

OVERVIEW

Aimed at **key stage 3** pupils.

In this activity, the class explore which human characteristics are inherited from our parents and which are caused by our environment.

CURRICULUM LINKS

- ★ **KS3:** All living things show variation, can be classified and are interdependent, interacting with each other and their environment
- ★ **KS3:** Behaviour is influenced by internal and external factors and can be investigated and measured

LEARNING OBJECTIVES

- ★ Some characteristics are inherited from our parents (are 'genetic') and the others are a result of our environment
- ★ The vast majority of characteristics involve a combination of both of these factors

PREPARATION

- ★ Print copies of the worksheet
- ★ Option of printing 10 flashcards if planning a large group discussion

Activity

- ★ Introduce the topic by discussing a few features (some examples given in the table below). Do they think the feature is inherited? If not, what may affect it?
- ★ Class discuss the 10 characteristics on the flashcards and complete the worksheet.
- ★ It might be interesting to discuss how some of these factors are investigated, and why it might be difficult to distinguish between a genetic or environmental factor. For example, two sisters may share a trait, such as freckles. However, if they live in the same home, how can scientists tell what causes them?
- ★ If possible, watch the **What genes means** animation on the Genes Are Us website.

EXAMPLE Features

Blue eyes	This is controlled by our genes and inherited from our parents.
Having the flu	This controlled by environment. It depends on whether we have been in contact with someone who has passed the virus on to us.
Being good at Maths	This is due to a combination of genetic and environmental factors, although current research suggests that environmental factors, such as how well/often you have been taught, are more important in determining this than genetic factors.
Liking the taste of sprouts	There is a gene coding for a taste receptor that enables some people to taste a bitter chemical found in sprouts. However, liking a taste is partly based on personal choice, or how often you experience that taste, so can have an environmental component.

ANSWERS

1. **Your blood type** – this is an entirely genetic trait.
2. **Being immune to chicken pox** – this is an environmental trait: people only become immune to chicken pox if they have had the illness themselves.
3. **Speaking English** – this is an entirely environmental characteristic.
4. **Being deaf** – deafness can be inherited, but can also be caused by environmental factors such as contracting meningitis.
5. **Having heart disease** – this can again be due to genetic or environmental factors. Some families do have a predisposition to heart disease, but it can also be triggered by environmental factors such as diet and smoking.
6. **Having attached earlobes** – this is a purely genetic feature.
7. **Having a brother or sister** – this is an entirely environmental characteristic.
8. **Your height** – again this is a combination of genetic and environmental factors. Genes play a part in determining height, but that environmental factors such as nutrition also clearly affect this.
9. **Having asthma** – this is again caused by a combination of factors. More than half of children with asthma come from a family containing other asthma sufferers, but not all do, and other factors such as air pollution also play an important role.
10. **Behaving well in class** – the role of genes on behaviour is interesting and complex. Genes are known to partly shape our personality, but it is generally held that environmental factors such as upbringing and family environment play a more important role in influencing behaviour than genetics.

FURTHER INFORMATION

This activity is designed to help students discuss what influences different characteristics. It is important to acknowledge that research in this area is ongoing, and that at this time we do not have all the answers.

Many genes have been identified over the past five years that play a part in complex characteristics, such as the FTO gene in obesity. We know that many genes and environmental factors influence whether an individual becomes obese.

One of the approaches in understanding how genes are involved is to run 'twin studies'. This involves inviting people who share identical genetic information (identical twins) into a study and comparing them with those raised in the same environment, but with different genes (non-identical twins).

EXTENSION

The media can sometimes overemphasise the discovery of genes involved with disease. Whilst these discoveries are important, as the class have been discussing, there may be several factors involved in whether a person develops a disease.

Example: Daily Mail - Struggling to quit smoking? Now you can blame your genes (April 2010)

<http://www.dailymail.co.uk/health/article-1268844/Struggling-quit-smoking-Now-blame-genes.html>

Is this giving a balanced report? How would you report this in a balanced way?

Why do you think it is important to understand whether diseases are caused by genetics or by the environment?

To address the balance, you could use the NHS Behind the Headlines Service, which aims to provide an unbiased and evidence-based analysis of health stories that make the news.

'Behind the Headlines' aims to respond to news stories the day they appear in the media.

Their reaction to this story about genes and smoking is available on the link below:

<http://www.nhs.uk/news/2010/04April/Pages/smoking-down-to-your-genes.aspx>

FOR MORE RESOURCES LIKE THESE AND TO SIGN UP FOR JEANS FOR GENES DAY, VISIT US AT WWW.JEANSFORGENES.ORG

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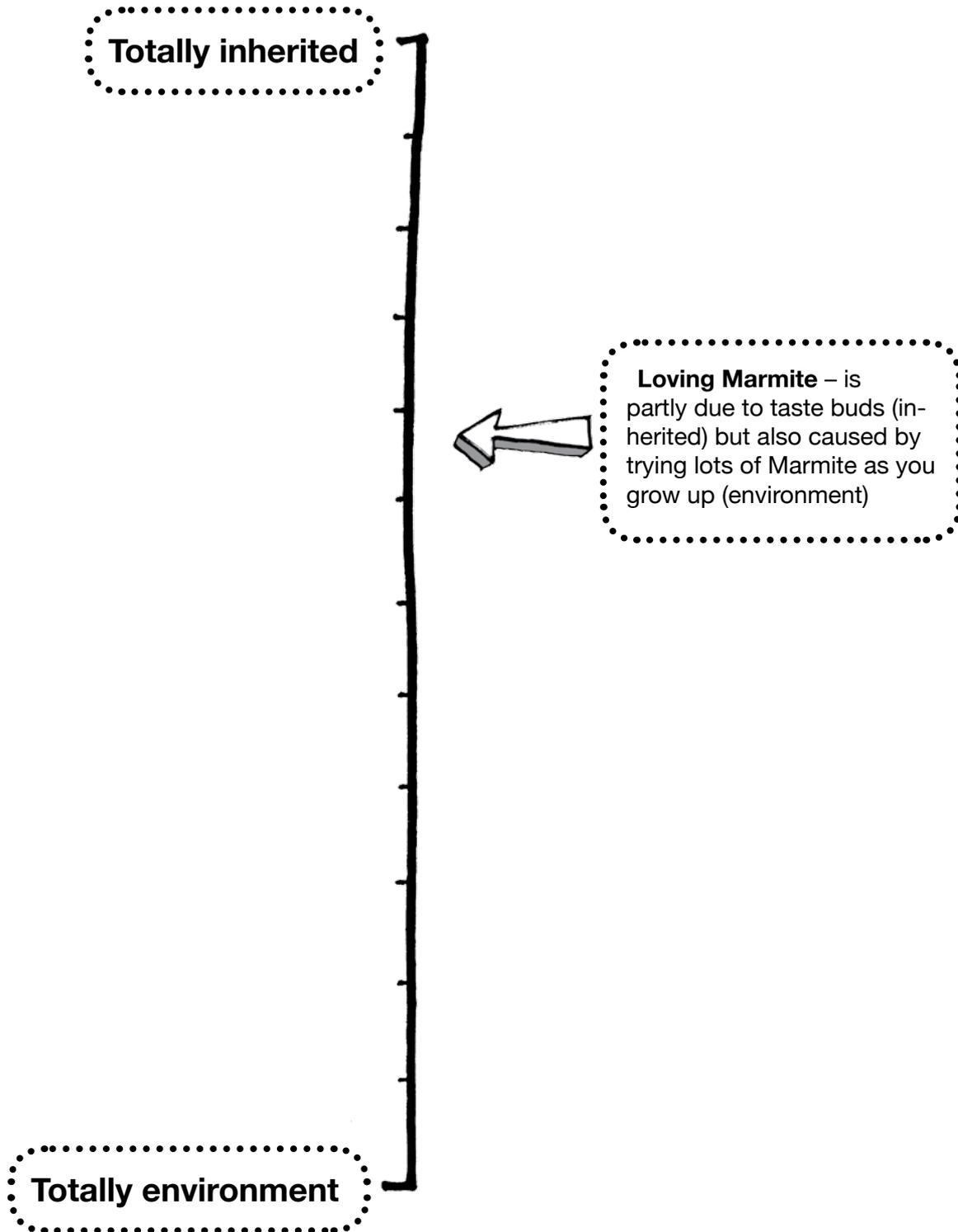
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NATURE AND NURTURE

Think about each of the characteristics you were given by your teacher and decide how much it is influenced by the environment or by genes (inherited).

Discuss these characteristics in pairs. Draw an arrow to show where each characteristic fits on the scale below. You can place the arrows anywhere on the line, but you need to explain your decision. One example is given below to get you started.



FOR MORE RESOURCES, GO TO WWW.JEANSFORGENES.ORG

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**Your
blood type**



**Being immune
to chicken
pox**

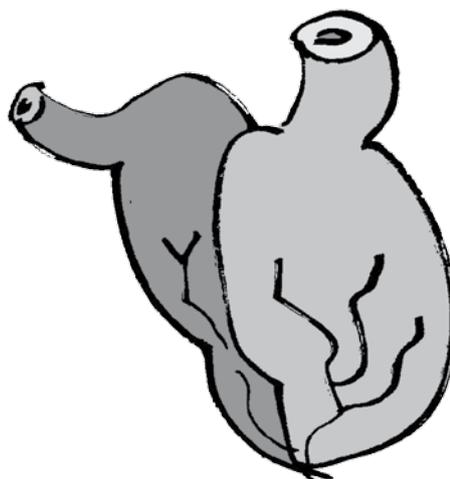


**Speaking
English**



Being deaf

**Having
heart
disease**



**Having
attached
earlobes**





**Having a
brother or
sister**

Your height



**Having
asthma**



Behaving well in class

