Unit 6 - Natural Selection

Content Area: **Science**
Course(s):
Time Period: **Full Year**
Length: **Full Year**
Status: **Published**

Unit Overview

In this unit, students connect ideas about how the environment determines which traits are adaptive and non-adaptive, and how this affects the likelihood of survival and reproduction, to form an understanding of natural selection. The rough-skinned newt phenomenon motivates students to figure out concepts, such as variation, differential rates of survival and reproduction, adaptive traits, and mutations. By relating these ideas to changes in populations, students are challenged to think more deeply about why the distribution of traits in a population can change over time. Students' hands-on role as student biologists adds a sense of responsibility and curiosity to this unit and inspires active, student-led learning in the classroom.

Enduring Understandings

A population can be described by the traits present and by the number of individuals who have each trait. The number of individuals with each trait in a population can change over time.
Over many generations, individuals with adaptive traits become more common in a population, while individuals with non- adaptive traits become less common. Whether or not a trait is adaptive depends on the environment.
Genes are instructions for making protein molecules and protein molecules determine an organism's traits. Individuals inherit their genes from their parents. Genes, and therefore traits, in a population are passed down from generation to generation.
Mutations are changes to genes that can lead to changes to protein molecules, which can result in changes to traits. Mutations to genes can sometimes introduce new traits into a population. A new trait will only become more common in a population if it is adaptive.

Essential Questions

Why do populations change over time?
How can we describe a population?
What makes the distribution of traits in a population change?
How do individuals in a population get their traits?
How do some traits become more common over many generations while others become less common?
How do new traits appear in populations?
What determines whether a new trait will become more common in the population?

Learning Objectives

A population can be described by the traits present and by the number of individuals who have each trait.

The number of individuals with each trait in a population can change over time.
Over many generations, individuals with adaptive traits become more common in a population, while individuals with non-adaptive traits become less common.
The traits that exist in a population determine which traits can become more common over many generations.
Whether or not a trait is adaptive depends on the environment.
Biologists analyze data about environmental conditions (the causes) to explain changes in the distribution of traits in populations (the effects).
Genes are instructions for making protein molecules and protein molecules determine an organism's traits.
Individuals inherit their genes from their parents. Genes, and therefore traits, in a population are passed down from generation to generation.
Individuals with adaptive traits are more likely to live longer and have offspring; individuals with non-adaptive traits are more likely to die without having offspring.
Mutations are changes to genes that can lead to changes to protein molecules, which can result in changes to traits.
Mutations to genes can sometimes introduce new traits into a population.
A new trait will only become more common in a population if it is adaptive.
Use the Sim and explore variation in populations and test when traits will become common.
Use a physical model of variation in a population, and analyze histogram evidence about the newt population.
Correct alternate conceptions represented in a short comic strip and represent their own ideas by creating visual models.
Use a physical model to investigate reproduction and traits, and use the Sim to investigate how adaptive traits affect survival and reproduction.
Read an article that describes scientists' research on poisonousness as an adaptive trait.
Correct the explanations in two more short comic strips and create visual models to represent their explanations.
Read about mutations and how they can cause new traits to appear in populations.
Investigate mutations in the Sim and correct one more misconception in a comic.
Make a final visual model and write a final explanation of what made the newts become so poisonous.

Standards: Content

MS-LS3-1	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 and function of the organism.
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 in a specific environment.
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.

Standards: Interdisciplinary

Assessment Evidence

Formative	Teacher observations, Class discussions, Lab Activities, Key concepts and vocabulary quizzes, Warm Ups, Open Ended Responses, Modeling, Simulations, Innovators Monthly Research
Summative	In correlation with the NJSLS, students must demonstrate the following as summative assessments: MS-LS3-1. 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 and function of the organism. MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increases some individuals' probability of surviving and reproducing in a specific environment 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 Other summative assessments will include but are not limited to: lesson activities, summative tests, lab skills, demonstrations, and vocabulary quizzes
Alternative & Benchmark	Alternative assessments as required by student IEP/504/I&RS - Read to the student and chart oral responses. Word banks, sentence frames, oral responses, graphic organizers, observations, and anecdotal notes. Benchmark – LinkIt Benchmark Assessment, Teacher Generated Assessments
Assessment Evidence Resource	

Instructional Resources

Smartboard, Computers, Websites and digital interactives/models, Multi-media presentations, Video Streaming, Amplify Digital Curriculum, Generation Genius, BrainPop, Mystery Science, Microsoft 365, Primary and Secondary Source Documents, Lab Materials as needed, Amplify Readings, Labs, Simulations

Instructional Resource List

Curricular Mandates

Below are the curricular requirements as defined in NJ Administrative Code and Statute

	Amistad		Diversity, Equity, and Inclusion
	Holocaust		LGBT and Disabilities (Grades 6-12)
	Climate Change		Asian American & Pacific Islander

Social Emotional Learning (SEL) Competencies

NJ Social and Emotional Learning Competencies & Sub-Competencies

	Self-Awareness		Relationship Skills
X	Responsible Decision-Making		Social Awareness
	Self-Management		

21st Century Skills & Themes

X	Global and Cultural Awareness	X	Technology Literacy		Planning and Budgeting
X	Creativity and Innovation		Financial Institutions		Risk Management and Insurance
X	Information and Media Literacy		Digital Citizenship		Economic and Government Influences
X	Critical Thinking and Problem Solving		Credit Profile		Career Awareness and Planning
	Civic Financial Responsibility		Financial Psychology		