Three Dimensional Learning Plan: **HS-LS3-2**

Grade Level: **High School**

Title	**Mutants Alive!**	Phenomenon/Problem	
Designed by	**Jaclyn Penney & Amanda Powers**	Course(s)	**Regents Living Environment**
Brief Learning Description	**This INCOMPLETE learning plan includes an outline of the tasks involved in inspiring student investigation of concepts relating to mutation and variation within replication and mitosis, meiosis, and as a result of environmental factors.**		

Desired Results

Performance Expectation(s)

HS-LS3-2: Inheritable Genetic Variation
Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. (Cause and Effect)

Summative Assessment

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
❑ Analyzing & Interpreting Data ❑ Asking Questions ❑ Constructing Explanations ❑ Defining Problems ❑ Designing Solutions ❑ Developing & Using Models ✓ **Engaging in Argument from Evidence** ❑ Mathematics & Computational Thinking ❑ Obtain, Evaluate, Communicate Information ❑ Planning & Carrying Out Investigations	✓ **LS3.B: Variation of Traits**	✓ **Cause & Effect** ❑ Energy & Matter ❑ Patterns ❑ Scale, Proportion & Quantity ❑ Stability & Change ❑ Structure & Function ❑ Systems & System Models

Activity 1			
Phenomenon or Problem	What will they do? The three dimensions woven together into a single learning performance.	Why is this important? How does this activity help build understanding of the anchoring phenomenon.	How will they do it? Graphic organizers, protocols, scaffolds, labs, mini-lesson, student discourse, etc.
Picture of Normal vs. Cancer Cells	Students explain the process involved that accounts for the difference. Ask questions about the differences between the cells	Students will understand how cell cycle control (and errors in DNA replication) determines whether cells reproduce normally or if they produce tumors.	- Develop a model
Formative Assessment What information are you collecting to know that they met the target?		•	

Activity 2			
Phenomenon or Problem	What will they do? The three dimensions woven together into a single learning performance.	Why is this important? How does this activity help build understanding of the anchoring phenomenon.	How will they do it? Graphic organizers, protocols, scaffolds, labs, mini-lesson, student discourse, etc.
Unlabeled Meiosis Diagram	• Ask questions about the diagram • Construct a model (noodles/pipe cleaners/pop beads) to demonstrate chromosome swapping during meiosis. • Construct an explanation of the effects of chromosome swapping on genetic variation.	Students will explore how meiosis is similar to and different from mitosis and focus on chromosome swaps.	- Students write questions individually - Teacher verbally scaffolds with reminders about past knowledge, CCCs - Students evaluate questions and share most relevant questions in small groups
Formative Assessment What information are you collecting to know that they met the target?		•	

Activity 3			
	What will they do? The three dimensions woven	Why is this important? How does this activity help	How will they do it? Graphic organizers, protocols,

Phenomenon or Problem	together into a single learning performance.	build understanding of the anchoring phenomenon.	scaffolds, labs, mini-lesson, student discourse, etc.
Meiosis Simulation Lab	Given 2 canine parent genotypes with alleles labeled and grouped on specific chromosomes, students must devise a model that explains how an offspring (puppy) may inherit a specific combination of alleles (that includes crossing over).	Students will understand the variety of possible gene combinations in parent gametes that are possible due to crossing over during meiosis.	- Cause and Effect Graphic Organizer
Formative Assessment What information are you collecting to know that they met the target?		•	

Activity 4			
Phenomenon or Problem	What will they do? The three dimensions woven together into a single learning performance.	Why is this important? How does this activity help build understanding of the anchoring phenomenon.	How will they do it? Graphic organizers, protocols, scaffolds, labs, mini-lesson, student discourse, etc.
Population Difference of sea turtles	Students will examine data tables that compare the number of turtles of each sex born under different temperature conditions.	Students will understand that environmental factors affect expression of traits and affect the probability of occurrences of traits in a population	- Patterns graphic organizer - Cause and Effect graphic organizer
Formative Assessment What information are you collecting to know that they met the target?		•	

Activity 5			
Phenomenon or Problem	What will they do? The three dimensions woven together into a single learning performance.	Why is this important? How does this activity help build understanding of the anchoring phenomenon.	How will they do it? Graphic organizers, protocols, scaffolds, labs, mini-lesson, student discourse, etc.
Frogs born with two heads, extra limbs, etc.	Students will examine maps that show the locations of chemical disposal facilities and compare them to locations where frogs with mutant characteristics have	Students will understand how chemicals and radiation can create mutations that lead to observable traits.	Environment Fitness Structure

	been found.		
 Formative Assessment What information are you collecting to know that they met the target?		•	
 Summative Assessment What information are you collecting to know that they met the target?		•	

Materials / Resources

Differentiation / Modifications