

# Ocean Acidification Simulator Activity: pH Effects on Marine Life

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## High School (NGSS Aligned) Teacher Guide

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### Overview

This guide supports implementation of the Ocean Acidification Simulator Activity: pH Effects on Marine Life using the 5E instructional model.

### Learning Objectives

- Students will model how CO<sub>2</sub> absorption changes ocean chemistry
- Students will analyze the relationship between atmospheric CO<sub>2</sub> and ocean pH
- Students will evaluate impacts on marine organisms
- Students will connect human activities to ocean changes

### Standards Alignment

- **HS-LS2-5:** Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon
- **HS-ESS3-6:** Use a computational representation to illustrate the relationships among Earth systems
- **HS-ESS2-2:** Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks

### Prerequisites

- Basic chemistry concepts (pH, acids/bases)
- Understanding of carbon cycle
- Chemical reactions and equilibrium

## Time Estimate

55 minutes

## Materials Needed

- Computer/tablet with internet access
- Student Activity Sheet
- Calculator
- Graph paper (optional)

## Teaching Tips by Phase

### Phase 1: ENGAGE (5-10 minutes)

- Start with the phenomenon or problem presented
- Elicit student predictions and prior knowledge
- Create cognitive dissonance if possible
- Build excitement for investigation

### Phase 2: EXPLORE (15-20 minutes)

- Allow students to investigate with minimal guidance
- Circulate and ask probing questions
- Encourage systematic data collection
- Note common discoveries and difficulties

### Phase 3: EXPLAIN (10-15 minutes)

- Have students share their findings first
- Build on their observations to introduce concepts
- Address misconceptions directly
- Connect to broader biological principles

### Phase 4: ELABORATE (10 minutes)

- Apply knowledge to new scenarios
- Make real-world connections

- Encourage deeper investigation
- Support transfer of learning

#### Phase 5: EVALUATE (5-10 minutes)

- Use varied assessment strategies
- Focus on conceptual understanding
- Provide immediate feedback
- Plan follow-up based on results

### NGSS Three-Dimensional Learning

- **Science Practices:** Developing and using models, analyzing data, constructing explanations
- **Crosscutting Concepts:** Patterns, cause and effect, systems thinking
- **Disciplinary Core Ideas:** See standards alignment above

#### Remember:

The goal is student discovery through guided inquiry. Resist the urge to explain concepts before students have explored them!