

Monster Genetics!

Grade: 5-6

Time: 1hr

Activity Overview :

Today we are going to be creating our very own monster using the power of genetics and art! To do so, let's first learn some key genetics terms.

Genetics is the study of genes. A gene is something that is found inside of our DNA and it gives you different traits that make your body unique. An example of a gene would be hair colour. An allele is a version of a gene. For example, if the gene were hair colour, an allele could be blonde, brown, black, and so on. You are a combination of alleles from both your parents!

Today we are going to be learning the basics of allele combinations through flipping a coin. One partner will determine the allele coming from the mother and the other partner will determine the allele coming from the father. Heads will mean dominant and tails will mean recessive. Then, look at the prepared chart to find out what characteristic your monster ended up happening. You will do this for traits like hair colour, face shape, number of legs, etc. Once you have gathered all your results, you can draw out your monster.

Before we begin, think about the following questions:

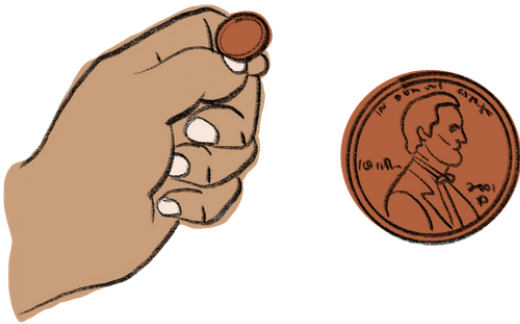
- What is a geneticist? Why is it important to study genes?
- Take a look at your family. What colour eyes or hair does everyone have? Do you have the same colours? Are they different?
- How do genes affect animals and the wildlife around us?

Materials:

- Pencil
- Eraser
- Something to colour with (pencil crayons, crayons, markers, etc.)
- A coin (or something with two different sides that you can flip)

Activity:

- 1 Find a partner to do this activity with (can be a parent or whoever is around!)
- 2 Print off or look at the handout on pages 4-7.
- 3 Read the instructions at the top of the worksheet and collect all the information you need through flipping a coin between you and your partner
- 4 Once you have collected all your information, draw out the monster you created with your partner! Don't forget to add some colour as well.



- Flip a coin and draw your monster's gene/traits
- We had some fun and made our own monster
 - We flipped the coin and got
 - Red wavy hair
 - One humongous ear and one small ear
 - Pointed ears
 - Dark blue eyes
 - Purple skin
 - A unibrow!
 - A tiny witch nose!
 - Tiny lips
 - 3 legs and 3 arms (I wanted to make my legs octopus tentacles!)
 - Insect wings!
 - Have fun! Don't forget to share your monster with us.

Engineering and Science Connections

What is DNA? DNA is a genetic material which contains all the information needed to determine how living things will function and look. You can essentially think of DNA as a blueprint to your body. There is all sorts of information inside DNA, from what colour your eyes are to how your brain tissue will form. A piece of information in a segment of DNA is called a gene, which we learned a bit about today. Your body is made up of a trillion tiny little structures called cells, and within every cell there is DNA!

What do you think co-dominance, incomplete dominance, and polygenic means?

If you have finished the activity, then you will know that:

- **Codominance** is when instead of the alleles competing to see which one shows up, they can both show up! For example, a cow can be all white, all brown, or be brown and white (spotted!). In other words, both alleles are equally dominant.
- **Incomplete dominance** is when alleles can mix together. For example, you can have a black cat, a white cat, or a gray cat (a mix between the white and black!)
- **Polygenic** is the term which describes when there is more than one gene influencing a characteristic.

What does genetics have to do with biodiversity?

Biodiversity is built upon genetic variation. We can classify the wide range of animals through studying their genetic makeup. The diversity of animals and organisms is a result of their genes and alleles being different. Even within one species there is genetic diversity which allows for the healthier and stronger organisms to survive and pass on their genes.

What is a geneticist? Why is it important to study genes?

A geneticist is an expert in genes. Geneticists can study how genes are inherited, as well as how they can become mutated, activated, and inactivated. Some geneticists manipulate and change genes within organisms to see how it changes them. It is very important to study genes to develop new medicine, cure diseases, create better food, understand genetic disorders, and so much more!

Extensions:

Repeat the activity and see which traits showed up again- are they the ones with a dominant allele in them?

Create your own worksheet- you can write characteristics to make your own dog, vampire, anything you can think up!

Create your Monster- with Genetics!

Instructions: Have one partner flip a coin and note if they get heads or tails. Then, have the other partner do the same. Find the combination of the two flips in the chart and highlight which characteristic you two got. Some characteristics will have special instructions to show **polygenic** traits, **codominance**, and **incomplete dominance**, so make sure to adjust accordingly!

Heads= dominant allele (uppercase letter)

Tails= recessive allele (lowercase letter)

Once you have gotten the results of all the characteristics, draw and colour your monster!

Face Shape

AA or Aa	aa
Round	Square

Chin

CC or Cc	cc
Very prominent	Less prominent

Chin Shape

Only flip if you got a prominent chin, skip over if not

RR or Rr	rr
Round	Square

Cleft Chin

CC or Cc	cc
Absent	Present

Ear Size

This is going to be a gene that works with **codominance**. Codominance is when instead of the alleles competing to see which one shows up, they can both show up! For example, a cow can be all white, all brown, or be brown and white (spotted!). In other words, both alleles are equally dominant. So, flip your coins just like before, but notice how there are now three possible characteristics instead of two. Also, note how there are now two letters in play instead of one. Heads will mean A and tails will mean B.

AA	AB	BB
Both ears are humungous	One humungous ear, one super tiny ear	Both ears are super tiny

Type of Ear

BB or Bb	bb
Horned	Wolf-like

Hair Type

This is going to be a gene that works with **incomplete dominance**. Incomplete dominance is when alleles can mix together. For example, you can have a black cat, a white cat, or a gray cat (a mix between the white and black!). So, flip your coins just like before, but notice how there are now three possible characteristics instead of two and how there are now two letters in play. Heads will mean S and tails will mean C.

SS	SC	CC
Straight	Wavy	Curly

Hair Colour

There are two genes involved in hair color. Therefore, hair colour is **polygenetic**. Polygenic is what happens when there is more than one gene influencing a characteristic. So, you need to flip your coin twice for each partner. One partner will flip for H/h and the other partner will flip for C/c.

HHCC	HHCc	HhCC	HHcc	HhCc	Hhcc	hhCC	hhCc	hhcc
Black	Black	Red	Brown	Brown	Regular blonde	Dark blonde	Regular blonde	Light blonde

Skin Colour

This is going to be another gene that works with **incomplete dominance**. Remember, incomplete dominance means alleles can mix together. Heads will mean S and tails will mean K

SS	SK	KK
Blue	Purple	Red

Eyebrow Thickness

CC or Cc	cc
Very bushy	Super thin

Eyebrow Separation

RR or Rr	rr
Unibrow	Separate brow

Eyebrow Colour

This is going to be another gene that works with **incomplete dominance**. Remember, incomplete dominance means alleles can mix together. Heads will mean H and tails will mean R

HH	HR	RR
Darker than hair	Same colour as hair	Lighter than hair

Eye Distance Apart

This is going to be another gene that works with **incomplete dominance**. Remember, incomplete dominance means alleles can mix together. Heads will mean E and tails will mean A

EE	EA	AA
Very close together	Average distance	Very far apart

Eye Shape

This is going to be another gene that works with **codominance**. Remember, codominance means both alleles can show up at once. Heads will mean A and tails will mean B

AA	AB	BB
Both eyes are round	One eye is round, and one eye is triangular	Both eyes are triangular

Eye Colour

There are two genes involved in eye color, therefore, eye colour is **polygenetic**. The first pair of alleles codes for pigment in front of the iris and the second pair of alleles codes for pigment in the back of the iris. So, you need to flip your coin twice for each parent. One partner can flip for E/e and the other partner will flip for C/c.

EECC	EECc	EeCC	Eecc	EeCc	Eecc	eeCC	eeCc	eecc
Dark Brown	Dark Brown	Brown with green flecks	Brown	Brown	Gray-blue	Green	Dark blue	Light blue

Number of Eyes

This is going to be another gene that works with **incomplete dominance**. Remember, **incomplete dominance** means alleles can mix together. Heads will mean A and tails will mean B

AA	AB	BB
Three eyes	Two eyes	One eye

Mouth Length

This is going to be another gene that works with **incomplete dominance**. Remember, **incomplete dominance** means alleles can mix together. Heads will mean L and tails will mean T

LL	LT	TT
Long	Normal	Tiny

Lip Thickness

TT or Tt	tt
Thick	Thin

Nose Size

This is going to be another gene that works with **incomplete dominance**. Remember, **incomplete dominance** means alleles can mix together. Heads will mean N and tails will mean M

NN	NM	MM
Large	Medium	Small

Nose Type

SS or Ss	ss
Button nose	Witch nose

Tail Type

AA or Aa	aa
Dog tail	Elephant tail

Wing Presence

WW or Ww	ww
Present	Absent

Wing Type

Only flip if you got present wings, skip over if not

AA or Aa	aa
Bird wings	Insect wings

Number of Arms and Legs

This is going to be another gene that works with **incomplete dominance**. Remember, incomplete dominance means alleles can mix together. Heads will mean S and tails will mean O

SS	SO	OO
4	3	2

Share your creations!

Don't forget to share your experiments and creations with us! We would love to see what you've made. You can Email us at: esqinfo@uwaterloo.ca or send us a message/tag us on our social media!

Facebook: @uwengoutreach

Twitter: @UWEngOutreach

Instagram: @uwengoutreach

Thanks for exploring, discovering, and learning with us!

3, 2, 1 Done!

3 - Write or draw 3 things you learned from this activity

2 - Write or draw 2 things you found super interesting or cool and want to learn more about

1 - Do you have any questions about the activity? Did something make you wonder...what if? how? or why?