Evolution Big Ideas & Learning Goals

These activities were developed before the Next Generation Science Standards for the Evolution Readiness project. You are encouraged to look at the alignment with NGSS (including, e.g., 3-LS4-2, 3-LS4-3, 3-LS4-4, and MS-LS4-2), state, and local standards.

Big Idea 1: Basic Needs of Organisms

- Plants and animals need air and water; plants also need light and nutrients; animals also need food and shelter.
- Different species have different preferred conditions for growth.

Big Idea 2: Life Cycle - Birth and Death Cycle

- Organisms are born, live, and die.
- Some members of the same species can survive (a specific event) even though every individual in the group eventually dies.
- There are several stages of the plant life cycle: seed, seedling, growing plant, flower, pollination, seedpod, seed dispersal.
- Plants make many seeds, most of which do not survive, which is equivalent to saying that many more organisms die than survive.
- All organisms have a finite lifetime and populations (interbreeding groups of organisms) will survive only if their constituent organisms have enough offspring over time to compensate for the number of deaths.
- The behavior of populations can be extrapolated from the behavior of individual organisms.

Big Idea 3: Organisms and Their Environment

- An organism thrives in specific environments that match its specific needs.
- Selection based on water or sunlight would lead a population (not an individual) of plants to migrate from one area to another.

Big Idea 4: Classification of Organisms

- Plants and animals can be classified into species and other types of groups based on the characteristics they share.

Big Idea 5: Interspecific Differences

- There are differences between species.

Big Idea 6: Interactions Between Species

- Organisms with similar needs compete with one another for resources.
- Animals obtain energy and resources by eating other animals and plants (food web).
- An ecosystem is a collection of interacting organisms, as well as their physical environment.
- Other plants and animals, as well as the environment, can affect the survivability of plants and animals.

Big Idea 7: Intra-specific differences

- Individuals of the same species may differ.
- Not all offspring from the same parents look alike, even with respect to inherited traits.

- Purposeful selection of certain traits over many generations can result in substantial changes in the physical characteristics of organisms in a population.

Big Idea 8: Adaptation/Evolution

- Species are adapted to their environments and species adapt to changes in their environment. If the environment changes only certain species survive.
- Organisms with traits best suited to their environment have better chances of survival.
- Species adapt to changes in their environment.
- Those organisms carrying traits that are better suited for a particular environment will have more offspring.
- Selection pressure can lead to a change in the characteristics of a population.
- Adaptation requires both variability and selection pressure.
- Organisms have different needs, thus some physical traits help it to survive in a given environment.
- It may be possible to reason backward from traits to environment – e.g., "What is the utility of <trait>? What environment is this organism adapted for?"

Big Idea 9: Heritability of Traits

- Offspring inherit some, but not all, of their traits from their parents.
- Some traits are inherited; some are not.

Big Idea 10: Reproduction

- Organisms have offspring.
- Without reproduction, a plant or animal species cannot continue.
- Only members of the same species can have viable fertile offspring.

Big Idea 11: Descent with modification

- Species evolve from common ancestors.
- Different species could arise from one species if different groups had different selection pressures.