LLAMA GENES ... BUT WAIT, LLAMAS DON'T WEAR JEANS!

An Introduction to Dominate and Recessive Genes

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Tennessee 4-H Youth Development

Llama Genes…But Wait, Llamas Don't Wear Jeans!
An Introduction to Dominant and Recessive Genes

Skill Level
Intermediate, 7th Grade

Learner Outcomes
The learner will be able to:
- Define Genotype and Phenotype
- Understand Dominant and Recessive genes
- Explain the expression of dominant and recessive genes

Educational Standard(s) Supported
7th Grade Science
GLE 0707.4.4
√ 0707.4.6
√0707.4.7
SPI 0707.4.4

Success Indicator
Learners will be successful if they:
- Create and interpret a Punnett square
- Draw a phenotypically accurate depiction of a Llama whose traits are molded by random chance

Time Needed
30 Minutes

Materials List

Student handouts, one per student
Ten short slips of pink paper
Ten short slips of blue paper
Ten long slips of pink paper
Ten long slips of blue paper
Colored pencils, markers or crayons

Introduction to Content

This lesson introduces students to the basic concepts of genetics. Students will explore dominant and recessive genes, as well as phenotypes and genotypes of humans and llamas. Students will learn to complete basic Punnett squares and identify what genes would be expressed based on the genetic combinations.

Introduction to Methodology

The lesson starts with students completing a KWL to assess their prior knowledge about genetics. Content is presented in a video, and then students work through several examples of Punnett squares, both with the instructor and on their own. The lesson concludes with students drawing "genes" for a Llama and constructing a Punnett square and phenotypically correct drawings of the genetic combinations.

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Terms and Concepts Introduction

Genotype- The genetic constitution of an individual
Phenotype- Observable characteristics of an individual
Homozygous- Having identical pairs of genes for a given hereditary characteristic
Heterozygous- Having dissimilar pairs of genes for a given hereditary characteristic

Setting the Stage and Opening Questions

Begin the lesson by showing these two images side by side:
https://goo.gl/images/PRGDx7
https://goo.gl/images/woS0Wq
Ask the students the following questions:
"**What are these animals?**" (Llamas)
"**Why do they look different from one another?**" (Different breeds, etc. Guide the students to saying that they have different genes.)

"**Today, we are going to learn about dominant and recessive genes, and by the end of the lesson you should be able to define genotype and phenotype, understand dominant and recessive genes, and describe how those genes are expressed.**" Post the learning objectives somewhere in the room so students can see during the W portion of the KWL.

Pass out the student handout and say, "**In the next 2 minutes, I want you to fill out what you already know about genes in the column under "K" and what you need to learn to meet our goals for today under the "W". After everyone has finished, we will share and then start on our activities for today.**"

Allow students to complete the K and W portions of their handout and then ask them to share with the class.

Experience

After students have shared, say, "**We will be watching a short video today that introduces Gregor Mendel and his experiment with pea plants. This was when dominant and recessive genes were first discovered. As we watch the video, fill out the important information on the bottom of your handout.**"

Show this clip: https://www.youtube.com/watch?v=Mehz7tCxjSE

As students watch the clip, they should be answering the four questions on the bottom of the front page of their handout. The answers to these questions can be found in the supplemental information.

After students have completed the handout, ask students to share the answers to the questions and correct any wrong answers.

Share

Say, "**Now that you have a general idea of dominant and recessive genes, we are going to work through completing a Punnett square together. On the back of your handout, you'll see several Punnett squares drawn. As a class, we will fill one out for Eye Color.**" Instruct students to write the parent genes across the top and down the left side. They then take the letter and copy it into the boxes below or beside it. A dominant gene (Capital Letter) will always be displayed regardless of what it is paired with. To express a recessive gene (lowercase letter) there must be two in the same square. The completed Punnett square for this example is in the supplemental information. After students have completed the Punnett square, ask them to write what eye color would be expressed by the genetic combination.

Process

Say to the students, "**Now that we have worked through an example of Punnett squares, you get to work through one on your own. This example deals with hair color. In this example, red is the recessive gene, and brown is dominant. Parent one has red hair, which is a recessive gene, and carries a homozygous gene for that. Parent two has brown hair, and carries a heterozygous gene for it, paired with red hair. Using this information, complete a Punnett square.**" Students should have rr as a gene for parent one and Br for parent two and complete the Punnett square using this information.

Generalize

After students have completed the Punnett square, ask them to share what they found. Correct any that were filled out incorrectly and reteach any information if necessary. As an assessment, have the students complete this Kahoot quiz in groups: https://play.kahoot.it/#/k/77e9ee97-7ce4-4b54-94e5-0d8a3cbb4855

Apply

Place all the pink slips in one container, and all the blue slips in another. Have students remain in their groups from the Kahoot quiz and say "**Now, we are going to look at how these genes are expressed. Each group will need to come up and draw two pink slips of paper and two blue slips. The length of the paper corresponds to whether the gene is dominant or recessive, with a long slip representing a dominant gene and a short slip representing a recessive gene, while the color indicates the parent. For Llamas, brown is a dominant gene, and red is a recessive gene. After you have drawn your slips, work as a group to complete a Punnett square and then draw a phenotypically correct drawing of your Llamas, one Llama for each square. For example, if I were to draw one short and one long pink slip, that parent, the mother, would be brown heterozygous.**"

Have students draw two slips of paper from each container, and create a Punnett square. Then draw their Llamas on the bottom half of the back of the student handout. After they have completed the drawing, have them fill in the "L" portion of the KWL Chart on the front of the handout to indicate what they have learned. Discuss the student responses as a class.

Supplemental Information
Educational Standards Met and Examples

GLE 0707.4.4 Predict the probable appearance of offspring based on the genetic characteristics of the parents
√ 0707.4.6 Use a Punnett square to predict the genotypes of offspring resulting from a monohybrid cross
√0707.4.7 Draw a phenotypically accurate picture of an individual whose traits are modeled by the roll of a die
SPI 0707.4.4 Interpret a Punnett square to predict possible genetic combinations passed from parents to offspring during sexual reproduction.

1. What is a genotype? *The genes that an organism has for a specific set of characteristics*
2. What is a phenotype? *The physical characteristics expressed by an organism for a specific set of genes*
3. What does homozygous mean? *Having matching genes in a pair for a certain characteristic*
4. What does heterozygous mean? *Having unmatching genes in a pair for a certain characteristic*
5. In the space below, draw the layout of a Punnett square. *See below*

Parent one (Bb)

	B	b
B	BB	Bb
b	Bb	bb

Parent two Bb
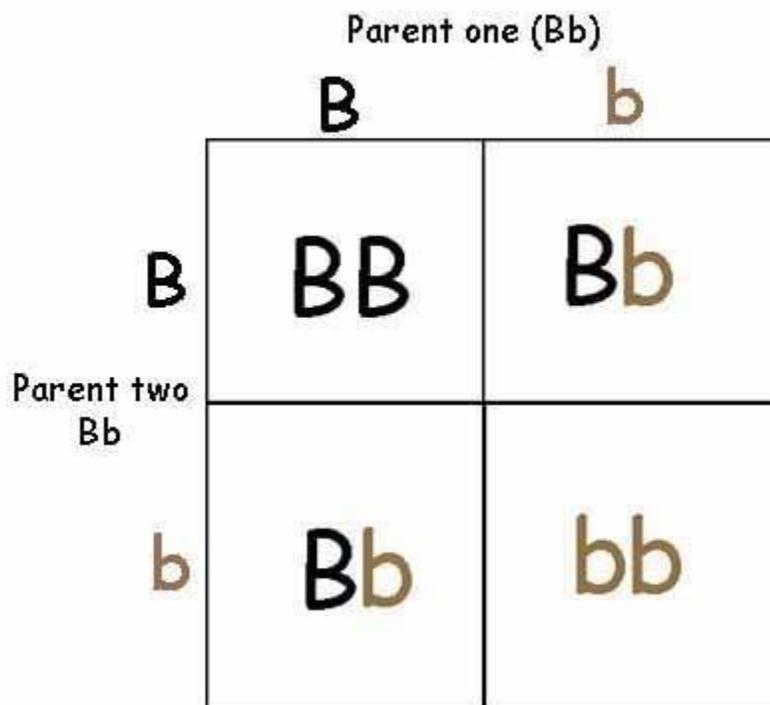
Share example Punnett Square.

B- Brown Eyes

b- Blue Eyes

K	W	L

1. What is a genotype?

   _____

2. What is a phenotype?

   _____

3. What does homozygous mean?

   _____

4. What does heterozygous mean?

   _____

5. In the space below, draw the layout of a Punnett square.

Genes