

**LS3: Heredity:
Inheritance and Variation of Traits
LS3.A: Inheritance of Traits**



1st Grade	3rd Grade	7th Grade	Biology
<p>Young animals are very much, but not exactly like, their parents.</p> <p>Plants also are very much, but not exactly like their parents.</p>	<p>Many characteristics of organisms are inherited from their parents.</p> <p>Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment.</p>	<p>Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual.</p> <p>Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits.</p> <p>Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.</p>	<p>Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA.</p> <p>The instructions for forming species' characteristics are carried in DNA.</p> <p>All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways.</p> <p>Not all DNA codes for protein, some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known functions.</p>

**LS3: Heredity:
Inheritance and Variation of Traits**
LS3.B: Variation of Traits



1st Grade	3rd Grade	7th Grade	Biology
<p>Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.</p>	<p>Different organisms vary in how they look and function because they have different inherited information.</p> <p>The environment also affects the traits that an organism develops.</p> <p>In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other.</p>	<p>In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations.</p> <p>Though rare, mutations may result in changes to the structure and function of proteins.</p> <p>Some changes are beneficial, others harmful, and some neutral to the organism.</p>	<p>In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation.</p> <p>Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which also cause mutations in genes, and variables in mutations are also inherited.</p> <p>Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in the population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors.</p>