Gene to Protein Simulator Activity: Protein Synthesis

Middle School (NGSS Aligned) 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 how bacteria gain new abilities
- Students will explain why some bacteria survive antibiotics
- Students will identify how bacteria work together

Standards Alignment

- **MS-LS3-1:** Develop and use a model to describe why structural changes to genes may result in harmful, beneficial, or neutral effects
- **SEP:** Developing and Using Models
- **DCI:** LS3.A: Inheritance of Traits
- **CCC:** Structure and Function

Prerequisites

- Basic understanding of bacteria
- Knowledge that antibiotics kill bacteria

Time Estimate

15 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!
