Teaching notes

This is a light-hearted way of illustrating the difference between genotype and phenotype.

Students will need to have a coin each and a copy of the grid.

Each student selects six canine characteristics.

Then they choose two forms of each characteristic. The first one they write down will be the dominant form and the second the recessive form.

Next, students choose a capital and lower case letter to represent the alleles.

They now swap grids with a partner. The partner carries out the coin toss which will decide the genotype of this dog. Heads means the dominant allele is selected and tails the recessive. They toss the coin twice for each characteristic. The grid is then returned.

Using the alleles selected by the coin toss, they can decide which characteristic will be expressed in the phenotype and indicate if their dog is homozygous or heterozygous for each characteristic.

The artistic can draw a picture of their dog; others can write a brief description.

Extension

Dogs with the same characteristic(s) could be crossed using a Punnett square.

Task

1. Fill in the first three columns of the table by:
   a. choosing six characteristics for your dog, e.g. muzzle shape, leg length, coat colour
   b. choosing two forms (alleles) for each characteristic. The first is the dominant allele.
2. Swap tables with your partner.
3. Toss a coin twice to decide the genotype of your partner's dog. Heads means a dominant allele, tails means a recessive allele.
4. Add results of the coin tosses to column four.
5. Pass the table back to your partner.
6. Complete the table (columns five and six) for your dog.

image © Jane Robertson

Characteristic	Types	Alleles	Coin Toss 1	Coin Toss 2	Description of genotype	Phenotype expressed
Eye colour	brown blue	B b	B	B	homozygous dominant	brown eyes

Questions

1. Why do you think you were prevented from tossing a coin for your own dog?
2. Which part of this activity decides the genotype of the dog?
3. What determines the genotype in a real dog?
4. This activity is designed to show you the differences between three key ideas: allele, genotype and phenotype. It also illustrates the wide variation which is found in populations and even within a family.

   How well does the activity do this? Discuss the useful aspects and the limitations of this model.
5. Draw or describe what your designer dog looks like.

allele	bias	dominant	express	genotype
homozygous	phenotype	recessive	heterozygous	

Suggested answers

Example table

Characteristic	Types	Alleles	Coin Toss 1	Coin Toss 2	Description of genotype	Phenotype expressed
Ears	upright/ droopy	U u	U	U	homozygous dominant	upright ears
Tail	curly/ straight	C c	c	C	heterozygous	curly tail
Muzzle	long/ squashed	L l	l	l	homozygous recessive	squashed muzzle
Colour	golden/ red	G g	G	g	heterozygous	golden colour
Hair texture	wavy/ straight	W w	w	W	heterozygous	wavy hair
Height	tall/ short	T t	T	T	homozygous dominant	tall

1) Why do you think you were prevented from tossing a coin for your own dog?

I might prefer my dog to have particular characteristics. I might be biased and try to influence the outcome!

2) Which part of this activity decides the genotype of the dog?

The coin toss.

3) What determines the genotype in a real dog?

The alleles it inherits from its parents, one allele from each parent for each characteristic.

4) This activity is designed to show you the differences between three key ideas: allele, genotype and phenotype. It also illustrates the wide variation which is found in populations and even within a family.

How well does the activity do this? Discuss the useful aspects and the limitations of this model.

It helps the user to see that phenotype is the outward appearance of the dog whilst genotype is a combination of different forms of a gene. These forms are called alleles. It shows that the dominant form is expressed in heterozygous examples.
It doesn't show that the genotype comes together when gametes meet, although using a coin gives an idea of the random nature of gene combinations.
Most characteristics result from the expression of several genes rather than just one. Scientists are still investigating how and why different genes are switched on and off.