Module 3: Traits and Heredity

Core Ideas: LS3 Heredity: Inheritance and Variation of Traits
LS4: Biological Change: Unity and Diversity

Prerequisite Learning: K.LS3.1, 2.LS3.1, 3.LS4.1, 3.LS4.2, 4.LS4.1

Percent of Time: 16%

Standard	Questions and Phenomenon Prompts	Module Vocabulary	Teacher Background/ Clarification Statement
5.LS3.1 Distinguish between inherited characteristics and those characteristics that result from a direct interaction with the environment. Apply this concept by giving examples of characteristics of living organisms that are influenced by both inheritance and the environment. **Learning Targets:** • Understand that an inherited trait or characteristic is coded in an organism's DNA and will be passed on to offspring. (eye color, tongue rolling, building a nest or web, flower color…). • Understand that an acquired trait or characteristic cannot be passed on to offspring. (scars, missing a leg, plants being trimmed to grow in a shape…). • Identify physical and behavioral inherited characteristics and those that are environmental and acquired physical and behavioral characteristics. • Identify environmental factors can affect some characteristics of organisms (examples: climate, disease, light, temperature, food supply…). Evaluate when an organism can be influenced by both inheritance and the environment (Examples: A person is born with a certain skin color but spends a lot of time in the sun and darkens the skin, a plant would normally be tall but it is deprived of water and sunlight so it is very small…) **Crosscutting Concepts:** • **Cause and Effect-** Cause and effect relationships are routinely identified and used to explain change.	Are there physical things that you inherited from your parents? What are some physical traits that you have acquired over time that your parents do not have? How can you change a characteristic you inherited so that it is both inherited and acquired?	Adaptation Inherit Trait Offspring Reproduce Learned trait Instinct Environment Variation Mutation Organism Species	An organism's appearance is the result of both environment and inheritance. Example: plants which have inherited a green leaf color from their parents may appear white if they grow in the absence of sunlight. Students should use both the terms characteristics and traits, however characteristics will be more widely used in assessments.

Science and Engineering Practice: • **Engaging in argument from evidence-** Students create and identify evidence-based arguments and consider whether an argument is supported by evidence or relies on opinions or incomplete representations of relevant evidence.			
5.LS3.2 Provide evidence and analyze data that plants and animals have traits inherited from parents and that variations of these traits exist in a group of similar organisms. **Learning Targets:** • Understand offspring acquire a mix of traits from their parents and different offspring vary in how they look and function because they have different inherited information. • Organize data to show traits of plant and animal parents, traits of plant and animal offspring, and variations in similar traits in a grouping of similar organisms. • Describe patterns in data to show similarities in the traits of a parent and the traits of an offspring (ex: short plants typically have short offspring, siblings often resemble each other), and that this provides evidence that traits are inherited. • Identify differences in data where groups of similar organisms have differences of trails (ex: a litter of puppies can have different colorings and sizes, pumpkins come in different colors and sizes). **Crosscutting Concept:** • **Patterns-** Students use patterns as evidence in an argument or to make predictions, construct explanations, and engage in arguments. **Science and Engineering Practice:** • **Analyzing and interpreting data-** Students should organize data (observations and measurements) in a manner which facilitates further analysis and comparisons.	Why do individuals of the same species vary in how they look, function, and behave? If a kitten inherits its traits from its parents, then why doesn't it look exactly like the mother? What are some traits in plants that you have seen? How are plants of the same species similar to one another? How do their traits vary?		Inheritance explains that offspring look similar but not identical to parents and that variation exists in a group of related organisms. Discussions about prediction of traits are beyond the scope of this standard.

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5.LS4.2 Use evidence to construct an explanation for how variations in characteristics among individuals within the same species may provide advantages to these individuals in their survival and reproduction.

Learning Targets:

- Identify differences in characteristics between individuals of the same species that provide advantages in surviving, finding, mates, and reproducing (example- a fish that has coloring closer to the color of the rocks it lives in is less likely to be eaten and more likely to survive and reproduce to make more fish with the same coloring, or a plant that has larger thorns than other plants may be less likely to be eaten).
- Explain and communicate the cause and effect relationship of the potential benefits of a given variation of a characteristic for a plant or animal (moths that are lightly colored blend in with light colored trees, where dark moths would stand out. If the environment changes so the bark of trees becomes dark then the light-colored moths would stand out).

Crosscutting Concepts:

- **Stability and Change-** Students begin to describe changes in terms of time over which they occur.

Science and Engineering Practice:

- **Obtaining, evaluating, and communicating information-** (O/E) Students can read and summarize text and embedded, non-text elements from multiple sources synthesizing an understanding on a scientific idea. (C) Students can communicate scientific information in writing utilizing embedded elements.

How do variations in characteristics among organisms help them survive?

What are some favorable variations in traits that help organisms survive and reproduce?

Are mutations in traits a good or a bad thing?

Observe a video of the phenomenon of a chameleon changing colors. How does a chameleon's changing skin help it survive?

Students should understand that some variations of a trait may have benefits over other variations. Students should recognize that the effect of a particular variation of a trait causes an increased likelihood of an organism's survival and reproduction.

This process, known as natural selection, favors certain traits in a population and suppresses others. Example: Rose bushes with longer thorns are less likely to be eaten, therefore, the variation of longer thorns will be passed down to offspring.