

Genetics: Learning Goals for Students and Teachers

Overarching learning goal: In sexually reproducing organisms, offspring exhibit traits they inherit from their parents' genes.

Student and Teacher Learning Goals	Additional Teacher Learning
<ol style="list-style-type: none"> 1. Offspring may exhibit the same trait as one parent or the other rather than a blending of both parents' traits. 2. Some traits mask or cover up other traits. The traits that mask other traits are called <i>dominant traits</i>. The traits that are covered up are called <i>recessive traits</i>. <ol style="list-style-type: none"> a. Recessive traits that don't appear in one generation because a dominant trait is masking them may be unmasked and reappear in the next generation. b. A <i>pedigree</i> is a helpful tool for tracking the pattern of trait expression across multiple generations of a family. 3. Sexually reproducing organisms have two sets of genes, one of which is inherited from each parent. <ol style="list-style-type: none"> a. Genes are found at specific locations on strands of DNA in chromosomes and move with the chromosomes. b. Different forms of the same gene are called <i>alleles</i>. Different alleles provide instructions for variations of a trait. c. Some alleles are dominant, which means they override any other instructions for a trait, and offspring will exhibit the dominant trait no matter what other allele is present. d. Offspring will exhibit a recessive trait only if they inherit two recessive alleles—one from each parent. 4. By understanding the movement of chromosomes (and the genes located on them) when egg and sperm are produced and unite to make a new individual, inheritance patterns can be described and predictions made regarding the likelihood of certain traits appearing among offspring. <ol style="list-style-type: none"> a. The <i>Punnett square</i> is a helpful tool for visualizing the separation of parents' alleles and representing the possible combinations of alleles in offspring. 5. There is a cause-and-effect relationship between the genes transmitted from parents to offspring and the resulting genetic variations appearing in each generation. 	<ol style="list-style-type: none"> 3Ta. A <i>gene</i> is a distinct sequence of nucleotide bases found at a specific location on a DNA strand in a chromosome. 3Tb. Most genes code for proteins that form the structures or trigger the chemical reactions that result in a particular trait in an organism. 3Tc. Alleles of a particular gene have slight variations in the DNA sequence. These variations may result in different proteins and thus change the trait associated with the gene. 4Ta. Most genes have more than two possible alleles, although any one individual can have at most two different alleles for a gene. 4Tb. One allele may not be completely dominant in relation to another allele. In this case, three variations of the trait will appear: two extremes with an intermediate trait between them. 4Tc. Two alleles may be equally dominant. In this case, three variations of the trait may appear: two individual variations, and a third variation in which both of the other variations are expressed codominantly. 4Td. Many different genes, with all their allele variations, control most traits, such as height, skin color, and intelligence. This results in continuous variations across a large range of traits.