

# Rock, Paper, Scissors - Dominant and Recessive Traits from Parent to Offspring

Utah Science - Heredity



## Materials

### Activity 1

- ◆ Plant Features activity sheet (one for each partnership)
- ◆ Rock, Paper, Scissors Recording Chart (one for each partnership)
- ◆ What Does It Look Like? activity sheet (1 for each student)
- ◆ Crayons and scissors
- ◆ Five gene pool containers made from shoe boxes or baskets

### Activity 2

- ◆ Plant Parent 1 cards—one for each student
- ◆ Plant Trait Key transparency
- ◆ Six colors of glitter: red, gold, blue, silver, green and magenta
- ◆ Chenille stems cut into 3-inch pieces, one piece for each student
- ◆ Glittering Offspring worksheet—one for each student

## Background

When an offspring is formed, its traits are determined by a combination of genes from each parent. Each parent contributes one-half of the genes for each trait. In the simplest cases, genes are either dominant or recessive. When a dominant gene combines with a recessive gene, the dominant gene's characteristics are expressed in the offspring. When two recessive genes are combined, the recessive characteristic is expressed in the offspring. Co-dominance occurs when the genes for a particular trait are equally strong. In this case, the two variations of the gene are expressed in equal strength.

In agriculture there are many examples of dominant, recessive and co-dominant traits. Some examples are listed below:

- Red potato skin is dominant over white potato skin.
- Russet colored potato skin is dominant over white potato skin.
- Green peas are dominant over yellow peas.
- Red cherry tomatoes are dominant over yellow cherry tomatoes.
- Red and white snapdragon flowers are co-dominant and produce pink flowers.
- Short and tall corn plants are co-dominant and produce medium-height corn plants.
- Tall sunflower plants are dominant over short sunflower plants.
- Yellow-kernel corn is dominant over white-kernel corn.

## Activity 1: Rock, Paper, Scissors

1. Have students list words that are associated with the words "dominant" (dominated, dominating, dominate, domain, dominance, predominant, dominator, etc.) and "recessive" (recessively, recede, recess, receded, receding, recessional, recession, etc.). Then discuss the differences between the concept of dominating a situation and receding in the same situation. For instance, if two people wanted to climb up a ladder of a slide at the same time, one person might dominate the situation by yelling it was his turn or pushing someone out of the way.

**Time:** 40-minute sessions

**Grade Level:** 5

## Science, Standard 5

Students will understand that traits are passed from the parent organisms to their offspring, and that sometimes the offspring may possess variations of these traits that may help or hinder survival in a given environment.

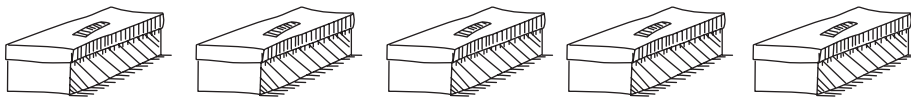
### Objective 1

Using supporting evidence, show that traits are transferred from a parent organism to its offspring.

- a. Make a chart and collect data identifying various traits among a given population (e.g., the hand span of students in the classroom, the color and texture of different apples, the number of petals of a given flower).
- b. Identify similar physical traits of a parent organism and its offspring (e.g., trees and saplings, leopards and cubs, chickens and chicks).
- c. Compare various examples of offspring that do not initially resemble the parent organism but mature to become similar to the parent organism (e.g., mealworms and darkling beetles, tadpoles and frogs, seedlings and vegetables, caterpillars and butterflies).
- d. Contrast inherited traits with traits and behaviors that are not inherited but may be learned or induced by environmental factors (e.g., cat purring to cat meowing to be let out of the house; the round shape of a willow is inherited, while leaning away from the prevailing wind is induced).
- e. Investigate variations and similarities in plants grown from seeds of a parent plant (e.g., how seeds from the same plant species can produce different colored flowers or identical flowers).

Someone else might recede by walking away and playing something else. The receding person may play at the slide later when there is less competition (similar to genes). Role-play a few situations such as lining up after recess or participating in class discussions.

- Describe the activity Rock, Paper, Scissors using the words “dominant” and “recessive.” Discuss that rock dominates scissors, scissors dominate paper, and paper dominates rock. Have the students do the activity with a partner, recording on a chart (provided) each partner’s contribution and each outcome for several rounds. The outcome column will say either “Rock,” “Paper,” or “Scissors.” If both people choose the same item, then it is a tie and the item that both people chose will be written in the outcome box. The procedure for the activity is described in the sidebar.
- Discuss the outcome of the game. Are there ways of making certain one person will always dominate (win)?
- Discuss “dominant” and “recessive” in terms of genes and



heredity.

- Have each partnership color and cut out the items on the *Plant Features* activity sheet. Place the features into the prepared “gene pool” containers (boxes, envelopes, etc.) labeled “Leaves,” “Fruit,” “Flowers,” “Roots,” and “Stems.” Each partnership will contribute dominant and recessive trait for each feature. Place the five different boxes in different locations throughout the room.
- Hand out to each pair of students *What Does It Look Like?* From five separate “gene pool” containers, have each student randomly select one feature. Have the students fill in the gene chart of the features chosen. The partners then need to determine what their plant looks like. For example, if one partner chooses a dominant round fruit and the other partner chooses a recessive oval fruit, the plant will have round fruit. Have the students draw their plant showing the appropriate feature.
- Have the students display their plants. Discuss how many dominant traits were expressed compared to recessive traits. Discuss the wide variety of plants produced from the same gene pool and how this activity shows that it would be highly unlikely for two brothers or sisters to be exactly the same.

### Questions for Discussion, Investigation & Assessment

- Have the class design their own dominant and recessive features for the gene pool.
- Rather than working in pairs, have the class create one plant on a flannel board by randomly selecting from the gene pool.
- When discussing traits that are dominant, co-dominant, and recessive, use colored chalk and a chalkboard to illustrate. Two colors can be blended for co-dominance and a recessive color can be erased.

### How to Play Rock, Paper, Scissors

After a count of “1-2-3,” each player must symbolize a rock, paper, or scissors with one hand on a desk or tabletop. The hand symbol for rock is a fist. The hand symbol for paper is a flat hand on the desk or tabletop. The hand symbol for scissors is the first two fingers cutting the air in a scissors motion. It is important that both partners reveal their chosen hand symbols at exactly the same time.



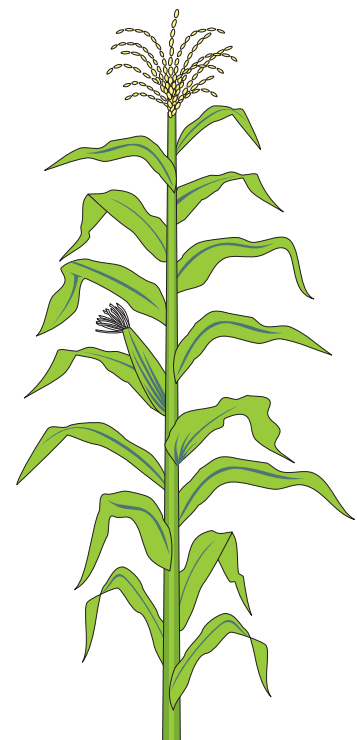
**Rock**



**Paper**



**Scissors**



Utah Agriculture in the Classroom

## Activity 2: Mixing Inherited Traits

1. Make copies of the *Plant Parent 1* cards and cut them apart.  
Prepare one card for each student.
2. Cut the chenille stems into 3-inch segments, one piece for each student.
3. Place the following eight piles of mixed glitter on small paper plates—leave about 12 inches between each pile.
  - Red, blue and green
  - Red, silver and green
  - Red, blue and magenta
  - Red, silver and magenta
  - Gold, blue and green
  - Gold, Silver and green
  - Gold, blue and magenta
  - Gold, silver and magenta
4. Pass out one *Plant Parent 1* card to each student. Explain that the card represents one of the parents of a plant offspring and that each color on the card represents one trait which that parent will pass on to the offspring.
5. Pass out one chenille stem piece to each student. Tell students that they are going to become pollinators. The chenille stems represent the hairy legs of a bee and the glitter piles represent the flowers of different second parents for the plant offspring.
6. Have students bend the chenille stems into “bee legs” (A right angle bend near one end).
7. Tell students they will visit **one** of the eight flowers (glitter piles) that will be the **second parent** (Parent 2) to the offspring they are creating.
8. Ask each student to visit and place his or her “bee leg” into the pile of glitter.
9. Have students return to their desks and remove the glitter from the “legs” onto a sheet of paper. Have them identify which colors are present for Parent 2.
10. Explain that sometimes a trait that an offspring receives from a parent is not visible, even though the offspring carries the information for that trait.
11. Show students the Glitter Plant Trait Key which lists the trait that the offspring will show for each color (trait) received from Parent 1 and Parent 2.
12. Ask students to complete the *Glittering Offspring* worksheet using the Glitter Code listed at the top of the *Plant Trait Key* overhead:  
Only red and/or gold colors can determine the color of the petals;  
only blue and/or silver can determine the length of the stem;  
and only green and/or magenta can determine the color of the leaf. Example: If you had Red, Silver and Green listed from your *Plant Parent 1* card and you obtained the colors Gold, Silver and Magenta from your glitter pile (Parent 2), then your plant would have:
  - Red and Gold = Red Petals
  - Silver and Silver = Short Stem
  - Green and Magenta = Dark Green Leaves
13. Discuss with the class the similarities and differences among the offspring and the frequencies of each visible trait.



### **Adaptations/Integration**

1. Have the students design their own dominant and recessive features for the gene pool, perhaps adding some co-dominant traits for them to consider. Have them create the offspring with modeling clay.
2. Display pictures of parent plants along with four different pictures of possible offspring. Have the students select which offspring is most appropriate based upon a list of dominant and recessive traits given by the instructor. Students should be able to justify their answer.

### **Additional Activities, What's Next?**



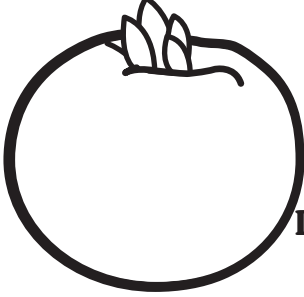
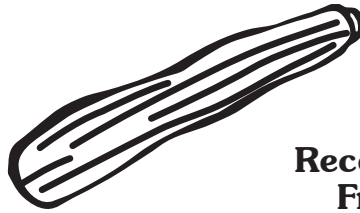
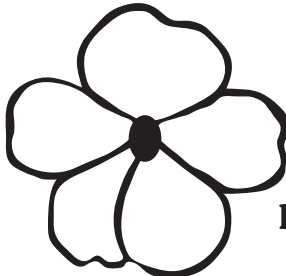
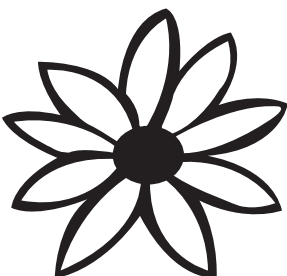
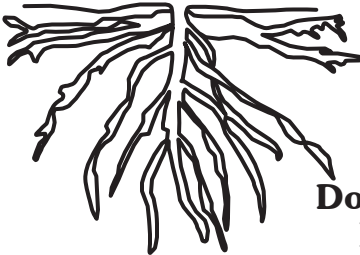



- Have two pairs of students cross their plants to produce offspring. The offspring would be created by a random selection of one trait from each plant's gene pool. Students could hold their traits behind their back while the other pair chose right or left hand to arrive at a trait. This process could continue through several generations. The plant's family tree could be displayed on a bulletin board.
- Based on features in an offspring, discuss what the parent plants may have looked like.



*This lesson was adapted from a lesson created by California Agriculture in the Classroom. Students who comprehend the content in this lesson should do well on the End-of-Level (CRT) tests.*

# Plant Features

Color and cut out the dominant and recessive features and place them in the appropriate boxes as explained by your teacher.

	Dominant	Recessive
Leaf	 <p>Dominant Leaf</p>	 <p>Recessive Leaf</p>
Fruit	 <p>Dominant Fruit</p>	 <p>Recessive Fruit</p>
Flower	 <p>Dominant Flower</p>	 <p>Recessive Flower</p>
Root	 <p>Dominant Root</p>	 <p>Recessive Root</p>
Stem	 <p>Dominant Stem</p>	 <p>Recessive Stem</p>

# Rock, Paper, Scissors Recording Chart

Name \_\_\_\_\_ Date \_\_\_\_\_

<b>Round</b>	<b>Partner A</b>	<b>Partner B</b>	<b>Outcome (Rock, Paper, Scissors)</b> <i>Possible Outcomes:</i> <ul style="list-style-type: none"><li>• rock dominates scissors</li><li>• scissors dominates paper</li><li>• paper dominates rock</li></ul>
<b>1</b>			
<b>2</b>			
<b>3</b>			
<b>4</b>			
<b>5</b>			
<b>6</b>			
<b>7</b>			
<b>8</b>			
<b>9</b>			
<b>10</b>			

- 1) Which outcome was most common in your partnership?
- 2) Which outcome was the least common?
- 3) Were your results similar to the results of the class?
- 4) Describe one thing you learned about heredity by doing this activity.

# What Does It Look Like?

Name \_\_\_\_\_ Date \_\_\_\_\_

Complete the chart and draw a picture of what your flower looks like.

Round	Partner A	Partner B	Outcome
Leaf			
Fruit			
Flower			
Stem			
Root			

## Plant Diagram

### Reminder

- two dominant genes = dominant trait
- two recessive genes = recessive trait
- one dominant gene and one recessive gene = dominant trait

## Glitter Plant Trait Key

**Glitter Code:**    **Red or Gold = Color of Petal**  
                           **Blue or Silver = Length of Stem**  
                           **Green or Magenta = Color of Leaf**

<b>Plant 1 (Parent 1 card)</b>	<b>Plant 2 (Glitter)</b>	<b>Visible Trait</b>
<b>Red</b>	<b>Red</b>	<b>Red Petals</b>
<b>Red</b>	<b>Gold</b>	<b>Red Petals</b>
<b>Gold</b>	<b>Red</b>	<b>Red Petals</b>
<b>Gold</b>	<b>Gold</b>	<b>White Petals</b>
<b>Blue</b>	<b>Blue</b>	<b>Tall Stem</b>
<b>Blue</b>	<b>Silver</b>	<b>Tall Stem</b>
<b>Silver</b>	<b>Blue</b>	<b>Tall Stem</b>
<b>Silver</b>	<b>Silver</b>	<b>Short Stem</b>
<b>Green</b>	<b>Green</b>	<b>Dark Green Leaves</b>
<b>Green</b>	<b>Magenta</b>	<b>Dark Green Leaves</b>
<b>Magenta</b>	<b>Green</b>	<b>Dark Green Leaves</b>
<b>Magenta</b>	<b>Magenta</b>	<b>Light Green Leaves</b>

# Plant Parent 1 Cards

<p><b>Parent 1</b> Red Blue Green</p>	<p><b>Parent 1</b> Gold Blue Green</p>
<p><b>Parent 1</b> Red Silver Green</p>	<p><b>Parent 1</b> Gold Silver Green</p>
<p><b>Parent 1</b> Red Blue Magenta</p>	<p><b>Parent 1</b> Gold Blue Magenta</p>
<p><b>Parent 1</b> Red Silver Magenta</p>	<p><b>Parent 1</b> Gold Silver Magenta</p>

# Glittering Offspring

Name \_\_\_\_\_ Date \_\_\_\_\_

*Complete the table and draw a picture of the plant offspring.*

	<b>Parent 1</b>	<b>Parent 2</b>	<b>Outcome</b>
<b>Leaf</b>			
<b>Flower Petal</b>			
<b>Stem</b>			

**Plant Offspring**

