**Topic:** Natural Selection

**Concept Ideas:**

* Population
* Environment
* Reproduction
* Variation
* Competition
* Mutations
* Resources
* Evolution
* Genes – Dominant/ Recessive
* Chart / Graphing

**Next Generation Science Standards**

Standards in black = NGSS

Standard in blue = The DCI within the NGSS

**Kindergarten**

K-LS1-1 Use observations to describe patterns of what plants and animals (including humans) need to survive.

LS1.C: Organization for Matter and Energy Flow in Organisms – All animals need food in order to live and grow. They obtain their food from plants or form other animals. Plants need water and light to live and grow.

K-ESS2-2 Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.

 ESS2.E: Biology – Plants and animals can change their environment

K-ESS3-1 Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.

 ESS3.A: Natural Resources – Living things need water, air, and resources from the land, and they live in places that have the things they need.

 ETS1.A: Defining and Delimiting an Engineering Problem – Asking questions, making observations, and gathering information are helpful in thinking about problems.

**First Grade**

1-LS1-1 Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.

LS1.A Structure and Function – All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and see, find, and take in food, water and air.

 LS1.B Growth and Development of Organisms – Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring survive.

 LS1.C Information Processing – Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs.

1-LS3-1 Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

 LS3.A Inheritance of Traits – Young animals are very much, but not exactly like, their parents.

 LS3.B Variation of Traits – Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.

**Second Grade**

2-LS2-1 Make observations of plants and animals to compare the diversity of life in different habitats.

**Third Grade**

3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

LS1.B: Growth and Development of Organisms – Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles.

3-LS2-1 Construct an argument that some animals form groups that help members survive.

LS2.D: Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size.

3-LS3-1 Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment.

 LS3.A: Inheritance of Traits

* Many characteristics of organisms are inherited from their parents.
* Other characteristics result from individuals’ interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment.

LS3.B: Variation of Traits

* Different organisms vary in how they look and function because they have different inherited information.
* The environment also affects the traits that an organism develops.

3-LS4-2 Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

3-LS4-4 Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

 LS4.B: Natural Selection – Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.

 LS4.C: Adaptation – For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

 LS4.D: Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

**Fourth Grade**

4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

LS1.A: Structure and Function – Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

**Fifth Grade**

5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

 LS2.A: Interdependent Relationships in Ecosystems

**Middle School**

MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

 LS1.B: Growth and Development of Organisms

* Animals engage in characteristic behaviors that increase the odds of reproduction.

MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

 LS2.A: Interdependent Relationships in Ecosystems

* Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.
* In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.
* Growth of organisms and population increases are limited by access to resources.
* Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival.

 LS2.C: Ecosystems Dynamics, Functioning, and Resilience

* Ecosystems are dynamic in nature, their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.

MS-LS3-1 Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

MS-LS3-2 Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

 LS1. B: Growth and Development of Organisms – Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring.

LS3.A: Inheritance of Traits

* Genes are located in the chromosome of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits.
* Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.

LS3.B: Variation of Traits

* In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individual have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may by identical or may differ from each other.
* In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations.

MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals’ probability of surviving and reproducing in a specific environment.

 LS4.B: Natural Selection

* Natural selection leads to the predominance of certain traits in a population, and the suppression of others.