

## Prior Knowledge Investigation: Heredity

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Interview with Selected Students: 11/3/05



- Here is a photograph of Bow Wow:
  - ✓ What determines what someone, like Bow Wow, looks like?
  - ✓ What traits could he have inherited from his parents?
    - voice? ability to dance? sense of style?
  - ✓ If he had a brother, would he also be able to dance and sing?
- What about you?
  - ✓ Do you think you inherited certain traits from either of your parents?
  - ✓ Can you inherit more traits from your father than your mother, or visa versa?
- What determines if you have blue eyes instead of brown eyes?
  - ✓ Could you have a gene copy for blue eyes and another for brown?
  - ✓ So what is the difference in appearance between someone who has one gene copy for blue eyes and one for brown and someone who has two gene copy for brown eyes
- If one of your siblings has a certain trait of one of your parents, does that mean your sibling “took” the trait? Or could future siblings also get that trait?



- You see a red flower, a white flower, and a pink flower in the photo
  - ✓ What determines whether the flower is red, white, or pink?
  - ✓ Is a pink flower a combination of the red and white flowers?



- Which living thing has more chromosomes?
- Does an organism's complexity determine chromosome number?



- What determines whether someone has Down Syndrome or not?
- What happens if you have too many or too few chromosomes?
- Can a person have a gene copy for a disease but not actually have the disease?
  - ✓ Does this mean all of the person's children will have the disease?
  - ✓ What determines whether they do or not?

## Chapter 6 –Heredity

11/4/05

### **Purpose / rationale:**

The purpose of this lesson is to introduce students to the basic principles of heredity. Students will review the role of chromosomes, distinguish between those traits that can and cannot be inherited, explore the variations within a single genetic trait, distinguish between dominant and recessive traits, distinguish between genotype and phenotype, and use Punnett squares to predict the possible combinations of inherited factors resulting from single trait crosses.

### **SOLs:**

**LS. 13.** The student will investigate and understand that organisms reproduce and transmit genetic information to new generations. Key concepts include

- b) the function of genes and chromosomes;
- c) genotypes and phenotypes;
- d) factors affecting the expression of traits;
- e) characteristics that can and cannot be inherited

**NSES C** Students should develop an understanding of reproduction and heredity. This includes understanding that every organism requires a set of instructions for specifying its traits, that heredity is the passage of these instructions from one generation to another, and that hereditary information is contained in genes, located in the chromosomes of each cell.

### **Materials and Resources:**

Activity sheet  
PowerPoint presentation

### **Safety:**

There are no specific safety guidelines for this lesson.

### **Procedures:**

*Engage*

1. Discrepant event – Students will make an educated guess regarding what Mendel should have seen when he crossed a green pea plant with a yellow pea plant for two generations. Students will write down what they think will happen on the provided activity sheet (**10 minutes**).

*Explore*

2. Students will share with the class how they answered questions on the discrepant event and give reasons as to why they answered the way they did. The actual results from the experiment will then be displayed and the students will respond with how they think this happened (**5 minutes**).

*Explain*

3. Students will fill out the activity sheet that corresponds to the PowerPoint lesson on the basic principles of heredity. This handout should be kept in their notebooks for future reference (study for tests, etc.). During this time, the teacher will continuously ask students questions regarding the material and students can freely ask questions (**25 minutes**).

*Elaborate*

4. Students will practice learned material by completing three simple Punnett squares and explaining what the results showed. They will do these Punnett squares on the back of their activity sheets (**5 minutes**).

(A) B = brown eyes, b = brown eyes, Bb x bb

(B) C = connected ear lobe, c = unconnected, CC x cc

(C) W = Widow's peak, w = no widow's peak, WW x Ww

*Evaluate*

5. The teacher will take up students' handouts at the conclusion of class.

Grading Scale:

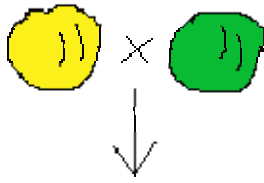
Section of Handout	Number of Questions	Total Points Possible
Discrepant Event	4	16
Notes	16	32
		<b>48</b>
Punnett square practice (EC)	3	+6 EC

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

## Introduction to the Basic Principles of Heredity Activity Sheet

**Make an Educated Guess!! The scientist Gregor Mendel did the following experiment:**

1. If you took a plant with yellow peas and a plant with green peas and bred them 4 times, would the offspring have yellow peas, green peas, or some combination of both?

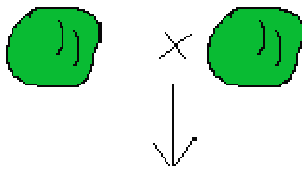


\_\_\_\_\_  
Offspring 1    Offspring 2    Offspring 3    Offspring 4

2. This is what would actually happen:

\_\_\_\_\_  
Offspring 1    Offspring 2    Offspring 3    Offspring 4

3. Now, what would happen if you took 2 of the offspring from #1 and bred those 4 times?



\_\_\_\_\_  
Offspring 1    Offspring 2    Offspring 3    Offspring 4

4. This is what would actually happen:

\_\_\_\_\_  
Offspring 1    Offspring 2    Offspring 3    Offspring 4

**Now let's see why this happened!!! . . . .**

5. Do you recall what is responsible for carrying genetic material to pass traits to offspring?

\_\_\_\_\_

6. How many chromosomes do you inherit from your dad? \_\_\_\_\_ Your mom? \_\_\_\_\_

7. What traits can be inherited?

\_\_\_\_\_

What traits cannot be inherited?

\_\_\_\_\_

8. With each trait (i.e. eye color) , a person inherits one of many variations (brown, blue, etc). Give another example of a trait with some variations.

\_\_\_\_\_

9. What is a dominant trait? List one example.

\_\_\_\_\_

What is a recessive trait? List one example.

\_\_\_\_\_

10. What is genotype? \_\_\_\_\_

What is phenotype? \_\_\_\_\_

11. Let's do a Punnett Square! G = Green pea, g = yellow pea


What were the results? G = \_\_\_\_\_ g = \_\_\_\_\_

Now let's cross the results from above!!


What were the results? G = \_\_\_\_\_ g = \_\_\_\_\_

## Chapter 6 –Heredity

11/10/05

### **Purpose / rationale:**

The purpose of this lesson is to continue to introduce students to the basic principles of heredity. Students will examine the traits of peas used by Mendel to study heredity, further explore gene combinations, continue practicing single-cross Punnett squares, examine incomplete dominance, and take a look at human versus other species' chromosome numbers and finally look at a human Karyotype.

### **SOLs:**

**LS. 13.** The student will investigate and understand that organisms reproduce and transmit genetic information to new generations. Key concepts include

- b) the function of genes and chromosomes;
- c) genotypes and phenotypes;
- d) factors affecting the expression of traits;
- e) characteristics that can and cannot be inherited

**NSES C** Students should develop an understanding of reproduction and heredity. This includes understanding that every organism requires a set of instructions for specifying its traits, that heredity is the passage of these instructions from one generation to another, and that hereditary information is contained in genes, located in the chromosomes of each cell.

### **Materials and Resources:**

PowerPoint presentation  
Science notebooks  
Textbook

### **Safety:**

There are no specific safety guidelines for this lesson.

### **Procedures:**

#### *Engage*

1. **Minds on Science** – pg. 113, Guinea Pig Genetics: A guinea pig with white fur is born to parents with black fur. However, in guinea pigs, the trait for black fur is dominant over the trait for white fur. Explain how this could have happened (**5 minutes**).

*Explore*

2. Students will share with the class how they answered the Minds on Science question. The teacher will make sure the students correctly grasp the answer (**5 minutes**).

*Explain*

3. Students will follow along with the PowerPoint presentation that uses figures obtained from their science textbooks. This includes reading a few passages together out loud and then copying notes into their science notebooks (**30 minutes**).

*Elaborate*

4. Students will work a few more Punnett square problems together in class from the book (or created by the teacher) (**5 minutes**).

*Evaluate*

5. The teacher will check for note completion at the end of the class.

## Chapter 6 –Heredity

11/11/05

### **Purpose / rationale:**

The purpose of this lesson is review all concepts learned from the previous two lessons on heredity. Specifically, students will practice doing and interpreting Punnett squares by using Starburst candy to complete an activity sheet.

### **SOLs:**

**LS. 13.** The student will investigate and understand that organisms reproduce and transmit genetic information to new generations. Key concepts include

- b) the function of genes and chromosomes;
- c) genotypes and phenotypes;
- d) factors affecting the expression of traits;

**NSES C** Students should develop an understanding of reproduction and heredity. This includes understanding that every organism requires a set of instructions for specifying its traits, that heredity is the passage of these instructions from one generation to another, and that hereditary information is contained in genes, located in the chromosomes of each cell.

### **Materials and Resources:**

Starburst candy  
Activity sheet

### **Safety:**

There are no specific safety guidelines for this lesson.

### **Procedures:**

#### *Engage*

1. **Minds on Science** – What do the following terms mean? (1) hybrid, (2) pure, (3) dominant, (4) recessive, (5) genotype, (6) phenotype (**10 minutes**)

#### *Explore*

2. Students will share with the class how they answered the Minds on Science question. The teacher will make sure the students correctly grasp the answer (**5 minutes**).

*Explain*

3. Students will complete the “Starburst Genetics” activity sheet with partners (**30 minutes**).

*Evaluate*

4. The activity sheets will be collected at the end of each period.

<b>Section</b>	<b>Number of Questions</b>	<b>Points Possible</b>
Trials	4	25
		<b>100 total</b>

Name \_\_\_\_\_  
Period \_\_\_\_\_

### STARBURST GENETICS

#### Trial #1 – Complete Dominance in Cheek Dimples

*D = Dimples, d = no dimples*

*Cherry = DD, Orange = Dd, Strawberry = dd*

1. Your Genotype: \_\_\_\_\_ Partner's Genotype: \_\_\_\_\_

2. Complete the Punnett square:


3. What **genotypes** resulted from your cross and how frequently did each occur (**use %**)?

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4. What **phenotypes** resulted from your cross and how frequently did each occur (**use %**)?

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5. What is the **dominant** form of the gene? \_\_\_\_\_  
What is the **recessive** form of the gene? \_\_\_\_\_

#### Trial #2 – Compare with another partner

1. 2<sup>nd</sup> Partner's Genotype: \_\_\_\_\_

2. Complete the Punnett square:


3. What **genotypes** resulted from your cross and how frequently did each occur (**use %**)?

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4. What **phenotypes** resulted from your cross and how frequently did each occur (**use %**)?

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5. Are there any differences between this cross and the first one? Why or why not?

**Trial #3 – Complete Dominance in Hand Clasp**

*R = Right over left, r = left over right*

*Cherry = RR, Orange = Rr, Strawberry = rr*

1. Your Genotype: \_\_\_\_\_ Partner's Genotype: \_\_\_\_\_

2. Complete the Punnett square:


3. What **genotypes** resulted from your cross and how frequently did each occur (**use %**)?

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4. What **phenotypes** resulted from your cross and how frequently did each occur (**use %**)?

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5. If both parents had been RR, could they have had a child that had a hand clasp which was left over right? Why or why not?

**Trial #4 – Incomplete Dominance in Blood Types**

*Cherry = AA, Orange = BB, Strawberry = OO, Strawberry Banana = AO, Kiwi Banana = BO, Tropical Punch = AB*

*\*\*\* Blood Type A and Blood Type B are CODOMINANT, Blood Type O is Recessive\*\*\**

1. Your Genotype: \_\_\_\_\_ Partner's Genotype: \_\_\_\_\_

2. Complete the Punnett square:


3. What **genotypes** resulted from your cross and how frequently did each occur (**use %**)?

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4. What **phenotypes** resulted from your cross and how frequently did each occur (**use %**)?

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5. Can a person have “O” **blood type** if they have an “A” or “B” in his/her genotype? Why or why not?

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