



Why You Are You

<p>THE BASICS</p>	<p>THE TOOLBOX</p>	<p>EDUCATION STANDARDS</p>	<p>Life Science Content Standard: Understanding the human life cycle and that certain characteristics are inherited and passed from parents to children.</p>
<p> Grade Level: 7-12</p>	<ul style="list-style-type: none"> Vocabulary list and activity sheet 	<p>SAFETY CONCERNS</p>	<p>None.</p>
<p> Estimated Time: 45 min.</p>		<p>FOR KIDS WITH DISABILITIES</p>	<p>Visually-impaired students should be paired with students who can describe the activity sheet and read the vocabulary list.</p>



Educational Objective:

To discuss the concept of heredity. To provide a simple, easy-to-understand model of illustrating the use of the Punnett square.

What to Do:

- Make photocopies of the activity sheet and vocabulary list.

Questions to Ask Students As They Do This Activity:

- How many offspring in the Punnett squares have brown eyes? How many have blue eyes?
- What percentage of the offspring are heterozygous?
- What percentage of the offspring are homozygous brown? Homozygous blue?
- Can offspring be homozygous blue? Why or why not?
- In guinea pigs, the gene for black hair (**B**) is dominant over the gene for white hair (**b**). If 2 black heterozygous guinea pigs are bred, what is the probability (percent chance) of producing a homozygous black offspring according to the Punnett square?

Why It Happens:

Genetics is the study of heredity, the passing on of genetic material from one generation to another. Heredity is the reason you look and act at least somewhat like your parents. The passing on of genetic material takes place in **genes**, which contain the actual information that gets passed on to you from birth.

By using the Punnett square, you can figure out the likelihood that living organisms whose parents have particular gene patterns (**genotypes**) will develop particular characteristics (**phenotypes**).

WEB SITES

- **Genetic Science Learning Center**
<http://gslc.genetics.utah.edu/> (Grades 3-12)
- **MendelWeb**
<http://www.netspace.org/MendelWeb/> (Grades 9-12)

SOFTWARE

- **Biology Explorer: Genetics**
LOGAL Software, Inc., 1999.
(Grades 8-12)
- **Biology Gateway: Principles of Genetics**
LOGAL Software, Inc., 1998.
(Grades 9-12)

READING ROOM

- Applegard, Bryan. **Brave New Worlds: Staying Human in the Genetic Future.** Viking, 1998. (Grades 7+)
- Edelson, Edward. **Gregor Mendel and the Roots of Genetics.** Oxford, 1999. (Grades 7+)
- Coen, Enrico. **The Art of Genes: How Organisms Make Themselves.** Oxford, 1999. (Grades 9+)

Career Connections

A geneticist studies the heredity and variation of organisms. Their research involves the study of patterns of inheritance, techniques of DNA analysis, and abnormal genes. Genetic counselors are trained to help families who may have children with inherited birth defects.

Why You Are You Vocabulary List

Allele: One form of a gene. For every inheritable gene, or trait, there is more than one form of the trait. For instance, the gene for hair color can determine that a person will have black, brown, blonde, or red hair. One allele for hair color causes red hair, while another causes black hair, etc.

Dominant: The gene whose characteristic is expressed physically in an offspring. Your genes occur in pairs, one from your mother and one from your father. Since this is the case, you might think that if you get a gene for blue eyes and one for brown eyes you will be born with one blue and one brown eye! But that doesn't happen. Instead, one gene is stronger than, or dominant over, the other, and the dominant gene manifests itself in your physical characteristics. In this case, you would have brown eyes because the gene for brown eyes is dominant over the gene for blue eyes.

Gene: Biological unit that carries the information about heredity from one generation to the next. For each of your characteristics, like hair color, you receive one gene from your mother and one from your father. These two genes form a pair.

Genotype: BB, Bb, bb are all genotypes. A genotype refers to the shorthand used in Punnett squares, the combination of genes for a particular trait.

Heredity: The passing down of mental and physical characteristics from parents to their children. When you see a girl who looks very much like her father, it is heredity that causes this similarity in their features.

Heterozygote: Offspring that has two different alleles for a given trait. A guinea pig with the gene pair **Bb** for black hair is a heterozygote, because it has a dominant and a recessive gene for hair color.

Homozygote: Offspring that has two identical alleles for a given trait. A guinea pig with the gene pair **BB** or **bb** for hair color is a homozygote.

Offspring: A term used in biology that means children. You are the offspring of your parents. Kittens are the offspring of cats. The term is used for plants as well as animals.

Phenotype: The physical manifestation of a given trait. For the genotypes **BB** and **Bb** for hair color in guinea pigs, the phenotype is **black**. For the genotype **bb** for hair color in guinea pigs, the phenotype is **white**.

Punnett square: A method of determining the likelihood that offspring will manifest certain alleles. Punnett squares, like the ones shown on the following page, use shorthand to represent alleles. Genes are represented by single letters, and gene pairs by pairs of letters. For instance, the shorthand for the trait of black hair, which is dominant in guinea pigs, is a capital **B**, which stands for "black" and is capital to indicate dominance. The shorthand for the recessive trait of white hair is represented by a lowercase **b**, which indicates a relation to black, and is lowercase to indicate recessiveness in the presence of a gene for black hair. To represent these two genes in a pair, you would write **Bb**.

Recessive: The gene whose characteristic is masked in the presence of a dominant gene. The characteristics of recessive genes are expressed only when you receive a recessive gene for a characteristic from each parent. In the case of eye color, you would only have blue eyes if both your father and mother passed along a gene for blue eyes to you.

WHY YOU ARE YOU ACTIVITY SHEET

- Discuss the list of vocabulary words on the following page. It is important for you to understand these terms in order to complete this activity.
- In this activity, you will use the Punnett squares to determine how likely it is that the offspring in the squares will have brown eyes (**B**) or blue eyes (**b**).
- The Punnett squares below predict the likelihood that the gene pairs shown will manifest the dominant trait of brown eyes (**B**) or the recessive trait of blue eyes (**b**). Using what you have learned about genotypes and phenotypes, fill out the Punnett squares and determine whether the resulting offspring will have brown or blue eyes. The answers are on the following page. A sample Punnett square has been completed for you.

1

	B	B
B	BB	BB
b	Bb	Bb

4

	B	B
B		
B		

2

	B	B
b		
b		

5

	B	b
B		
b		

3

	B	b
b		
b		

6

	b	b
b		
b		

Why You Are You Answer Sheet

1

	B	B
B	BB	BB
b	Bb	Bb

4

	B	B
B	BB	BB
B	BB	BB

2

	B	B
b	Bb	Bb
b	Bb	Bb

5

	B	b
B	BB	Bb
b	Bb	bb

3

	B	b
b	Bb	bb
b	Bb	bb

6

	b	b
b	bb	bb
b	bb	bb

Note: BB represents brown eyes, Bb represents brown eyes, and bb represents blue eyes.