Enzyme Environment Activity: Environmental Effects on Enzyme Function

High School (NGSS Aligned) Teacher Guide

Overview

This guide supports implementation of the Enzyme Environment Activity: Environmental Effects on Enzyme Function using the 5E instructional model.

Learning Objectives

- Students will investigate how temperature and pH affect enzyme activity
- Students will determine optimal conditions for different enzymes
- Students will model enzyme denaturation and its consequences

Standards Alignment

- **HS-LS1-1:** Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life
- **HS-LS1-6:** Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen may combine with other elements to form large carbon-based molecules

Prerequisites

- Basic understanding of proteins and enzymes
- Knowledge of pH scale
- Understanding temperature effects on molecules

Time Estimate

50-55 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!
