Waynesville High School
Biology
Unit 3: Evolution
Estimated Time: 9 weeks

Essential Understanding:

Students will understand…

- the theory of evolution explains the natural origins for the diversity of life.
- how science is done including observing, questioning, hypothesizing, designing, analyzing data, and communicating and supporting conclusions.

Essential Questions:

- How has life change and will life continue to change?
- Why does "survival of the fittest" mean?
- Why have 99.9% of all species that have ever existed on earth gone extinct?

Learning Goal: **Estimated time: 3 weeks**

1. Students will understand the evidence of evolution.

Targets:

Students will be able to…

- list the evidence that supports evolution (fossil record, age of fossils through radiometric dating, embryology, anatomy, biochemistry, biogeography).
- identify patterns of evolution (convergent, divergent and coevolution).
- define evolution, homologous, analogous and vestigial structures.
- describe the evidence that supports evolution (fossil record, age of fossils through radiometric dating, embryology, anatomy, biochemistry, biogeography).
- explain patterns of evolution (convergent, divergent and coevolution).
- explain how adaptive radiation and artificial selection can lead to divergent evolution.
- explain how historically theories of evolution have changed over time.
- explain that the process of natural selection is the result of four factors.
- develop a timeline from Mendel's Darwin's and Wallace's work to present day.
- use hands on materials to model natural selection on a population and analyze the data to determine the relationship between environmental changes and the population.

Learning Goal: **Estimated time: 3 weeks**

2. Students will understand that populations not individuals evolve over time.

Targets:

Students will be able to…

- describe the five conditions necessary for Hardy-Weinberg's equilibrium.
- describe the process of natural selection in terms of variation and adaptation.
- define natural selection and its three types (stabilizing, directional and disruptive).
- define gene pool, allele frequency, phenotype frequency, genetic drift, immigration, emigration, gene flow, speciation, sexual selection.
- explain genetic variation in terms of mutation, genetic recombination, and random fusion of gametes.
- explain how genetic variation contributes to natural selection and evolution.
- apply Hardy-Weinberg's law to predict gene frequency patterns in a population.
- explain how each of the following can disrupt Hardy-Weinberg's equilibrium and lead to evolution (mutation, migration, genetic drift, nonrandom mating, natural selection).
- analyze populations and determine which of the three types of natural selection they are undergoing.
- describe how geographic and reproductive isolation can lead to speciation.
- analyze real world populations using Hardy-Weinberg calculations to determine if evolution is taking place.
- design and conduct scientific investigations using simulation software or hands on materials to demonstrate concepts of natural selection and Hardy-Weinberg laws.
- apply mathematical reasoning to solve problems (use Hardy Weinberg's law to explain gene frequency patterns in a population).

Learning Goal: **Estimated time: 3 weeks**

3. Students will understand the history and diversity of life on earth.

Targets:

Students will be able to…

- describe the first cellular life forms on earth as prokaryotic, heterotrophic and anaerobic.
- explain that the first autotrophic cells were chemosynthetic.
- describe how evolution explains the natural origins for the diversity of life as represented in the fossil record.
- name the primary criterion that modern taxonomists consider when they classify an organism.
- describe the classification system used by scientists.
- recognize explanations and models such as 5 vs 6 kingdom classification system/Linnaeus.
- define taxonomy, binomial nomenclature, phylogeny, derived character.
- list Linnaeus's levels of classification from the most general to the most specific.
- explain how the first life forms evolved into life forms today as the environment changed over time.
- explain how the Earth's present day species descended from earlier, common ancestral species.
- define endosymbiosis and explain why it is important in the history of eukaryotes.
- explain how biological classification is based on molecular evidence.
- explain how recent molecular sequence data generally support earlier hypotheses regarding lineages of organisms based on morphological comparisons.
- explain what information a phylogentic tree shows.
- construct a cladogram using morphology and molecular evidence to describe biodiversity.
- analyze real data, such as a phylogentic tree, to describe the relationship between groups of organisms.
- analyze explanations and models and how they change over time such as 5 vs 6 kingdom classification system/Linnaeus.