

Mutt Mixer Modeling

Pilot Condition M

Using dogs and alleles based on Mutt Mixer, students model how an individual makes reproductive cells with different combinations of alleles, and how reproductive cells join to make varied offspring.

Implementation instructions

1. Distribute materials. Each student or pair will need 2 parent dog cards, an Instructions page, a Student Sheet, and a Gametes page. *Parent dog cards and instructions pages can be re-used.*
2. Set a method for randomly assigning alleles to eggs and sperm (flip a coin, roll a die). Students should repeat the randomization process for each gamete.
3. Students will need some information about the traits from Mutt Mixer to complete the table on the Student Sheet. They can use the Edit feature in *Mutt Mixer* to input their pup's allele combinations for one of the dog parents. Alternatively, you could give them the information they need from the *Mutt Mixer Trait Quick Reference* pdf.

Optional: Students can make a visual representation of their pup by taking a screen shot from *Mutt Mixer* or drawing their pup.

Notes from the developers

This activity is meant to unpack the idea of random assortment that happens behind the scenes in Mutt Mixer. Try to keep the discussion focused there, as a source of variation in the offspring.

Materials needed

- Copies, scissors, student devices with internet access
- Optional: Blank paper, colored pencils or crayons for drawing dog offspring

Discuss

- How does the ***distribution of alleles into reproductive cells*** lead to genetic variation in offspring?
- How does the ***joining of random reproductive cells*** lead to genetic variation in offspring?

Reminders

- Have students take the quiz right after this activity.
- Rejoin the lesson sequence **after** the *Mutt Mixer Modeling* activity.
- Please do NOT use any of the optional Punnett square lessons below the Inheritance table.

Mutt Mixer Modeling

Instructions

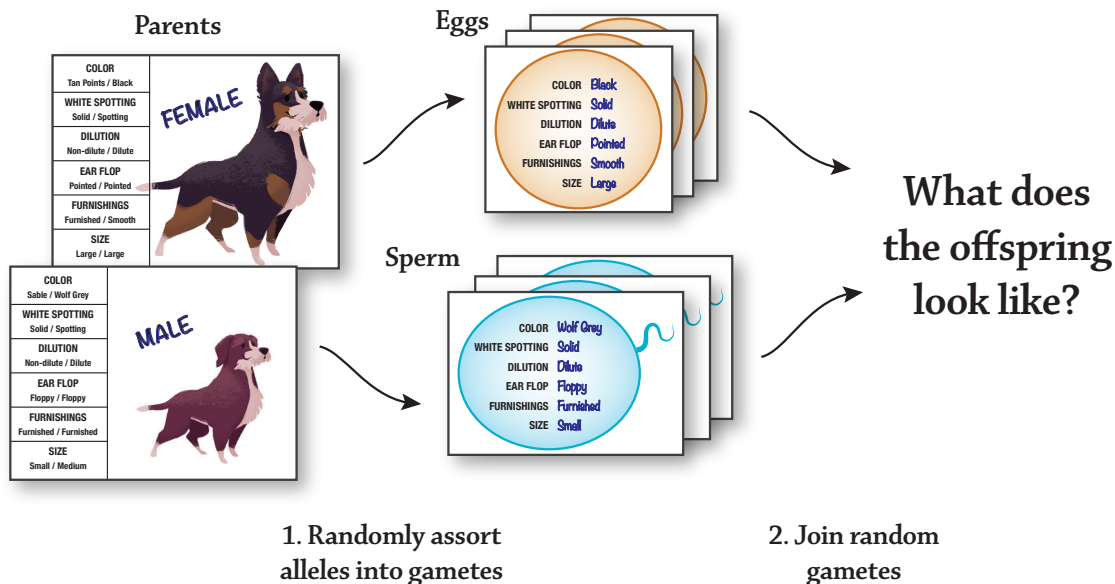
Now that you have played with *Mutt Mixer*, you'll model how random shuffling of parents' alleles leads to variation in the pups. You'll model allele shuffling in two steps:

Part 1: Randomly distribute alleles into gametes

1. Start with two parent dogs.
2. Choose one of your dogs to be female and one to be male. Label them.
3. Make 3 gametes for each dog (on separate *Gametes* page).

Part 2: Join two random gametes

4. Cut out your gametes and separate them into two groups: eggs and sperm.
5. Flip your gametes so they are face down.
6. At random, choose one egg and one sperm. Put them together to make an offspring!
7. Fill out the table on the student sheet and answer the questions.



Mutt Mixer Modeling

Student Sheet

What does your pup look like?

Fill in the table to show the offspring's alleles and trait versions:

	Allele from egg	Allele from sperm	Trait
Color			
White spotting			
Dilution			
Ear Flop			
Furnishings			
Size			

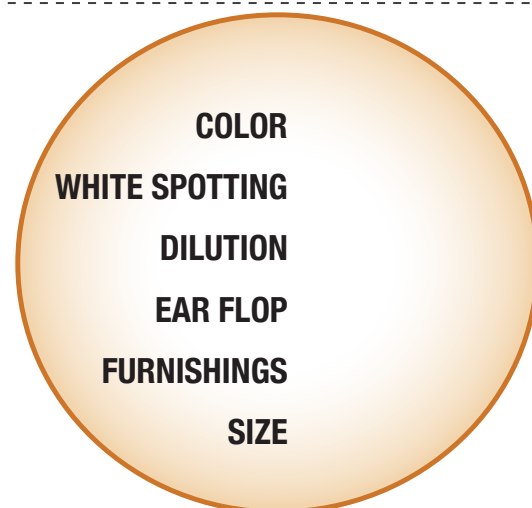
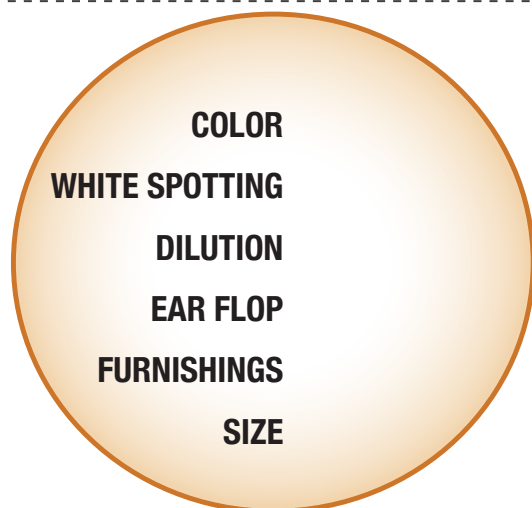
Questions

1. Can you find a trait in the offspring that is different from both of its parents? Which trait?
2. If you chose two different gametes to make a second offspring, would it have the same traits as the first? Why or why not?
3. What does this activity teach you about how sexual reproduction leads to variation?

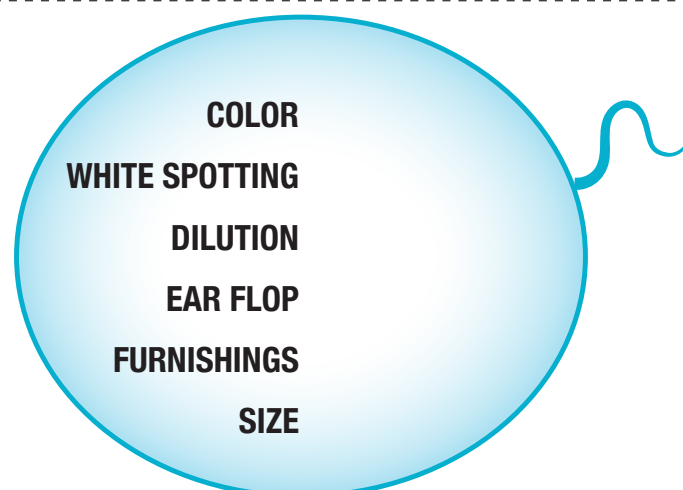
Gametes

- For each gene, give each gamete ONE allele – chosen at random – from the parent.
- Write the name of the chosen alleles inside the gamete.

Eggs from mom



Sperm from dad

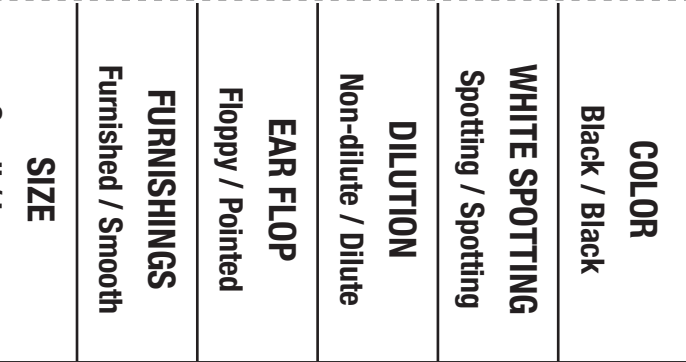


	COLOR Tan Points / Black
	WHITE SPOTTING Solid / Spotting
	DILUTION Non-dilute / Dilute
	EAR FLOP Pointed / Pointed
	FURNISHINGS Furnished / Smooth
	SIZE Large / Large
	COLOR Tan Points / Sable
	WHITE SPOTTING Solid / Spotting
	DILUTION Non-dilute / Dilute
	EAR FLOP Pointed / Pointed
	FURNISHINGS Smooth / Furnished
	SIZE Medium / Medium



Tan Points / Tan Points	COLOR
WHITE SPOTTING	Solid / Solid
DILUTION	Non-dilute / Dilute
EAR FLOP	Pointed / Floppy
FURNISHINGS	Furnished / Smooth
SIZE	Large / Medium

COLOR	Black / Black
WHITE SPOTTING	Spotting / Spotting
DILUTION	Non-dilute / Dilute
EAR FLOP	Floppy / Pointed
FURNISHINGS	Furnished / Smooth
SIZE	Small / Large



COLOR	
Sable / Wolf Grey	
WHITE SPOTTING	
Solid / Spotting	
DILUTION	
Non-dilute / Dilute	
EAR FLOP	
Floppy / Floppy	
FURNISHINGS	
Furnished / Furnished	
SIZE	
Small / Medium	



COLOR	
Sable / Wolf Grey	
WHITE SPOTTING	
Solid / Solid	
DILUTION	
Non-dilute / Dilute	
EAR FLOP	
Pointed / Floppy	
FURNISHINGS	
Smooth / Smooth	
SIZE	
Medium / Large	



COLOR	
Tan Points / Wolf Grey	
WHITE SPOTTING	
Spotting / Solid	
DILUTION	
Non-dilute / Dilute	
EAR FLOP	
Floppy / Floppy	
FURNISHINGS	
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SIZE	
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COLOR	
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