Epigenetics Activity: Gene Expression Regulation

High School (NGSS Aligned) Teacher Guide

Overview

This guide supports implementation of the Epigenetics Activity: Gene Expression Regulation using the 5E instructional model.

Learning Objectives

- Students will model how DNA instructions become proteins
- Students will investigate how changes in DNA affect protein structure
- Students will explain the steps of gene expression

Standards Alignment

- **HS-LS1-1:** Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins
- **HS-LS3-1:** Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits

Prerequisites

- Basic understanding of DNA structure
- Knowledge of proteins and their importance
- Familiarity with mutations

Time Estimate

50-55 minutes

Materials Needed

- Computer/tablet with internet access
- Student Activity Sheet
- Codon wheel or table (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!
