



pets in the
classroom

Decoding the Guinea Pig Blueprint: Genes and Heredity

Adapted from	Guinea Pig Genes: See also: Leopard Geckos Pets in the Classroom	
Pet: Guinea pigs	Class:	6-9

Brief Overview: This lesson explores genes and heredity, using the guinea pig as a model organism. Students will learn about the basic building blocks of inheritance, how traits are passed from parents to offspring, and the role of chance in determining individual characteristics. <i>This lesson is easily adaptable to other pets and other grade levels.</i>	Lesson Breakdown Lesson 1: Guinea Pig Differences Lesson 2: Practice with Punnett Squares
Essential Question How do genes and heredity determine the characteristics of living things?	

Subjects <input checked="" type="checkbox"/> Science <input type="checkbox"/> ELA <input type="checkbox"/> Math <input type="checkbox"/> STEM <input type="checkbox"/> Art <input type="checkbox"/> Other	Stem Connections Science: Technology: Engineering: Math:
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Performance Expectations/ Standards

NGSS Standards:

LS1.A: Structure and Function: Within living cells, specific molecules, such as DNA, carry genetic information, which is passed from parent to offspring through reproduction.

LS3.B: Variation of Traits: Genetic variations of inherited traits exist in populations.

LS3.C: Inheritance and Variation of Traits: The probability of a particular trait appearing in offspring can be determined by analyzing the genotypes of the parents.

CCSS Standards:

RST.6-8.7: Integrate information from text, images, multimedia, and oral presentations to demonstrate understanding of a topic.

WHST.6-8.2: Write informative/explanatory texts that examine a topic and convey ideas and information clearly and accurately.

SL.6.8.1: Engage effectively in a variety of collaborative discussions.

I CAN statements

- explain the difference between genes and heredity.
- identify the role of DNA in inheritance.
- predict the possible offspring traits based on parent genotypes in guinea pigs.
- communicate my understanding of genetics and heredity through writing and discussion.

Materials

[Introduction to Genes and Heredity](#)

[Decoding the Guinea Pig Blueprint Student Worksheet](#)

Teacher Background

This quick guide equips you with the essential genetic concepts for your lesson, empowering you to confidently guide your students through the fascinating world of inheritance.

Key Players:

Genes: These microscopic segments of DNA encode instructions for specific traits like fur color, hair length, and eye color. Each organism inherits two copies of each gene, one from each parent.

Alleles: Different versions of the same gene are called alleles. Some alleles are dominant, meaning they mask the expression of the recessive allele if paired together. Recessive alleles require pairing with another recessive allele to be expressed.

Understanding Inheritance:

Punnett Squares: This visual tool predicts the possible combinations of alleles offspring can inherit based on the parents' genotypes. By filling in squares with parental alleles and applying dominance rules, you can calculate the probabilities of different traits appearing in the offspring.

Beyond Simple Dominance:

Incomplete Dominance: Some alleles exhibit incomplete dominance, resulting in a blended phenotype (e.g., roan coat in guinea pigs).

Codominance: Both alleles in a heterozygous pair contribute to the phenotype (e.g., AB blood type in humans).

Polygenic Traits: Multiple genes influence a single trait, resulting in complex inheritance patterns (e.g., human height or skin color).

Sex-linked Inheritance: Genes located on sex chromosomes (X or Y) exhibit unique inheritance patterns affecting males and females differently (e.g., orange fur color in some male guinea pigs).

Lesson 1: Guinea Pig Differences

Time	Materials	Activity
10 mins		<p>Show students pictures of different guinea pig breeds with varied fur colors, patterns, and eye colors.</p> <p>Discuss observable traits and ask students to brainstorm how these differences might arise.</p>
10 mins		<p>Define genes as the basic units of heredity located on chromosomes within cells.</p> <p>Use analogies like building blocks or instructions to explain how genes influence traits.</p> <p>Introduce the concept of alleles, different versions of a gene that can determine different expressions of a trait.</p>
25 mins	Introduction to Genes and Heredity	<p>Show the slide presentation and work through the examples.</p> <p>Focus on specific guinea pig traits like fur color (black, white), fur texture (smooth, rough), and eye color (red, black).</p> <p>Explain dominant and recessive alleles using Punnett squares, visually representing the inheritance of traits from parents to offspring.</p>

Lesson 2: Practice with Punnett Squares

Time	Materials	Activity
10 minutes	Decoding the Guinea Pig	<p>Review with students the dominant and recessive alleles.</p> <ul style="list-style-type: none">The dominant B allele is responsible for black fur,

	Blueprint Student Worksheet	<p>while the recessive b allele is responsible for brown fur.</p> <ul style="list-style-type: none"> • The dominant H allele is responsible for a guinea pig with hair while the recessive h allele is responsible for no hair (Skinny pigs) • The dominant R allele is responsible for Black eyes, while the recessive r allele is responsible for red eyes • The dominant G allele is responsible for banded colored fur while the recessive g allele is responsible for a solid coat
25 mins	Guinea Pig to observe Decoding the Guinea Pig Blueprint Student Worksheet	Allow students to complete the sample problems in their worksheet
10 mins	Decoding the Guinea Pig Blueprint Student Worksheet	Allow the students time to complete the CER

Differentiation

For students who need additional support:

- Provide additional support for struggling students by offering simpler Punnett squares or pre-made genetic information for specific guinea pig breeds.
- Complete the worksheet as a class

For students who need additional challenges:

- Challenge advanced students to research more complex genetic concepts like polygenic traits or incomplete dominance.
- Encourage students to create detailed drawings or illustrations of guinea pigs and their genetic traits.

Assessment

Category	4 Points (Mastery)	3 Points (Proficiency)	2 Points (Developing)	1 Point (Emerging)
Participation	Actively participates, asks insightful questions, shares observations, & contributes significantly to group work.	Participates consistently, offers relevant contributions, but may not always initiate discussion or raise complex questions.	Participates occasionally, requires prompting to contribute, & may struggle to follow complex discussions.	Rarely participates, requires significant prompting & support to engage in discussions or activities.
Punnett Squares	Accurate and complete, demonstrating clear understanding of gene combinations & expected outcomes.	Mostly accurate, with minor errors that are explained & corrected with guidance.	Contain errors that hinder accurate prediction of outcomes & require significant guidance for correction.	Inaccurate & demonstrate fundamental misunderstandings of gene combinations & their consequences.
Claim-Evidence-Reasoning (CER)	Well-structured with strong claims supported by compelling evidence & clear reasoning connecting evidence to the claim.	Generally clear & organized, with evidence supporting the claim but reasoning may need further elaboration.	Incomplete or poorly organized, lacking clear connections between evidence & the claim, or relying on vague reasoning.	Missing or incoherent, lacking evidence, clarity, or logical reasoning.



Extension

- Visit a local animal shelter or farm to observe different breeds and discuss their inherited traits.
- Conduct a classroom debate on the ethical considerations of genetic engineering.
- Research and create a presentation on famous historical figures with interesting genetic anomalies.