

LESSON PLANS

LESSON #5: UNDERSTANDING THE OCEAN NUTRIENT CYCLE

3RD > 5TH
GRADE

LEARNING OUTCOMES

- Read directions in groups to conduct a water experiment about the ocean's nutrient cycle.
- Record what they observe about the experiment.
- Draw conclusions from what they witness.
- Watch a [short video \(1 minute\)](#) to compare conclusions.
- Reflect on group's ability to follow directions accurately to achieve observable results.

TIME REQUIRED FOR LESSON: 1 fifty minute period

BIG IDEA

Students will understand how upwelling affects the ocean nutrient cycle, which therefore allows phytoplankton to utilize the nutrients into energy.

BACKGROUND

Dense, cold water is normally found deep in the ocean. The remains of dead, decomposing organisms sink to the ocean bottom making the deep ocean waters rich in nutrients. However, phytoplankton, which are the basis for the oceanic food web, live in the upper, warmer sunlit layers of the ocean and need these nutrients to live.

The process of upwelling brings nutrients nearer to the surface. Upwelling occurs when offshore winds move the warmer surface water away from the shoreline, allowing the cooler water to rise or upwell. Where upwelling occurs, marine life is rich.

ESSENTIAL QUESTIONS

- What is an upwelling?
- How do wind patterns and currents affect the nutrients in the ocean?
- How do Phytoplankton benefit from the nutrient cycle?

MATERIALS/SOURCES

- Student resource paper with directions, observations, and conclusions.
- For each group of students- 2 rectangular transparent pans at least 4 inches deep, food coloring, ice, water (must be room temperature or warmer), pipette, plastic cup, flexible drinking straw for each student, ruler and water pitcher (or something to carry water in).
- Video- <http://www.teachertube.com/video/ocean-upwelling-importance-200033>

ACTIVITIES

ENGAGE

Students will be introduced to the idea of conducting their own scientific experiment to teach themselves about the ocean's nutrient cycle.

DISCUSS/EXPLORE

Students will break up into groups and work independently (following directions and expectations on student resource paper) as the teacher floats through groups and helps where necessary.

SHARE/EVALUATE/REFLECT

The class will come back together as a whole and share observations and conclusions made about the experiment and the essential questions. Students will watch a short video about ocean upwelling and evaluate their understanding from the experiment compared to the video. Teacher will facilitate a short discussion about how accurately groups followed directions and decide whether to have a successful group demonstrate the visual explanation that happens when the experiment is done correctly.

EXTENSIONS

There are infinite directions to go from here. Students could:

- Critique the experiment to try and improve its learning value by proposing an improved experiment.
- Develop a digital model or create a kinesthetic body re-enactment, visual illustration or song to explain the process.

CONNECTIONS TO STANDARDS**3rd Grade:**

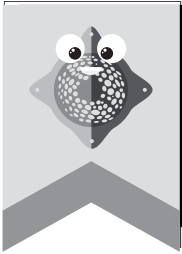
- NGSS.3-LS4-1 Analyze and interpret data to make sense of phenomena using logical reasoning.
- NGSS. 3-LS1-1 Develop models to describe phenomena.
- CCSS.ELA-LITERACY.RF.3.4 Read with sufficient accuracy and fluency to support comprehension.

4th Grade:

- NGSS.4-PS4-2 Develop a model to describe phenomena.
- CCSS.ELA-LITERACY.RF.4.4 Read with sufficient accuracy and fluency to support comprehension.
- CCSS.ELA-LITERACY.W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.

5th Grade:

- CCSS.ELA-LITERACY.RF.5.4 Read with sufficient accuracy and fluency to support comprehension.
- CCSS.ELA-LITERACY.W.5.2.D Use precise language and domain-specific vocabulary to inform about or explain the topic.
- NGSS.5-PS3-1 Use models to describe phenomena.



UNDERSTANDING THE NUTRIENT CYCLE

NAME

GROUP MEMBERS



PLEASE READ ESSENTIAL QUESTIONS TO CONSIDER WHILE CONDUCTING THE EXPERIMENT:

What is an upwelling? How do wind patterns and currents affect the nutrients in the ocean?
How do Phytoplankton benefit from the nutrient cycle?

READ THE BACKGROUND INFO:

Dense, cold water is normally found deep in the ocean. The remains of dead, decomposing organisms sink to the ocean bottom making the deep ocean waters rich in nutrients. However, phytoplankton, which are the basis for the oceanic food web, live in the upper, warmer sunlit layers of the ocean and need these nutrients to live. The process of upwelling brings nutrients nearer to the surface. Upwelling occurs when offshore winds move the warmer surface water away from the shoreline, allowing the cooler water to rise or upwell. Where upwelling occurs, marine life is rich.



YOUR GROUP WILL NEED:

- 2 rectangular transparent pans at least 4 inches deep
- water pitcher (or something to carry water in)
- food coloring
- ice
- water
- pipette
- plastic cup
- flexible drinking straw for each student in group
- ruler

**DIRECTIONS FOR NUTRIENT CYCLE EXPERIMENT:**

- Using the pitcher, fill both pans with room-temperature (or warmer) water to about 1-2 inches from the top.
- Do not bother the pans for about 5 minutes so the water can settle.
- While the water in the pans is settling, prepare the plastic cup with 3-5 drops of food coloring and a handful of ice. Fill the cup with water 2 inches from the top of the cup and gently mix with straw.
- Fill the pipette with the colored ice water and release a few drops at the bottom (near one end) of each pan. This will represent the nutrient-rich water. Try and release the same amount in each pan! Observe the water, how are the different temperatures of water reacting to each other? Write your observations:

- Rest the straw on the opposite end from the colored water of ONE pan. Gently blow across the top (not into) the water, creating offshore waves. This will represent the wind. Compare the difference between the two pans. What happens to the “nutrient-rich” water when the surface water is moved away by the wind? Write and draw your observations:

**WHAT CONCLUSIONS CAN YOU MAKE ABOUT OUR ESSENTIAL QUESTIONS?**

What is an upwelling?

**WHAT CONCLUSIONS CAN YOU MAKE ABOUT OUR ESSENTIAL QUESTIONS? (CONT'D)**

How do wind patterns and currents affect the nutrients in the ocean?

How do phytoplankton benefit from the nutrient cycle?
