Genetic Mutation

Life Science | Lesson Guide

5th Grade

Photo Description

This image shows a bright pink zinnia flower with a distinctive yellow center surrounded by deep red stamens. Notice how the petals radiate outward in different shades, and the yellow center structures (stamens and pistil) contrast sharply with the pink petals. In the background, you can see other flowers in a garden with slightly different colors and shapes, showing that plants in the same species can look different from one another.

Scientific Phenomena

Anchoring Phenomenon: Why do flowers of the same type look different from each other?

This image represents genetic variation and trait expression in plants. Each flower carries genetic instructions (DNA) that determine its color, petal shape, and size. Even though all the flowers in this garden are zinnias, they express their genes slightly differently because they inherited different combinations of genetic information from their parent plants. The pink coloring, petal shape, and stamen structure are all traits controlled by genes. Just like humans in the same family can have different eye colors or heights, plants in the same species show natural variation in their appearance.

Core Science Concepts

* Genetic Variation: All living things have genes that code for traits. Organisms with the same genes can still look different because they inherit different combinations of those genes from their parents. This natural variation helps ensure that some organisms survive environmental changes.

* Inherited Traits: Physical characteristics of organisms, like flower color and petal shape, are passed down from parent organisms to offspring through genes. These traits are determined by DNA.

* Adaptation and Survival: Plants with different colored flowers may have advantages in different environments. For example, a bright pink flower might attract certain pollinators better than other colors, helping that plant reproduce successfully.

* Pollinator Attraction: The combination of bright color (pink petals) and the contrasting yellow center serve as signals to insects like bees and butterflies. Different pollinators are attracted to different color combinations, which influences which plants successfully reproduce.

Pedagogical Tip:

When teaching genetic variation to fifth graders, avoid introducing the term "mutation" (which implies a change from an expected form). Instead, emphasize that variation is NORMAL and expected in nature. Use familiar examples like "Why don't all dogs look the same even if they're the same breed?" This reframes variation as natural diversity rather than error.

UDL Suggestions:

To support diverse learners, provide multiple means of representation: (1) Use physical flower specimens or high-quality images so students can observe variations directly; (2) Create a comparison chart with images of different zinnia varieties side-by-side; (3) Offer a "flower color sorting station" where students physically group flowers by color intensity to develop observational vocabulary before discussing genetics formally.

Discussion Questions

1. If you planted seeds from this pink zinnia flower, would all the baby flowers be the same pink color? Why or why not? (Bloom's: Analyze | DOK: 2)

2. What do you think would happen to the garden if all the flowers were the same color instead of different shades? How might that affect the insects that visit them? (Bloom's: Evaluate | DOK: 3)

3. This flower has pink petals and a yellow center. How is this different from the other flowers you see in the background? What does this tell us about how traits are inherited? (Bloom's: Understand | DOK: 1)

4. If a bee is attracted to bright pink flowers more than pale pink flowers, how might this affect which zinnia plants produce the most seeds over time? (Bloom's: Evaluate | DOK: 3)

Extension Activities

1. Flower Color Variation Hunt: Take students on a nature walk around the school grounds or local park to collect images (photos or sketches) of flowers in the same species that show color variations. Have them create a display organizing flowers from lightest to darkest shade. Discuss: What causes these differences? Could genes be responsible?

2. Inheritance Prediction Game: Provide students with two "parent" flower cards showing different traits (e.g., one pink flower, one white flower). Have students predict what "offspring" flowers might look like if these parents reproduced together. Then reveal actual photos of hybrid zinnias or other flowers to see if their predictions were reasonable. This builds understanding of how traits combine.

3. Pollinator Preference Experiment: Set up a simple observation station with pictures of different colored flowers (or use real flowers if available). Place small stickers or drawings of different pollinators near each flower color. Have students predict which pollinators visit which colors based on the image. Research actual pollinator preferences and compare their predictions to real data.

NGSS Connections

Performance Expectation: 5-LS3-1 - Analyze and interpret data to provide evidence that plants get the traits they have from parent plants.

Disciplinary Core Ideas:
- 5-LS3.A - Organisms inherit traits from their parents
- 5-LS3.B - Variation of traits in a species may provide advantages in surviving and reproducing
- 5-LS1.A - Plants get the materials they need for growth from air and water

Crosscutting Concepts:
- Patterns - Observable patterns in flower colors and shapes show that variation exists within species
- Cause and Effect - Genetic information causes organisms to have particular traits

Science Vocabulary

* Gene: A tiny instruction inside cells that tells an organism what traits to have, like flower color or petal shape.

* Trait: A characteristic or feature of an organism that can be seen or observed, such as color, size, or shape.

* Inherited: Passed down from parent organisms to their offspring through genes; something you get from your parents.

* Variation: Natural differences in how organisms look or behave, even when they are the same type of living thing.

* Pollinator: An animal (like a bee, butterfly, or hummingbird) that carries pollen between flowers and helps plants make seeds.

* Reproduce: To make new living things; for plants, this often happens when pollen from one flower reaches another flower.

External Resources

Children's Books:
- Flower Colors by Valerie Bodden (Seedlings series) - Simple, photo-based exploration of why flowers have different colors
- From Seed to Plant by Gail Gibbons - Comprehensive guide to plant growth and variation with clear illustrations
- The Reason for a Flower by Ruth Heller - Beautifully illustrated explanation of why flowers look different and attract pollinators

YouTube Videos:
- "Plant Traits and Heredity" by Amoeba Sisters (4:49 min) - Animated explanation of inherited plant traits with clear visuals and relatable examples. https://www.youtube.com/watch?v=sXkcrbMFIcU

- "Why Are Flowers Different Colors?" by National Geographic Kids (3:15 min) - Explores how flower colors attract pollinators and relate to genetic variation in nature. https://www.youtube.com/watch?v=V1hzPAJ-w0Y

Implementation Note: This lesson scaffold moves from observation !' explanation !' prediction !' application. Consider starting with the photo and discussion questions, then building toward extension activities over 2-3 class periods for deeper understanding.