StoryMap: Camouflage, Climate, and The Code of Life

Middle School Life Science

Camouflage, Climate, and The Code of Life investigates how genetic variation and environmental change shape the survival of organisms over time. Centered on the snowshoe hare, this unit engages students in modeling, data analysis, and systems thinking to explore predator-prey dynamics, gene expression, and natural selection. Aligned with NGSS standards LS2-4, LS3-1, LS4-4, and LS4-6, students develop a deeper understanding of how traits emerge, shift, and evolve within real-world ecosystems.

🎯 End Goal

Students explain how genetic variation in fur color and molt timing leads to differences in survival, and how environmental changes like climate affect natural selection. Story's Driving Question:

- **"How do predator-prey dynamics and seasonal changes act as selective pressures that shape traits in populations over time?"**

🌱 Starting Phenomenon

Students examine a photo or video of a white and brown snowshoe hare sitting on bare brown ground— the white clearly visible to predators. (https://www.youtube.com/watch?v=NwZzmTuhs3M from 0:51 to 0:57)

Students might respond with ideas about camouflage, fur, predators, and weather—but won't know about **genes or selection yet**. That's your launch point.

🧩 Learning Progression

#	Question Progression	Concept Focus	Investigations	Standards
1	What happens when camouflage fails?	Predator-prey relationships & survival	Video of lynx vs. hare, predator-prey simulation, discuss seasonal survival	MS-LS2-4
2	Why do hares change color at all?	Environmental signals & adaptation	Time-lapse of molting, day length, melatonin intro	
3	What causes fur color to change?	Gene expression & protein synthesis	Build models: DNA → RNA ⇢ Protein → Pigment	MS-LS3-1
4	Why don't all hares molt at the same time?	Genetic variation in populations	Trait sorting activity; intro to alleles & gene regulation	MS-LS4-4
5	Who survives and why?	Natural selection & selective pressures	Survival simulations with snow vs no snow; data analysis	MS-LS4-4 MS-LS4-6
6	What happens over time?	Evolution of populations	Graph trait frequencies across generations	

7	How are genes and ecosystems connected?	Systems thinking & transfer	Students create models that connect climate ⇢ gene expression ⇢ camouflage ⇢ selection	MS-LS2-4 MS-LS3-1 MS-LS4-4 MS-LS4-6

Standards Alignment

Standard	SEP	CCC	Why it Fits
MS-LS2-4 *Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.*	**Engaging in argument from evidence** Data (climate = physical change; fur = population effect)	**Stability and change** Environmental disruption (climate change) causes population shifts	Students connect climate-induced camouflage mismatch to population change, using ecosystem thinking
MS-LS3-1 *Develop and use a model to describe that genes are located in chromosomes, and they control the production of proteins, which in turn affect traits of organisms.*	**Developing and using models** (DNA ⇢ RNA ⇢ protein → pigment)	**Structure and function** Traits result from molecular structures and interactions	Students explain why hares with certain molt timing survive better, using simulation data and trait models
MS-LS4-4 *Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing.*	**Constructing explanations** based on evidence	**Cause and effect** Trait variation ⇢ survival differences ⇢ trait frequency changes	Students explain why hares with certain molt timing survive better, using simulation data and trait models
MS-LS4-6 *Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.*	**Using mathematics and computational thinking** (Graphing survival or trait frequency over generations)	**Patterns** Trait frequency data reveals evolutionary trends	Students analyze survival data and create trait frequency graphs to explain how populations evolve

Vocabulary Anchor List

- ☐ Camouflage
- ☐ Melanin
- ☐ Trait
- ☐ Gene
- ☐ Protein Synthesis
- ☐ Genetic Variation
- ☐ Natural Selection
- ☐ Selective Pressure