



Variation and Heredity

Objectives

You will be able to

- Distinguish between sexual and asexual reproduction.
- Develop a model to show how sexual reproduction results in variation of traits and asexual reproduction results in identical traits.
- Collaborate to identify patterns.
- Use language to describe diagrams



How do the environment and genetics affect who we are and how we are similar or different?

Evaluation and Feedback

To evaluate your work, you will

- Use the “Developing and Using Models” row of the Science and Engineering Practices Rubric.
- Use other criteria determined by your teacher.

Task 3: Make a Dog Family and Bacteria Family

As a group:

- Identify variation of traits in dogs.
- Identify the traits and alleles in parent dogs.
- Create two puppies from the parent dogs.
- Create a model to describe variations in puppies.
- Identify the traits and alleles in bacteria.
- Create bacteria offspring.
- Create a model to describe the lack of variation in bacteria offspring.

Vocabulary

- allele
- asexual reproduction
- bacteria
- chromosome
- dominant
- gene
- recessive
- sexual reproduction
- trait
- variation

Connect to the Culminating Project

Plan and organize your children’s book in your Individual Project Organizer:

- Design and draw your main character as a baby and its parents.
- Make allele pairs for six character traits.
- Show how alleles are passed from parent to offspring.

Introduction

In Task 2, you discovered different structures and behaviors that make it more likely for a plant or animal to reproduce successfully. Now it's time to think about the results of reproduction. You started out the unit thinking about your own human traits, but how did you get them? You know that your parents reproduced to make you, but how did you end up with the collection of traits you have?

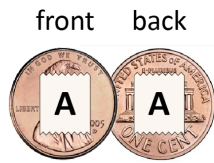
- Do you look identical to or different from your parents? Make a prediction: Why do you think this is the case?

Part I • Dog Traits

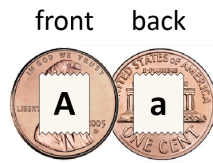
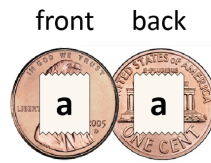
1. You will find these resource cards on your table:
 - Domestic Dog Pictures Resource Card
 - Animal and Plant Reproduction Resource Card
2. Analyze the Domestic Dog Pictures Resource Card and answer these questions:
 - Describe three variations, or differences, you see among the dogs.
 - **Cause and Effect:** Why does variation in dogs exist?
3. Analyze the Animal and Plant Reproduction Resource Card.
 - Describe the process of sexual reproduction.

Part II • Make a Dog Family

1. Place the following handouts that your teacher gives you in front of you:
 - Domestic Dog Pictures Resource Card (one per group)
 - Dog Traits and Alleles Resource Card (one per group)
 - Dog Family Picture Frame (one per student)
2. Pick a mom dog and a dad dog from the Domestic Dog Pictures.
3. Draw your mom and dad dogs in your Dog Family Picture Frame.
4. Identify your mom and dad dogs' **traits** in the Dog Traits and Alleles Resource Card. Record the traits in the Dog Data Table.
5. Identify your mom and dad dogs' **alleles** in the Dog Traits and Alleles Resource Card. Record the traits in the Dog Data Table.
6. Follow your teacher's instructions to make a puppy with your penny alleles. Record its traits and alleles in the Dog Data Table.



2 dominant alleles

1 dominant allele
1 recessive allele

2 recessive alleles

United States coin images from the United States Mint

7. Repeat step 7 for a second puppy. Record its traits and alleles in the Dog Data Table.
8. Draw your two puppies in the Dog Family Picture Frame.
9. Name the four dogs in your dog family.

Dog Data Table

	Mom Dog		Dad Dog		Puppy 1		Puppy 2	
	Use Dog Traits and Alleles Resource Card.				Flip Mom and Dad pennies.			
Trait	Trait	Alleles	Trait	Alleles	Trait	Alleles	Trait	Alleles
Example: Tail Shape	Curved	Tt	Curved	Tt	Curved	Tt	Straight	tt
Tail Shape								
Tail Fluffiness								
Tail Length								
Height								
Coat Color								
Coat Length								
Ear Stance								
Ear Length								
Your Choice								
Sex: M or F								

Part III • Dog Family Analysis

1. Using the process you modeled in making your dog family, develop and draw a model to show how sexual reproduction results in variation of traits in the offspring. Make sure to label the parts of your model. Draw your model in your science notebook.



2. **Cause and Effect:** Describe why sexual reproduction results in variations of traits in the offspring. Record your answer in your science notebook.



3. Apply the model above and show how two brown-haired parents can have a blond-haired child. Record your answer in your science notebook.

B = Brown allele b = blond allele



Part IV • Bacteria Traits

1. You will find these resource cards on your table:
 - Bacteria Resource Card
2. Analyze the Bacteria Resource Card and discuss the following with your group:
 - Brainstorm three variations, or differences, you see among the bacteria.
 - **Cause and Effect:** Why does variation in bacteria exist?
3. Analyze the Bacteria Reproduction part of the Bacteria Resource Card and discuss with your group:
 - Describe the process of asexual reproduction.

Part V • Bacteria Family

1. In addition to the resource cards in Part IV, you will find the Bacteria Traits Resource Card on your table.
2. Place the following handout that your teacher gives you in front of you:
 - Bacteria Family Picture Frame
3. Select your parent bacteria from the Bacteria Resource Card (you only need to choose one parent).
4. Draw your parent bacteria on your Bacteria Family Picture Frame.

- Identify the parent bacteria's **traits** using the Bacteria Traits Resource Card. Record these traits in the Bacteria Data Table.
- Identify the parent bacteria's **alleles** using the Bacteria Traits Resource Card. Record these alleles in the Bacteria Data Table.
- Make two bacteria babies.

**HINT**

Design a way to identify the alleles that will be passed from parent to offspring in bacteria.

- Record the **traits** and **alleles** of your baby bacteria in your Bacteria Data Table.
- Draw your baby bacteria on your Bacteria Family Picture Frame.

Bacteria Data Table

	Parent Bacteria		Baby Bacteria 1		Baby Bacteria 2	
Trait	Trait	Allele	Trait	Allele	Trait	Allele
Cell Shape						
Growth Pattern						
Flagellum						
Outer Coat (Capsule)						
End (Spore)						

Part VI • Bacteria Family Analysis

- Using the process you modeled in making your bacteria family, develop and draw a model to show that asexual reproduction **does not** result in variation of traits in the offspring. Make sure to label the parts of your model.

Draw your model in your science notebook.



- Cause and Effect:** Use your model to describe why asexual reproduction **does not** result in variations of traits in the offspring. Record your answer in your science notebook.



3. Make a Venn diagram to show the differences and similarities between asexual reproduction and sexual reproduction. Draw your diagram in your science notebook.

**REFLECT**

At the beginning of this task, you tried to explain why you look identical or different from your parents. Look back at your response. After what you have learned about sexual and asexual reproduction, how could you change or add to your ideas?

Part VII • Connect to the Culminating Project and Assessment

Complete the Individual Project Organizer for this task.

