Lab-wide Learning Outcomes for Genetic Drift and Bottlenecked Ferrets

Knowledge-Based Outcomes

Upon completion of *Genetic Drift and Bottlenecked Ferrets*, students should be able to:

1. Explain how random sampling error causes evolution by genetic drift (a change in allele frequencies across generations).
2. Contrast the effects of random sampling on both large and small populations.

Students should reduce their expression of the following misconceptions:

1. Genetic drift only occurs in small populations.
2. Genetic drift only occurs after an event that reduces the population size.
3. Genetic drift's random nature makes predicting its effects impossible.
4. Genetic drift is directional and leads to greater fitness.
5. Genetic drift is not directional and therefore is not a mechanism of evolution.

Skills-Based Outcomes

Upon completion of *Genetic Drift and Bottlenecked Ferrets*, students should be able to:

1. Evaluate how random sampling error across generations will affect genetic variation both within and among populations.

Genetic Drift and Bottlenecked Ferrets, Part 1: Luck of the Draw

Knowledge-Based Outcomes

Upon completion of *Part 1: Luck of the Draw*, students should be able to:

1. Define "allele frequency".
2. Describe the effects either a founding or bottlenecking event could have on the genetic diversity within a population.

Genetic Drift and Bottlenecked Ferrets, Part 2: Random Mating

Knowledge-Based Outcomes

Upon completion of *Part 2: Random Mating*, students should be able to:

1. Define "gene pool" and describe its relationship to a population's allele frequencies.
2. Explain why the allele frequency in a small number of zygotes may be different than the allele frequency in the parent population.
3. Using the idea of random sampling, compare allele frequencies among offspring in a population to those of founding populations, and explain how these frequencies depend on sample size.

Skills-Based Outcomes

Upon completion of *Part 2: Random Mating*, students should be able to:

1. Given the frequency of an allele in a population, predict the frequency of that allele among zygotes of the next generation, assuming random mating.

Genetic Drift and Bottlenecked Ferrets, Part 3: Size Matters

Knowledge-Based Outcomes

Upon completion of *Part 3: Size Matters*, students should be able to:

1. Explain why an allele's frequency will vary less over time due to genetic drift in a large population compared to a small population.

Skills-Based Outcomes

Upon completion of *Part 3: Size Matters*, students should be able to:

1. Determine the probability that an allele will become lost or fixed, given the initial frequency of the allele in a population and assuming allele frequencies change only by genetic drift.
2. Predict the relative sizes of populations by comparing graphs of their allele frequencies over time.

Genetic Drift and Bottlenecked Ferrets, Part 4: Inbreeding and Genetic Drift

Knowledge-Based Outcomes

Upon completion of *Part 4: Inbreeding and Genetic Drift*, students should be able to:

1. Define "heterozygosity" and explain its relationship to genetic diversity.
2. Distinguish between census and effective population size.
3. List factors that can cause effective population size to be smaller than census population size.

Skills-Based Outcomes

Upon completion of *Part 4: Inbreeding and Genetic Drift*, students should be able to:

1. Predict the effects that nonrandom mating and unbalanced sex ratios will have on a population's effective size.

Genetic Drift and Bottlenecked Ferrets, Part 5: Save the Ferrets!

Knowledge-Based Outcomes

Upon completion of *Part 5: Save the Ferrets!*, students should be able to:

1. Using the concepts of genetic diversity and population size, explain why it is important to consider genetic drift in the conservation of endangered species.
2. Explain why it is useful to run an experiment multiple times.

Skills-Based Outcomes

Upon completion of *Part 5: Save the Ferrets!*, students should be able to:

1. Evaluate the potential effectiveness of different ferret reserve designs for maintaining genetic diversity in the reserve's ferret population.

2. Design a ferret reserve that optimizes genetic diversity in a simulated population.