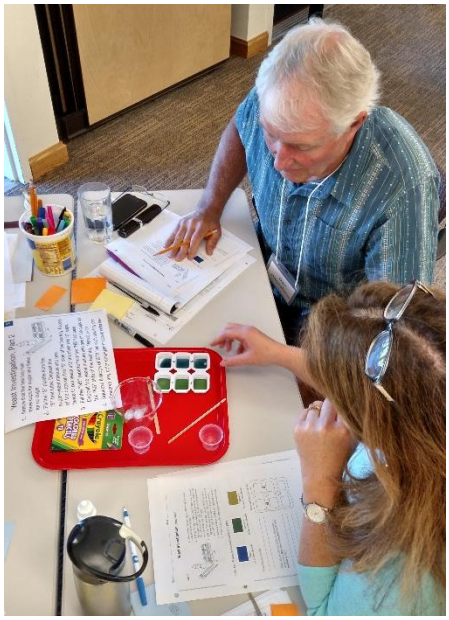
Tracking Carbon

Investigating the Role of Photosynthesis and Respiration in Global Carbon Cycling (Grades 6-12)

Overview



In this session, participants collect evidence using multiple approaches (e.g., lab investigations, field experiments, model simulations, real-time data) to explore the role of photosynthesis and respiration in the movement of carbon through different global carbon "reservoirs". They learn that dissolved oxygen can be a "proxy" for carbon dioxide in natural waters and use this to explore and interpret natural patterns and identify environmental factors that control oxygen, carbon dioxide, and pH. With this collection of evidence, they construct explanations for changes in oxygen, photosynthesis, and respiration throughout the day and discuss the implications for this in terms of seasonal patterns in changing atmospheric CO_2 and ocean pH on local and global scales.

Learning Outcomes

Students will be able to:

- Conduct manipulative experiments using various organisms (e.g., yeast, aquatic plants) to explore the effect of photosynthesis and respiration on dissolved oxygen, pH and carbon dioxide;
- Bring together multiple types of evidence to construct explanations for the role of photosynthesis and respiration in daily and seasonal carbon cycling;
- Make predictions and test their predictions with professionally-collected water quality data;
- Use the NERR data portal to identify and explain natural changes in oxygen, pH and CO2 in estuarine waters.

Data Resources:

- This activity has students engage in explorations of real-time and archived water quality and weather data collected as part of the National Estuarine Research Reserve (NERR) System Wide monitoring Program (SWMP).

NGSS Connections

- **Disciplinary Core Ideas**: PS1.B Chemical Reactions; PS3.D Energy in Chemical Processes and Everyday Life; LS1.C Organization for Matter and Energy Flow in Organisms
- **Science and Engineering Practices**: Planning and Carrying out Investigations; Constructing Explanations and Designing Solutions; Analyzing and Interpreting Data
- **Crosscutting Concepts**: Cause and Effect; Energy and Matter; Systems and System Models

Ocean Literacy Principles

- 3.e : The ocean dominates the Earth's carbon cycle. Half the primary productivity on Earth takes place in the sunlit layers of the ocean and the ocean absorbs roughly half of all carbon dioxide added to the atmosphere.

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