Learning Set 2 Question: *Why do some trait variations sometimes become more common?*

Scientific Principles

- **Selective breeding can change successive generations so that individuals appear very different from their ancestors because of three mechanisms: 1) random selection of alleles passed on through meiosis, 2) intentional selection of mates and 3) intentional selection of who to remove from the population.**
- **Natural selection tends to increase the proportion of individuals that have advantageous traits for a particular environment; it occurs when there is some variation in the heritable traits within a population and when some of those traits give individuals a competitive advantage over others for surviving and reproducing.**
- **The mechanisms of sexual reproduction can result in some alleles being passed on more frequently than others to each new generation (genetic drift).**
- **Because of genetic drift chance alone can result in the disappearance alleles from a gene pool over time.**
- **Genetic drift typically causes smaller populations to lose diversity from their gene pools more quickly than larger populations.**

Lesson Question	Learning Performances in the Activity	Evidence that students evaluate	What students should know	Vocabulary to post	Learning Performances in the Homework
Activity 7 How Can Selective Breeding Change Populations?	Identify two forms of intentional selections in selective breeding (who to breed and who to remove from a population). Explain how meiosis yields a new random sorting of alleles for a gene into each sex cells for every new offspring. Describe how the the interaction of meiosis and intentional selections of individuals when repeated over and over again in each new generation of offspring, help shift trait combinations in a population toward a desired outcome.	Output of a four person participatory simulation from a model of selective breeding. Two historical examples of selective breeding in dogs and maize.	Selective breeding can change successive generations so that individuals appear very different from their ancestors because of three mechanisms: 1) random selection of alleles passed on through meiosis, 2) intentional selection of mates and 3) intentional selection of who to remove from the population.	*Purebred* *Selective breeding* *domestication*	Identify two forms of intentional selections in selective breeding (who to breed and who to remove from a population).

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Activity 8 How Does Nature Select For Some Trait Variations Over Others?	Compare the selection mechanisms in natural selection with those in selective breeding. Describe why natural selection requires trait variation in a population. Describe how natural selection mechanisms preferentially, but not intentionally, select individuals with specific trait variations to survive or reproduce more frequently than others.	Model runs and population graphs from experiments with a simple producer & consumer ecosystem model under different environmental conditions. A historical example of pesticide resistance in insects.	Natural selection tends to increase the proportion of individuals that have advantageous traits for a particular environment; it occurs when there is some variation in the heritable traits within a population and when some of those traits give individuals a competitive advantage over others for surviving and reproducing.	*Natural selection* *resistant*	Explain how when the environment changes, natural selection can lead to populations particularly well suited to surviving in that new environment.

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Activity 9 How Do Random Selection Events Alone Change Gene Pools?	Explain why a population may show only one trait variation in a given generation, yet have two alleles for the variations of that trait in its gene pool. Describe how alleles change in frequency in a gene pool through sexual reproduction. Explain why it is likely that one of two alleles for a trait will often be lost from a gene pool in a small population that reproduce for many generations at about the same carrying capacity.	Model runs and populations graphs from experiments with fish tank populations.	The mechanisms of sexual reproduction can result in some alleles being passed on more frequently than others to each new generation (genetic drift) Because of genetic drift chance alone can result in the disappearance alleles from a gene pool over time.	*Genetic drift*	Explain how geographic barriers would contribute to offspring populations that look very different from one another, each less diverse than their ancestor population.

Lesson Question	Learning Performances in the Activity	Evidence that students evaluate	What students should know	Vocabulary to post	Learning Performances in the Homework
Activity 10 How do population sizes and barriers affect genetic drift?	Explain why genetic drift always will tend to result in more similar individuals over time in a populations even though the specific similarity is difficult to predict. Compare the rate of genetic drift in different population sizes. Predict and test how barriers contribute to the effects of genetic drift and lead to the fragmentation of gene pools.	Model runs and populations graphs from experiments with fish tank populations of different sizes and when geographic barriers are added. Cases of studies of founder effects and population bottle necks in cheetahs and the Amish population.	Genetic drift typically causes smaller populations to lose diversity from their gene pools more quickly than larger populations.	*Population bottleneck* *Founder effect* *Geographic Isolation*	Describe the causes and outcomes of the founder effect. Identify some environmental interactions that might lead to a population bottleneck.