Teachers' Notes for the Labrador Breeding Game

The aim of the game is to get pupils to understand the concept of alleles of genes which affect genetic uniqueness, and the idea of dominant and recessive characteristics.

For Labradors, the two coat colours, black and brown, are controlled by a pair of alleles (or versions) of the same gene. The black allele (B) is dominant over the brown allele (b). The term allele is not used in the game though; instead pupils are told that every dog has two coat colour genes. Rather than introducing the phrases, a points system is used to demonstrate dominance and recessive such that the black gene is worth 2 points and the brown gene is worth 1,.

Aims of the game:

o To experiment with the colour of puppies produced when you mate different parent dogs and how much money you make from each litter
o To work out the colour of the mum and dad dogs and what two coat colour genes they each have

In the game the children acts as dog breeders. They have three female dogs - Gloria, Barley and Rummie, to mate with three male dogs – Petra, Alfie and Bear. (The colour pink signifies the mums, blue signifies the dads.) All the mum and dad dogs have different coat colour gene combinations. Pupils are told that each puppy gets one coat colour gene from their mum and one from their dad. The coat colour gene the parent gives is random every time, which is why they are instructed to mix the cards up each time before they pick them. This is something you should emphasise to them so they understand the purpose of mixing the cards up, as this is the way it works in nature.

The pupils have to work out what gene combinations the parent dogs have and then deduce their coat colours by breeding the dogs together to see what colour puppies they produce. Getting them to work in pairs or groups will make it more fun for them and mean they can discuss with each other.

What each pair needs:

o 12 gene cards – 2 from each parent
o A copy of the instructions
o Answer sheet

What you need to prepare before playing the game:

o 12 gene cards – 2 from each parent for every pair of pupils. Print out the sheet with the gene cards on, preferably double sided so you don't have to stick them together. Then cut out each card with the colour gene on one side and the name on the other. Use the answer sheet on the next page to ensure that each dog has the correct genes. If you have the facility the cards could be laminated to make them last longer.
o Print out a copy of the instructions & answer sheet for each pair

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Answers:

MUMS:	Coat colour genes:	Coat Colour:
Gloria	black X black	Black
Barley	black X brown	Black
Rummie	brown X brown	Chocolate

DADS:	Coat colour genes:	Coat Colour:
Petra	black X black	Black
Alfie	black X brown	Black
Bear	brown X brown	Chocolate

It does not matter which mum they cross with which dad for any of the crosses, they should be able to come to the correct answers regardless.

What pupils should get out of the game:

o They should have grasped that the black coat colour gene wins over the chocolate coat colour gene
o To understand that it is possible to produce chocolate puppies from two black parents, in this case if they mate Barley and Alfie together. However, they should see that this is only possible because both Barley and Alfie carry a brown coat colour gene and the chances of this happening are small (25%).
o The enterprise aspect of the game – using knowledge about genetics to make money in real life situations, in this case if they mate Rummie and Bear together who are both chocolate all the puppies are chocolate so they make the most amount of money. You could relate this to selective breeding used by farmers to increase their profits from agriculture.

Extensions of the game:

You could adapt the game to play with more advanced year groups by introducing the yellow coat colour.

The yellow coat colour is the only other recognized coat colour by the AKC Labrador Retriever Standard. Golden Labradors are produced by the presence of a second separate gene where having two recessive alleles masks the black and chocolate genes.

So EE = no yellow gene
Ee = yellow carrier but appears black or chocolate
ee = yellow coat color (irrespective of black and brown alleles present)

Golden Labrador puppies are more expensive than black puppies, but cheaper than chocolate puppies. They could be worth £150.

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