Essential Question:

How are traits passed from parents to offspring?

Unit Description:

This unit is part of a district pilot for implementing a new 7th grade curriculum. A few of the science teachers in the district volunteered to participate in the piloting of the new curriculum, and my cooperating teacher and I decided to participate. This unit is part of the Science Explorer Life Science book. The teacher materials for the pilot included books, activities, lesson-planning tools, presentations, and exam questions and tools. Throughout the unit we tried to be as true to the curriculum as possible, without supplementing additional material or modifying activities.

The genetics unit covers two sections in the book, and takes about 4 weeks to complete. The unit is introduced through a Big Idea, which is a focal point for all of the activities. The unit begins with an explanation of the unit project, entitled "All in the Family," where the students learn about how offspring have similar and different traits from those of their parents by creating a family of "Paper Pets" to explore how traits are passed from parents to offspring. This activity will be returned to throughout the unit, and students will create parents, and 6 offspring after mating the parents. In the first section, students learn about Mendel's work in genetics through a series of activities, worksheets, readings, and direct instruction. Students will learn about heredity and traits through the explanation of Mendel's pea plant experiments, define and explain dominant and recessive alleles, as well as proper notation, and explain the significance of Mendel's contributions to genetics. They will complete this section by taking an individual and class survey of student's traits. In the second section, students will begin to learn about probability and heredity by completing a series of coin flipping activities. They will then learn how to create a Punnett Square by using alleles from the two parents, and predict the probability of a potential outcome of a cross. Students will then read about the differences between phenotype and genotype, as well as the concept of codominance. Students will complete this section with a lab called Make the Right Call, in which they cross a combination of homozygous and heterozygous parents to determine the probability of different offspring. After completing both sections and the Paper Pet project, students will complete a unit exam testing them on the concepts learned throughout the unit.

Learning Goals for Unit:

Goal	Assessment
Describe the results of Mendel's experiments	Students will explain that when purebred tall-stemmed plants were crossed with purebred short-stemmed plants, the F1 generation had all tall stems. The F1 generation self-pollinated, and in the F2 generation, 75% had tall stems, and 25% had short stems.
Identify what controls the inheritance of traits in organisms	Students will explain that traits are controlled by the alleles inherited from parents, and that offspring get one allele from each parent. Some alleles are dominant, while others are recessive, and a dominant allele will always show up when present, whereas a recessive allele is hidden if the dominant is present.

Define probability and describe how it helps explain the results of genetic crosses	Students will define probability as a number that describes how likely it is that an event will occur. Using a Punnett Square, students will explain that in a genetic cross, the alleles that an offspring inherit from their parents are based on probability.
Explain what is meant by phenotype and genotype	Students will describe phenotype as an organism's physical appearance, and genotype as its genetic makeup or allele combinations
Tell what codominance is.	Students will define codominance as a pattern where alleles are neither dominant nor recessive, resulting in both alleles being expressed in the offspring. Students give the example of a black rooster and a white rooster giving offspring with a combination of the two colors.

Applicable State Standards:

6-8 INQC Investigate	Collecting, analyzing, and displaying data are essential aspects of all *investigations*.	*Communicate* results using pictures, tables, charts, diagrams, graphic displays, and text that are clear, accurate, and informative. *a Recognize and interpret *patterns* – as well as *variations* from previously learned or observed *patterns* – in data, diagrams, symbols, and words.
6-8 INQE Model	*Models* are used to represent objects, events, *systems*, and processes. *Models* can be used to test *hypotheses* and better understand *phenomena*, but they have limitations.	Create a *model* or *simulation* to represent the behavior of objects, events, *systems*, or processes. Use the *model* to explore the *relationship* between two *variables* and point out how the *model* or simulation is similar to or different from the actual phenomenon.
6-8 LS3B	Every *organism* contains a set of *genetic information* (instructions) to specify its traits. This information is contained within *genes* in the *chromosomes* in the *nucleus* of each cell.	*Explain that* information on how cells are to grow and *function* is contained in *genes* in the *chromosomes* of each cell *nucleus* and that during the process of reproduction the *genes* are passed from the parent cells to offspring.
6-8 LS3D	In *sexual reproduction* the new *organism* receives half of its *genetic information* from each parent, resulting in offspring that are similar but not identical to either parent. In *asexual reproduction* just one parent is involved, and *genetic information* is passed on *nearly unchanged.*	*Describe* that in *sexual reproduction* the offspring receive *genetic information* from both parents, and therefore differ from the parents. *Predict* the outcome of specific genetic crosses involving one *characteristic* (using *principles* of *Mendelian* genetics). *Explain* the survival value of *genetic variation*.