name _____ Date _____Class _____Group _____

Making Waves Lab Sheet

Question: Can the wind from a fan create a wave?

Prediction: What will happen when the fan blows across the water's surface?

My Data:

Low Speed Testing:
Observations:

Questions to answer:

1. Are there waves now in the pan?
2. Did the water bunch up at the far end of the pan? How do you know?
3. Did the water slosh out of the pan?
4. Make an illustration to show how the waves spaced

High Speed Testing
Observations:

Questions to answer:

1. Are there waves now in the pan?
2. Did the water bunch up at the far end of the pan?
3. Did the water slosh out of the pan?
4. Make an illustration to show how the waves spaced.