

Brown Eyes, Blue

Wyoming Science, Mathematics

Objectives:

- Show an understanding of genetics by determining genetic possibilities for offspring.
- Show an understanding of probability by determining the chances of genetic combinations for offspring.
- Learn the terms “dominant” and “recessive”.

Background:

Genes are in every living organism. They determine characteristics about the organism such as hair color, height, and even the ability to curl your tongue! Every organism has between 50,000 and 100,000 genes. Genes are a segment of a DNA molecule in a chromosome contained in a cell. They determine characteristics by influencing chemical and physical processes during growth and aging. Genetic studies are important in agriculture for crop and livestock improvement, as well as in other areas.

Humans have two of every kind of gene, one from their mother and one from their father. Only one gene from each parent is passed to offspring for a particular trait.

Genes can be dominant or recessive. Dominant genes overpower recessive genes. For example, eye color: the gene for brown eyes is dominant and the gene for blue eyes is recessive. Dominant genes are always expressed in offspring. Recessive genes are expressed in offspring only if both parents contribute recessive genes. Therefore, if you received a brown-eye gene from either one of your parents, you will have brown eyes.

If you received a brown-eye gene from your father (B) and a brown-eye gene from your mother (B), your genes for eye color would be BB. Your eyes would be brown because you received only brown-eye genes.

If you received a brown-eye gene from your father (B) and a blue-eye gene from your mother (b), your genes for eye color would be Bb. Your eyes would be brown because the dominant brown-eye gene overpowered the recessive blue-eye gene.

If you received a blue-eye gene from your father (b) and a brown-eye gene from your mother (B), your genes for eye color would be Bb. Your eyes would be brown because the dominant brown-eye gene overpowered the recessive blue-eye gene.

If you received a blue-eye gene from your father (b) and a blue-eye gene from your mother (b), your genes for eye color would be bb. Your eyes would be blue because you only



Standards

Science

Life Systems: 1.2
Science As Inquiry:
2.1, 2.2, 2.3, 2.4

Mathematics

Data Analysis & Probability:
5.1, 5.2, 5.3

Materials

- 2 paper bags
- 8 small pieces of paper (“B” for brown eyes written on four, “b” for blue eyes written on four)

Estimated Time

45 Minutes

Grades 5-6

notes:

received blue-eye genes and there are no brown-eye genes to overpower the blue-eye genes.

Math Connection: Probability is the chance that something will happen. Chances can be determined by looking at possibilities. When humans receive one gene from each parent, there are four possibilities. In this lesson, students will determine gene possibilities and the chances of offspring receiving those possibilities.

Activity Procedures:

1. Discuss genes with the students using the brown-eye/blue-eye example.
2. Remind the students that each parent has two genes for eye color. Each parent will pass only one eye-color gene to their child.
3. Draw a Punnet Square on the blackboard. The Punnet Square is a way of representing parental traits and showing the chances of offspring inheriting certain traits.

Here is an example:

		Mom	
		B	b
Dad	b	Bb	bb
	b	Bb	bb

4. In this situation, the Mom has the genes “Bb,” therefore she has brown eyes. The Dad has the genes “bb,” therefore he has blue eyes. The child will receive “Bb” or “bb” because those are the only possible combinations. The child has a 50% chance of brown eyes (Bb) and a 50% chance of blue eyes (bb).
5. To conduct a demonstration, label one paper bag “Mom” and the other “Dad.”
6. Make eight slips of paper. Write “B” on four slips and “b” on the other four slips. Explain to the students that the “B” represents brown eyes and the “b” represents blue eyes. Turn the slips over so you cannot see the letters on them. Mix up the slips. Randomly select two slips and place them in the bag labeled “Mom.” Place two other slips in the bag labeled “Dad.”
7. The slips in each bag represent the eye-color genes the parents have. Talk about the eye color possibilities of the parents. Either parent could have BB, Bb, or bb.
8. Let a student draw the genes from each bag to determine what eye-color genes each parent has. Take these genes

and make a Punnet Square to determine the eye color possibilities of the child.

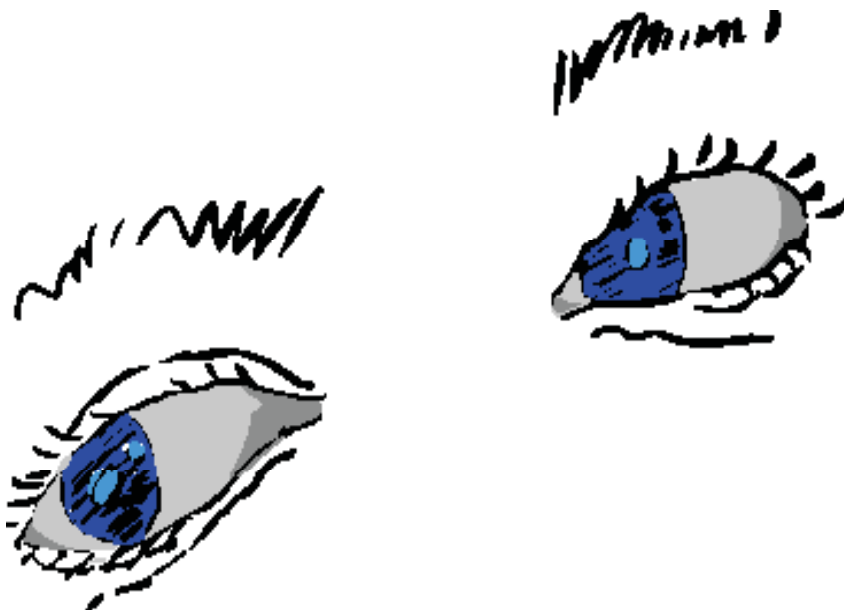
9. Continue the demonstration using other eye color combinations for the parents.

Additional Activities

1. Discuss DNA strands and how they affect human characteristics.
2. Create strands of DNA using construction paper.
3. Create a model of an animal or plant cell.
4. Invite a crop specialist or livestock producer to discuss genetic engineering of crops/livestock and its value.

Questions for Investigation:

- Why are genes important?
- What are dominant and recessive genes?
- How many possibilities are there for gene combinations when each parent contributes one gene for each trait?
- What is probability?



Adapted from Illinois Agriculture in the Classroom.

vocabulary:

- *offspring*
- *DNA*
- *gene*
- *recessive*
- *dominant*
- *probability*