



Grade 7 Science - Unit 2 - Genetics

Unit Focus

Through the examination of several natural phenomena related to the evolution of adaptation in organisms, students will craft evidence-based explanations for traits that enable organisms to survive in their environment. Students will engage in a variety of simulations and examine case studies as they uncover the principles of natural selection that result in large variety of differences within and between species. As a foundation to this study, students will learn the basics about the genetic code and how sexual & asexual reproduction and genetic mutation give rise to the variations that are crucial for the success of populations.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Next Generation Science Standards Performance Expectations: Middle School Life Sciences <ul style="list-style-type: none">Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. (MS-LS1-4)Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. (MS-LS1-5)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-LS3-1)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. (MS-LS3-2)Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. (MS-LS4-1)Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern	<i>Students will be able to independently use their learning to...</i> T1 Analyze qualitative and quantitative data to interpret patterns, draw conclusions, and/or make predictions. T2 Evaluate scientific claims and analyze issues to verify the credibility of the source, data, and/or approach.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 Species can change over time in response to changes in environmental conditions through natural selection acting over generations. Traits that support successful survival and reproduction in the new environment become more common. U2 Natural and artificial selection results from certain traits giving some individuals an advantage in surviving and reproducing, leading to predominance of certain genetic traits in a population. U3 Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed adult anatomy. U4 The fossil record and comparisons of anatomical similarities between organisms suggests lines of evolutionary descent. U5 The fossil record chronologically documents the existence, diversity, evolution, and extinction of many life forms and their environments through Earth's history. U6 Genetic information can be altered because of mutations, which may result in beneficial, negative, or no change to the proteins and traits of an organism.	<i>Students will keep considering...</i> Q1 How do different methods of reproduction affect the genetic makeup of offspring? Q2 What factors influence the traits of an organism, and how do those traits affect its success in an environment? Q3 In what ways do inherited traits and environmental conditions interact to shape how organisms grow, survive, and thrive? Q4 What evidence do we have that living organisms have changed over time, and what does it reveal about their evolutionary relationships? Q5 How do humans impact the traits of other organisms through science and technology?

Stage 1: Desired Results - Key Understandings

<p>organisms and between modern and fossil organisms to infer evolutionary relationships. (MSLS4-2)</p> <ul style="list-style-type: none"> Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. (MS-LS4-3) 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-LS4-4) Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. (MS-LS4-5) Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. (MS-LS4-6) 	<p>U7 In sexual reproduction, each parent contributes half of the genes acquired by the offspring resulting in variation between parent and offspring.</p> <p>U8 Organisms inherit chromosomes from their parents containing genes that code for different proteins which affect an individual's traits.</p> <p>U9 Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring.</p> <p>U10 Animals engage in behaviors that increase the odds of reproduction.</p> <p>U11 Animal and plant growth is affected by both genetic and environmental factors.</p> <p>U12 Organisms and populations are dependent on their environmental interactions both with other living things and with nonliving factors, any of which can limit their growth.</p>	
<p>Madison Public Schools Profile of a Graduate</p> <ul style="list-style-type: none"> Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2) 	<h3 style="text-align: center;">Acquisition of Knowledge and Skill</h3>	
	<h4 style="text-align: center;">Knowledge</h4>	<h4 style="text-align: center;">Skill(s)</h4>
	<p><i>Students will know...</i></p> <p>K1 Plants and animals have special structures and behaviors that help them reproduce successfully.</p> <p>K2 An organism's growth is influenced by both its genes (inherited traits) and environmental factors (like sunlight, water, and nutrients).</p> <p>K3 Genes are instructions found on chromosomes that determine inherited traits.</p> <p>K4 Sexual reproduction can cause a mutation in a gene that may be helpful, harmful, or have no effect on an organism.</p> <p>K5 In asexual reproduction, the offspring are genetically identical to the parent.</p> <p>K6 In sexual reproduction, offspring inherit a mix of genetic material from both parents, which causes genetic variation.</p> <p>K7 The fossil record shows patterns of life on Earth, including evolution, extinction, and changes in species over time.</p> <p>K8 Embryos of different animals can look very similar in early stages, showing evolutionary relationships not visible in adult organisms.</p>	<p><i>Students will be skilled at...</i></p> <p>S1 Explaining how traits and behaviors help plants and animals reproduce.</p> <p>S2 Describing how both genes and the environment affect how organisms grow.</p> <p>S3 Using evidence to explain how changes in genes (mutations) can affect an organism.</p> <p>S4 Modeling how sexual and asexual reproduction lead to different types of offspring.</p> <p>S5 Reading and interpreting fossil evidence to understand how life on Earth has changed over time.</p> <p>S6 Comparing body structures of living and fossil organisms to find similarities and differences.</p> <p>S7 Looking at embryo pictures to find patterns that show relationships between species.</p>

Stage 1: Desired Results - Key Understandings

K9 Genetic differences (variations) in a population affect how well individuals survive and reproduce in a given environment.

K10 Natural selection is the process where traits that help survival become more common over time.

K11 Humans use selective breeding and genetic technologies to change traits in plants and animals.

K12 Data and graphs can be used to show how trait frequencies in a population increase or decrease over generations.

K13 Natural selection is the process that explains how certain traits in populations arose.

K14 When an organism has a favorable variation/trait that makes them more likely to survive to reproduce and pass on the genes for this trait, it is likely that the trait will become more common in a population.

K15 When environments change, sometimes a trait becomes more favorable and thereby becomes more common in the population over time.

K16 Sexual reproduction is primarily responsible for variation in populations because it scrambles the genes in a person and then combines these genes with another.

K17 Genetics Vocabulary: breed, probability, pollen, flower, petal, seed, fruit, nectar, germination, pollination, meiosis, mitosis, sexual and asexual reproduction, genes, chromosomes, natural selection, evolution, genetic diversity, population, variations, fitness of genes, adaptation (Structural/ Behavioral), mutation, genetic code, genotype, phenotype, homozygous, heterozygous, heredity, DNA, trait, Punnett Square, ratio, Pedigree, ancestry, dominant trait, recessive trait, allele, zygote, gamete, development, extinct, plumage, homologous, embryo, mutations, Homologous, analogous, diversity, unicellular, multicellular, Natural selection, artificial selection, evolution, adaptation and proteins.

S8 Explaining how having different traits can help some individuals survive and reproduce better.

S9 Describing how people use technology to change traits in plants and animals.

S10 Using graphs or numbers to show how certain traits become more or less common in a population over time.

S11 Building models to show how traits are inherited and passed on.

S12 Gathering and sharing information to explain how traits and survival are connected.