

Outdoor Science! Week 1

Day 4: Investigating Inherited Traits

Teacher/Parent Background:

- In this activity, students will differentiate between learned and inherited traits by collecting and analyzing data from their surroundings.

Related Standards:

- Construct an explanation of how genetic variations occur in offspring through the inheritance of traits or through mutations.

Key Terms:

Physical Trait

Inheritance

Heredity

Genetic material

Materials List:

- Paper
- Pencil
- Colored Pencils
- 2 Pennies

Activity Description:

Students will work through an activity to help them recognize that inherited traits are the results of genetic material being passed from one generation to the next through genes, which are stored within chromosomes in the nucleus.

- Have students read the following:

“Genetic instructions control how traits are passed from one generation to the next. Genetic instructions are like a set of directions and traits are like the results of following the directions. For example, directions (genetic instructions) are needed to bake a cake. The flavor of the cake (trait) and the way the color of the cake (trait) are the result of following the directions for the assembly of the cake. Cells follow genetic instructions provided by deoxyribonucleic acid, or DNA, that determines their form and function. For example one cell may be directed to be a red blood cell, another to be brown eye pigment, while a third may be directed to form bone cells. DNA forms strands that are made up of smaller pieces, or segments, called genes. It is these genes that govern the many traits of an organism. Traits are inherited qualities of an organism and can be divided into three types:

a. physical traits such as height, eye color or hair color
b. behavioral traits such as protective instincts
c. predisposition to a medical condition such as cancer, heart disease, sickle cell anemia, or diabetes. The same trait can be shared by many organisms yet it is the combination of traits that makes every individual unique.”

- Go outside and find 3 inherited traits and 3 learned/acquired traits, in nature.
- Now, investigate some inherited traits that may or may not be shared by your family members by playing, “Family Traits Trivia!” from the Genetic Science Learning Center.
 - Invite your family to sit in a circle. Hold up one game card at a time to show the picture of a trait.
 - All family members that have this trait should stand or raise their hand.
 - Continue with each game card to find similarities and differences among family members.
 - » Did you have a trait in common with a parent?
 - » Did you have a trait that a parent does not have?
 - » Did each person in your family have a different combination of the traits described?

Once the group is familiar with all of the inherited traits described in this activity, try this second activity!

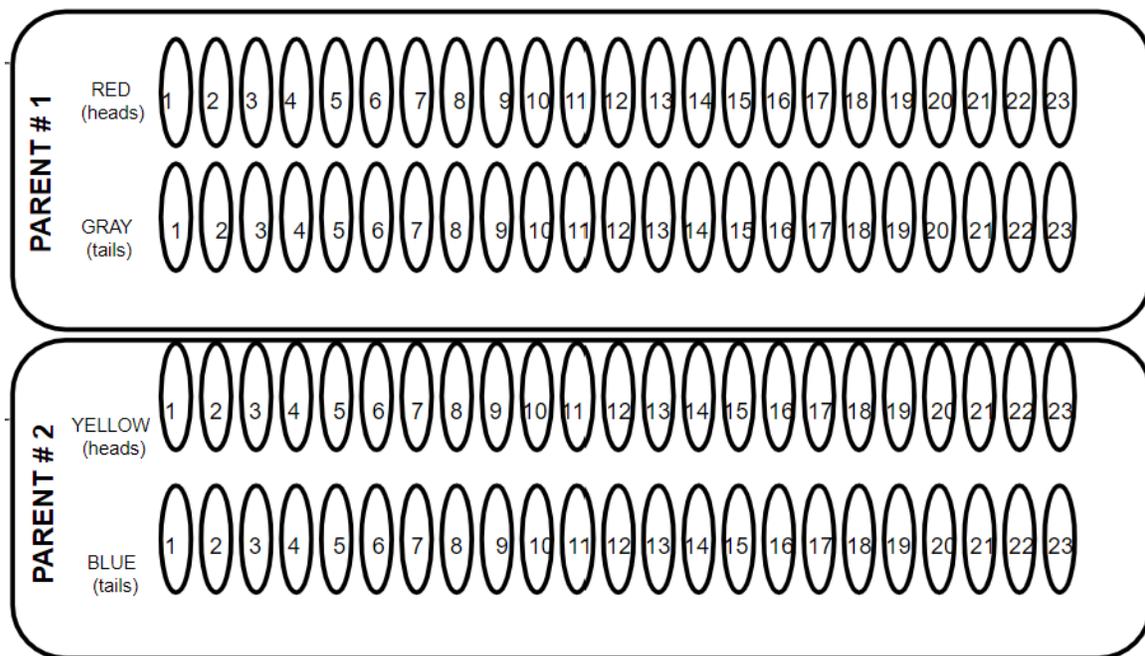
- Shuffle the game cards and place the deck face down. Invite your family to stand up and form a circle. Draw a card and hold it up to display the picture of the trait.
- All family members who have this trait should stay standing. Those who do not have the trait should sit down. Once a person sits down, they should not get up again. Continue with each game card until only one person is left standing.
 - » How many cards did it take to find one person with a unique combination of traits?
 - Shuffle the cards and play again as many times as you would like.
 - Family Traits Activity Sheet
- Have students read the following:

“Not all inherited traits are easily observed. Other unseen traits also contribute to unique individuals, for example: blood types or the way information is processed in the brain. Human traits and diversity result from the differences in a mere .1 of genetic material. It is amazing that 99.9% of the genes governing the many traits of the human organism are identical, yet that small percentage, .1 is what makes every human unique. Genes are tightly packed and stored in chromosomes within the nucleus of eukaryotic cells. When the process of heredity occurs asexually from a single parent, the offspring receive an exact duplicate of the parents genetic material. When the process of heredity occurs from the sexual reproduction of two parents, the offspring receives half of the genetic material from the mother and half from the father. Chromosomes are found in pairs in eukaryotes, and are different in number for various organisms. For example: humans have 23 pairs of chromosomes (46 in total), carp fish have 52 pairs (104 in total) and broad beans have 6 pairs (12 in total). This means that humans pass 23 individual chromosomes from one parent (mother) and 23 individual chromosomes from the second parent (father) to form the 23 pairs of chromosomes in the offspring. The result is an offspring that shares some traits from each parent, but are not identical to either parent. The exact chromosome a parent passes on to form a pair in an offspring is random, yet each pair must receive one from the mother and one from the father.”

In this next activity students will investigate how traits are inherited by passing the gene containing chromosomes from one generation to the next.

- Color one set of the 23 paired chromosomes from parent #1 red.
- Color the second set of the 23 paired chromosomes from parent #1 gray.

- Color one set of the 23 paired chromosomes from parent #2 yellow.
- Color the second set of the 23 paired chromosomes from parent #2 blue.
- Produce an offspring from parent #1 and parent #2. Obtain 2 pennies, 1 to represent each parent.
- Toss the parent #1 penny. If it is heads color the first chromosome red on the top line of Offspring A. If it is tails, color the first chromosome gray on the top line of Offspring A.
- Next, toss the parent #2 penny. If it is heads, color the first chromosome yellow on the bottom line of Offspring A. If it is tails, color the first chromosome blue on the bottom line of Offspring A.
- Continue with the same process for the remaining 22 pairs of chromosomes to provide Offspring A with a complete set of 23 pairs of chromosomes, one from parent #1 and one from parent #2.
- Next produce a second offspring (a brother or sister) from parent #1 and parent #2. Repeat the entire process to produce Offspring B with random chromosomes by using the coin toss method. Remember the individual chromosome the parent passes from the pair is random but the offspring must receive one from each parent, #1 and #2.



Closure:

Ask students the following questions:

-Do either of the offspring have identical genetic material as compared to parent #1 or parent #2? *No*

-Is the genetic material of offspring A identical to offspring B? *No*

-Why would offspring A have different traits than offspring B if they both have the same parents? *An offspring shares some traits from each parent but is not identical to either parent. The exact chromosome that a parent passes on to form a pair in an offspring is random, yet each pair must receive one from the mother and one from the father. Because the exact chromosome that a parent passes on is random, it makes each resulting offspring unique.*

Extension:

Watch & Play-[TED ED: Understanding Genetics](#)

Explore- [What are DNA and Genes?](#)

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