

Variation in Traits: Learning Goals for Students and Teachers

Overview: The unit central question is *Do all of the mice living in the same environment, such as a field or forest, have an equal chance of surviving?* In lesson 1, students explore similarities and differences among organisms of the same kind. In lesson 2, students explore trait variation in plants. In lesson 3, students explore the effects of trait variations on an organism’s ability to survive longer in its environment. In lessons 4 and 5, students investigate how trait variation and environment affect which organisms in a population are most likely to survive and reproduce. In lesson 6, students consider why offspring look similar to, but not exactly like, their parents. In lesson 7, students use everything they’ve learned to explain the impact of trait variation and environment on the ability of an organism to survive long enough to reproduce.

Student and Teacher Learning Goals	Additional Teacher Learning
1. The traits of individuals of the same kind of plant or animal can vary.	1Ta. Traits in organisms include physical, behavioral, and molecular traits, as well as chemical and developmental pathways.
2. Organisms inherit many traits from their parents.	2Ta. One reason groups of organisms share so many features is common ancestry. 2Tb. Among sexually reproducing organisms, offspring receive one copy of a gene from each parent. Random chance determines which of the parents’ genes the offspring will receive. This accounts for most of the variation among organisms in a population. 2Tc. Random changes or mutations in DNA can also cause trait variations among sexually reproducing organisms.
3. Within a species, trait variations affect which individuals of the same kind survive long enough in their environment to produce young.	3Ta. Natural selection is a nonrandom process that is the result of the following factors: <ol style="list-style-type: none"> 1. Variation among individuals in a population 2. Inheritance that produces trait variations among offspring 3. Selection of offspring that are better equipped to compete for limited resources and, thus, are more likely to survive and reproduce 4. Adaptation as the frequencies of traits and the genes that code for those traits change within a population over time (See NGSS MS-LS4-4, MS-LS4-6, HS-LS3-2, and HS-LS3-3.)
4. Trait variation and the environment affect which plants or animals of the same kind survive long enough to reproduce and, thus, which trait variations become more common in the next generation.	4Ta. Several lines of evidence support evolution, including the fossil record, structural similarities, and biogeography.