

Lab-wide Learning Outcomes for Darwinian Snails

Knowledge-Based Outcomes

Upon completion of *Darwinian Snails*, students should be able to:

1. Describe the three conditions necessary (variation, heritability, and differential survival) for evolution by natural selection.
2. Distinguish between change in the allele frequencies for a trait in an individual and change in allele frequencies for a trait in a population (evolution).

Students should reduce their expression of the following misconceptions:

1. Populations change traits because they need to.
2. Changes in a population occur through gradual change in all members of a population.
3. The environment directly causes change and/or mutation.
4. Mutations are intentional adaptive responses.
5. Offspring only inherit traits that are beneficial.
6. Acquired characteristics are inheritable.

Skills-Based Outcomes

Upon completion of *Darwinian Snails*, students should be able to:

1. Predict how the violation of any of the three requirements of evolution by natural selection will affect a population's ability to evolve by natural selection.

Darwinian Snails, Part 1: Snail Shells

Skills-Based Outcomes

Upon completion of *Part 1: Snail Shells*, students should be able to:

1. Construct a histogram (with axes provided).
2. Find the approximate mean value for data plotted in a histogram.
3. Compare two histograms and determine whether there is a qualitative difference in means for the two data sets represented.

Darwinian Snails, Part 2: Evolution by Natural Selection

Knowledge-Based Outcomes

Upon completion of *Part 2: Evolution by Natural Selection*, students should be able to:

1. Describe how natural selection can lead to the evolution of a trait in a population.

Darwinian Snails, Part 3: Requirements for Natural Selection

Knowledge-Based Outcomes

Upon completion of *Part 3: Requirements for Natural Selection*, students should be able to:

1. Describe how a lack of variation of a trait within a population will affect the evolution by natural selection of that trait.
2. Describe how a lack of heritability of a trait will affect the evolution by natural selection of that trait.
3. Describe how a lack of differential survival related to a trait will affect evolution by natural selection of that trait.
4. Explain how a population can evolve through random chance, even in the absence of natural selection (i.e., by genetic drift).

Skills-Based Outcomes

Upon completion of *Part 3: Requirements for Natural Selection*, students should be able to:

1. Given the description of a trait, including its heritability, variation within a population, and ability to affect survival, predict whether and how the trait is likely to evolve by natural selection.

Darwinian Snails, Part 4: The Source of Variation

Knowledge-Based Outcomes

Upon completion of *Part 4: The Source of Variation*, students should be able to:

1. Explain the role of genetic mutation as a source of variation within a population and clarify the significance of this role for evolution.

Darwinian Snails, Part 5: Testing For Natural Selection

Knowledge-Based Outcomes

Upon completion of *Part 5: Testing For Natural Selection*, students should be able to:

1. List the types of evidence needed to show that a difference between two populations is likely due to evolution by natural selection.

Skills-Based Outcomes

Upon completion of *Part 5: Testing For Natural Selection*, students should be able to:

1. Support a claim that a population evolved by natural selection using both observational and experimental data.