

<b>Time Frame:</b> Feb-Apr	<b>Unit Title:</b> Inheritance and Evolution: Melanin Storyline and Case Study	<b>Course Name:</b> Biology (CP and honors)
<b>Stage 1 - Desired Results</b>		
<b>Established Goals</b> NGSS performance expectations (HS-LS) LS1-1: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. LS3-2: 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	<b>Transfer</b>	
	<i>Students will be able to independently use their learning to...</i>  analyze the genetic mechanism, phenotypic expression, evolutionary change, and ecological implications of a mutation in an unfamiliar organism.	
	<b>Meaning</b>	
	<b>UNDERSTANDINGS</b> <i>Students will understand that....</i> All cells contain genetic information in the form of DNA molecules. DNA is organized in cells into chromosomes. Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Differences in DNA are passed from parents to offspring through patterns of inheritance, meaning that differences in traits are also inherited. Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation	<b>ESSENTIAL QUESTIONS</b> <i>Students will keep considering...</i>  How do traits occur in organisms? What makes one trait different from another trait? How are proteins used by organisms? How do genotype and phenotype impact evolution by natural selection?  Where do different traits come from? How do traits change over time?

<p>replication, and/or (3) mutations caused by environmental factors.</p> <p>LS3-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.</p> <p>LS4-2: Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.</p> <p>LS4-3: Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms</p>	<p>and distribution of traits observed depends on both genetic and environmental factors.</p> <p>Evolution by natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. Evolution by natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. Adaptation also means that the distribution of traits in a population can change when conditions change.</p>	
	<p style="text-align: center;"><b>Acquisition</b></p>	
	<p><i>Students will know...</i></p> <ul style="list-style-type: none"> <li>- basic structure of DNA, RNA, and proteins</li> <li>- how DNA is transcribed into RNA and how RNA is translated into amino acids of protein</li> <li>- features of Punnett squares and pedigrees</li> <li>- the requirements for evolution by natural selection: variation, inheritance, and differential survival/reproduction</li> </ul>	<p>Students will be skilled at...</p> <p>8 science &amp; engineering practices (NGSS)</p> <ul style="list-style-type: none"> <li>● Asking questions and defining problems</li> <li>● Developing and using models</li> <li>● Planning and carrying out investigations</li> <li>● Analyzing and interpreting data</li> <li>● Using mathematics and computational thinking</li> </ul>

<p>lacking this trait.  LS4-4: Construct an explanation based on evidence for how natural selection leads to adaptation of populations.</p>		<ul style="list-style-type: none"> <li>• Constructing explanations and designing solutions</li> <li>• Engaging in argument from evidence</li> <li>• Obtaining, evaluating, and communicating information</li> </ul> <p>Explain and demonstrate how the structure of DNA determines the structure of proteins through transcription and translation.</p> <p>Use mathematical representations to show and analyze genetic diversity.</p> <p>Ask questions to clarify relationships about the role of DNA and chromosomes for passing traits from parents to offspring.</p> <p>Defend a claim with evidence about the origin of genetic traits.</p> <p>Apply statistics and probability to explain variation and distribution of traits.</p> <p>Construct an explanation based on evidence that the process of evolution by natural selection results from variation in a trait, inheritance of the trait, and differential survival and/or reproduction because of the trait.</p> <p>Apply statistics and probability to explain how organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking the trait.</p> <p>Explain with evidence how evolution by natural selection leads to adaptation of populations.</p>
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