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# Genetics for Geniuses: The Creature Creator Lab

**Materials Needed:**

- 2 coins (pennies, quarters, etc.)
- Paper (plain and/or colored construction paper)
- Pencils, colored pencils, or markers
- Scissors (optional)
- Glue or tape (optional)
- Worksheet: "My Creature's Genetic Code" (a simple chart you can draw, see instructions below)

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## Lesson Overview

**Subject:** Science (Life Science/Genetics)
**Grade Level:** 6th Grade (Ages 11-12)
**Student:** Cora
**Time Allotment:** Two 50-minute blocks

## Learning Objectives

By the end of this two-part lesson, Cora will be able to:

- **Explain** that traits are passed down from parents to offspring through genes.
- **Differentiate** between dominant and recessive traits using a simple model.
- **Construct** a model (a creature) to demonstrate how random gene combinations lead to specific traits.
- **Illustrate** the concept of genetic variation by comparing two offspring (creature siblings) from the same parents.
- **Hypothesize** how certain traits might be advantageous for a creature in a specific environment.

## Standards Alignment

This lesson aligns with the Next Generation Science Standards (NGSS):

- **MS-LS3-2:** Develop and use a model to describe why sexual reproduction results in offspring with genetic variation.

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# Part A: Inheritance of Traits (50 minutes)

## 1. Introduction: The "Why" Question (5 minutes)

- **Ask Cora:** "Have you ever been told you have your mom's eyes or your dad's smile? Why do you think you look like your family, but you're not an exact copy of anyone?"
- **Discuss:** Briefly talk about how we inherit features, or "traits," from our parents. Explain that we're going to explore how this works by creating our very own creature and seeing what traits
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it inherits from its imaginary parents.

2. Core Concepts: The Recipe for Life (15 minutes)

- **Analogy:** "Think of your DNA as a giant cookbook for making 'you'. A **gene** is like a single recipe in that book for a specific trait, like eye color."
- **Alleles:** "For each recipe (gene), you get two versions, one from each parent. These versions are called **alleles**. Sometimes, one recipe is a little 'louder' or stronger than the other."
    - A **dominant** allele is the "loud" one. If it's there, you'll always see its trait. We'll represent it with a capital letter (like F).
    - A **recessive** allele is the "quiet" one. You only see its trait if you have two copies of it. We'll use a lowercase letter (like f).
- **Coin-Flip Model:** "Each parent has two alleles to give, but they only pass on ONE. Which one they pass on is totally random, like flipping a coin! Today, our two coins will represent the two parents. Heads will be the dominant allele (F), and tails will be the recessive allele (f)."

3. Activity: Create-a-Creature! (25 minutes)

1. **Prepare the Worksheet:** Draw a simple two-column chart titled "My Creature's Genetic Code." Column 1: "Trait." Column 2: "Alleles (from coin flip)."
    - **List these traits in the first column:** Fur Color, Eye Shape, Number of Legs, Tail Type, Ear Shape.
2. **Define the Traits:** Explain the creature's possible traits to Cora. For example:
    - **Fur Color:** Fluffy (F) is dominant to Smooth (f).
    - **Eye Shape:** Round (R) is dominant to Star-shaped (r).
    - **Number of Legs:** Six legs (L) is dominant to Two legs (l).
    - **Tail Type:** Long & Curly (T) is dominant to Short & Straight (t).
    - **Ear Shape:** Pointy (P) is dominant to Floppy (p).
3. **Flip for Genes:** For each trait, Cora will flip two coins (one for each "parent").
    - Record the result in the chart. For example, for Fur Color, if she flips a Heads (F) and a Tails (f), she writes down "Ff". If she flips two tails, she writes "ff".
    - After flipping for all traits, help her determine the creature's appearance. For "Ff," the creature has fluffy fur because the dominant 'F' allele is present. For "ff," it would have smooth fur.
4. **Draw the Creature:** Based on the final traits determined by the "genetic code," Cora gets to draw her unique creature. Encourage her to give it a name and be creative!

4. Wrap-up & Reflection (5 minutes)

- Ask Cora to present her creature. "Tell me about 'Sparky.' Why does he have pointy ears but a short tail?"
- Guide her to explain using the words "dominant" and "recessive."

Part B: Variation of Traits (50 minutes)

1. Re-Introduction: A Creature Sibling (5 minutes)

- **Ask Cora:** "Your creature is amazing! But what would happen if its parents had another baby? Do you think the sibling would be an identical twin? Why or why not?"
- **Explain:** Today we're going to explore "variation"—the small differences between individuals in a family or a species. We'll do this by creating a sibling for her first creature.

2. Activity: The Creature Family (25 minutes)

1. **Create a Sibling:** Using a new "My Creature's Genetic Code" chart, have Cora repeat the coin-flipping process for a second creature. The "parent" genetics (the coin) stay the same, but the random outcome of the flips will likely be different.
2. **Draw the Sibling:** Cora draws the new creature next to the first one.
3. **Compare and Contrast:** Lay the two creature drawings side-by-side. Ask Cora:
    - "What traits do the siblings share?"
    - "What traits are different?"
    - "Why aren't they exactly alike, even though they have the same parents?" (Answer: Because the combination of alleles they received was different due to random chance).

3. Creative Application: Field Guide & Adaptation (15 minutes)

- **The Challenge:** "Now, let's be wildlife biologists! Imagine your creature family lives in a specific environment, like a snowy mountain, a dense jungle, or an underwater cave. Choose an environment for them."
- **Think Critically:** "Look at the variations between your creatures. Is having fluffy fur better in a snowy mountain? Are six legs better for climbing in a jungle? Is having star-shaped eyes better for seeing in a dark cave?"
- **Create a Field Guide Entry:** On a new sheet of paper, Cora can write a "Field Guide" entry for her creature species. It should include:
    - The species' name.
    - A drawing of one of the creatures.
    - A description of its habitat (the environment she chose).
    - A short paragraph explaining how one of its specific traits (e.g., fluffy fur, six legs) helps it survive in that habitat. This is the beginning of understanding adaptation!

4. Final Discussion (5 minutes)

- Have Cora share her field guide entry.
- Praise her for thinking like a scientist—not just creating something, but thinking about how it fits into the world around it.
- Recap the big ideas: traits are inherited, mixing genes creates variation, and variation can be helpful for survival.

Differentiation & Extension

- **For Extra Support:** Reduce the number of traits to three. You could also provide pre-drawn body shapes and have Cora add the specific trait details.
- **For an Extra Challenge (Going Further):**
    - Introduce "incomplete dominance" for one trait (e.g., if F is for red flowers and f is for white, Ff results in pink flowers) and let her create a trait for that.
    - Briefly introduce Punnett Squares as a way to predict the probability of traits instead of just flipping coins.

Assessment

Cora's understanding will be assessed through:

- **Verbal Explanations:** Her ability to use terms like "trait," "dominant," and "variation" correctly during discussions.
- **Creature Models:** The accuracy of her creature drawings based on the "genetic code" she generated with the coins.

- **Field Guide Entry:** Her written work will show if she can connect a specific inherited trait to an environmental advantage, demonstrating an applied understanding of the concept.

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