Yeast Respiration Activity: Fermentation and Cellular Respiration

High School (NGSS Aligned) Teacher Guide

Overview

This guide supports implementation of the Yeast Respiration Activity: Fermentation and Cellular Respiration using the 5E instructional model.

Learning Objectives

- Students will model how cells switch between aerobic and anaerobic respiration
- Students will analyze factors affecting cellular respiration rates
- Students will compare ATP production in different metabolic pathways
- Students will explain why organisms use fermentation when oxygen is limited

Standards Alignment

- **HS-LS1-5:** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy
- **HS-LS1-7:** Use a model to illustrate that cellular respiration is a chemical process
- **HS-LS2-3:** Construct and revise an explanation based on evidence for the cycling of matter

Prerequisites

- Basic cellular respiration
- ATP as energy currency
- Aerobic vs anaerobic
- Chemical equations

Time Estimate

50 minutes

Materials Needed

- Computer/tablet with internet access
- Student Activity Sheet
- Calculator
- Colored pencils for graphing

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!
