Phoenixville Area School District UbD Science Unit Plan

Grade Level: 8th Grade **Unit Name:** Heredity **Author:** A. Gottschall and D. Sylvan

Stage 1 Desired Results

Overarching NGSS & PA Standards:

3.1.6-8.L
Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

3.1.6-8.M
Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure

Transfer

Students will be able to independently use their learning to…

1. Ask questions and/or define problems
2. Develop and/or use models
3. Plan and/or carry out investigations
4. Analyze and interpret data using computational thinking
5. Obtain, evaluate, and communicate information (supported by evidence)
6. Construct explanations and design solutions

Meaning-Making

Students will understand that…

- Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.
- Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness of an ecosystem's biodiversity is often used as a measure of its health.
- Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling.
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
- Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each. Each distinct gene controls the production of proteins, which affects the traits of the individual. Mutations to genes can result in changes in traits.
- In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Some changes are beneficial, others harmful, and some neutral to the organism.
- Organisms reproduce either sexually or asexually and how these reproductive processes result in the transfer of genetic information to their offspring.
- Asexual reproduction results in offspring that are genetically identical while sexual reproduction results in offspring with genetic variation.

ESSENTIAL QUESTIONS
Students will keep considering...

How (and why} do organisms interact with their environment and what are the effects of these interactions?

What happens to ecosystems when the environment changes?

How are characteristics of one generation passed to the next?

How are the characteristics of one generation related to the previous generation?

How can individuals of the same species and even siblings have different characteristics?

and function of the organism. **3.1.6-8.N** Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. **3.1.6-8.U** Evaluate competing design solutions for maintaining biodiversity and ecosystem services. **Which branch(es) of science apply:** **LS**	• The inheritance of half of an offspring's genes from each parent and how this leads to variations in traits.	Why (How) do individuals of the same species vary in how they look, function and behave?
	Knowledge and Skills Acquisition	
	Students will understand that… • What the physical and biological components of an ecosystem are. • What factors influence the biodiversity of an ecosystem. • What biodiversity is and how it indicates the health of an ecosystem. • How humans benefit from biodiversity and how a lack of it can impact our resources. • How genes are transferred from parents to offspring. • What a dominant allele is compared to a recessive allele. • Understand that organisms can reproduce sexually or asexually. • How a Punnett square is designed and functions. • How mutations can lead to neutral, negative, and/or positive outcomes.	*Students will be skilled at…* • Inferring, based on data, what the health of an ecosystem is. • Identifying the impact of human actions on an ecosystem. • Modeling a healthy ecosystem. • Evaluate solutions to increasing ecosystem biodiversity. • Identifying organisms that reproduce sexually and asexually. • Determine the possible traits that are being passed down to offspring using a Punnett square. • Classify characteristics that can be passed down by both parents. • Determine what trait came from which parent. • Determine the consequences of a mutation.
	KEY VOCABULARY • Ecosystem • Biological • Biodiversity • Population • Resources • Decomposition • Invasive • Water Purification • Nutrient Recycling • Erosion • Homeostasis • Inheritance • Genes • Sexual reproduction • Asexual reproduction • Fertilization • Trait • Allele • Dominant • Recessive • Variation • Mutation	
Stage 2 – Evidence		
Evaluative Criteria	***Assessment Evidence***	

	PERFORMANCE TASK(S):	Differentiation Considerations:

What criteria will be used in each assessment to evaluate attainment of the desired results?
 	
Graded tests and quizzes.
 	
Pre-Assessment via online game (quizizz, kahoot! Etc).
 	
Mastery Path Progress
 	
Rubrics related to each.
	Projects, Labs, and Investigations:
	
	• Lab: Biodiversity kick-net from local stream.
	  ○ This lab will require a trip to a local stream (Pickering behind the YMCA) or water samples from a kick net.
	  ○ Students will use microscopes, a macro-invertebrate identification sheet, and a data sheet to identify organisms present in their sample.
	  ○ Determine which organisms require water quality with high/low dissolved oxygen, pH, nitrates, etc
	  ○ Analyze data to determine stream health.
	  ○ Infer how different events ie. Road salt in the winter would impact the stream.
	• Project: Rainforest Origins
	  ○ Students select an item from a list and research where its materials come from, how they were discovered, and how it is made. Examples include medicine, rubber, perfume (Ambergris)
	  ○ Present to class via PowerPoint, Song, Skit, etc.
	• Lab: Peppered Moth Lab
	  ○ Read article on the Peppered moth and watch the short documentary.
	  ○ Determine how the variation in coloring helps the moth survive forest fires.
	  ○ Discuss and hypothesize how albinism may hinder or help an organism.
	• Project: Plastic Oceans Documentary – Student made PSA videos
	  ○ After watching the documentary, students discuss places where they have found plastic litter.
	  ○ Keep a plastic journal for 1 week identifying places they've found plastic and the number of pieces observed.
	  ○ Students work in small groups to film and edit a video public service announcement about plastic waste. Videos may take the form of rap, song, dance, speaking, etc.
	• Lab: Ugly Baby – Use Punnett Squares and dice to determine dominant and recessive alleles.
	  ○ Student partners roll dice to determine whether they will pass on a dominant or recessive allele to their imagined offspring.
	  ○ By combining their dice roll with a partner they use a Punnett Square to determine the potential genotypes and identify the corresponding phenotypes.
	  ○ Students create a portrait of the offspring.
	• Project: Genetic Disorder Brochure
		Differentiation Considerations:
		
		Different modes of presentation
		
		• PowerPoint
		• poster
		• Student choice
		
		Use of notes and resources
		
		Chunked Assignment
		
		Adapted Assessment
		
		Chunked Assignment
		
		Checklists

	○ Students are given a short overview of common genetic disorders and the choice to pick one of interest for this research project. ○ Students create a presentation that describes the genetic cause of the disorder, how it affects the individual, and possible treatmen. Alternative Projects/Labs/Presentations: • Project: Homeostatic aquariums (snail, photosynthetic, bacteria)	
What criteria will be used in each assessment to evaluate attainment of the desired results? What criteria will be used in each assessment to evaluate attainment of the desired results? Graded tests and quizzes. Pre-Assessment via online game (quizizz, kahoot! Etc). Mastery Path Progress	OTHER EVIDENCE: Teacher Summative: • Ecosystems, Biodiversity, Natural Resources • Genes, Reproduction, Mutations Common Summative: • Unit Test Participation in hands-on labs a. Checklists of collaborative behaviors in labs and activities Science Notebook/Portfolio a. Concept maps b. Vocabulary/Glossary entries c. Guided Research d. Lab Reports described above e. Daily Journal Entries Checklists of collaborative behaviors in class discussions Self-assessments for Performance Tasks	Differentiation Considerations: Differentiation Considerations: Adapted/Modified Quizzes Homogeneously grouped labs to allow for teacher support Pictures to support vocabulary Flexible grouping Peer Mentors Guided Notes/Printed PowerPoint Slides Pictures and videos to support vocabulary Sentence Starters Product modification in place of writing: • Drawing • Verbal explanation

Rubrics related to each.	Class Participation	