Gene to Protein Simulator Activity: Protein Synthesis

AP Biology/College Level Teacher Guide

Overview

This guide supports implementation of the Gene to Protein Simulator Activity: Protein Synthesis using the 5E instructional model.

Learning Objectives

- Students will model bacterial transformation and horizontal gene transfer
- Students will analyze bacterial survival strategies
- Students will evaluate the game as a model of bacterial evolution

Standards Alignment

- **ESSENTIAL KNOWLEDGE 5.4.A.1:** Genetic variation can result from mutations.
- **ESSENTIAL KNOWLEDGE 6.3.A.1:** Horizontal gene transfer occurs in bacteria.
- **ESSENTIAL KNOWLEDGE 7.3.A.1:** Natural selection results in evolutionary change.

Prerequisites

- Understanding of bacterial genetics
- Knowledge of natural selection

Time Estimate

25 minutes

Materials Needed

- Computer with internet access
- Student Activity Sheet

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

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