*Biology> Big idea BHL: Heredity and life cycles > Topic BHL1: Inheritance and the genome > Key concept BHL1.2: The structure and function of the genome*

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| **Response activity** |
| **Genome journalist** |

**Overview**

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| Learning focus: | The structure and function of organisms depends on proteins made by cells using instructions stored in the DNA of the genome. |
| Observable learning outcome: | Apply the idea that cells use the information stored in other regions of the genome to control when genes are used. |
| Activity type: | Discussion, literacy, modelling |
| Key words: | genome, gene, DNA, chromsosome |

This activity can help develop students’ understanding of the how different regions of the genome (including genes and non-coding regions) affect our characteristics, by challenging them to explain the key concepts to a layperson using a suitable metaphor. It can be used in response to the following diagnostic questions:

* Diagnostic question: The other 98%

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| **B** | **BRIDGING**  This activity explores ideas that are usually taught at age 14-16, to build a bridge to later stages of learning. |

**What does the research say?**

Research has shown that the media can be the major source of information – and misunderstandings – about DNA, genes and heredity for primary school students (Donovan and Venville, 2012).

Dreyfus and Jungwirth (1988) found that many 16-year-olds struggled to explain how the cell nucleus ‘controls’ the structure and functions of a cell, while Lewis and colleagues (Lewis, Leach and Wood-Robinson, 2000; Wood-Robinson, Lewis and Leach, 2000; Lewis and Kattmann, 2004) have reported common misunderstandings about genes, DNA and the genome in school children, including difficulty in explaining the differences and relationships between genes, chromosomes, DNA and genetic information.

Science education researchers have acknowledged that we live in a genomic era in which the genomes of humans and many other organisms have been sequenced, and in which the study of genomes underpins work in many fields of biological science and generates numerous applications and implications for our everyday lives. Teaching and learning about inheritance and genetics at school must aim to prepare students to live and work in the genomic era (Stern and Kampourakis, 2017).

**Ways to use this activity**

Challenge students, in pairs or small groups, to become science journalists. Their task is to explain to a layperson, using a suitable metaphor, how different regions of the genome (including genes and non-coding regions) interact and affect our characteristics.

Students should complete this activity in pairs or small groups. The focus of the activity should be on group discussion to reach a consensus on a suitable metaphor and how to use it to explain the key concepts to a member of the public. It is through the discussions that students can check their understanding and develop their explanations. Listening in to the conversations of each group will often give you insights into how your students are thinking.

The quality of the discussions can be improved with a careful selection of groups; or by allocating specific roles to students in the each group. For example, you may choose to select a student with strong prior knowledge as a scribe, and forbid them from contributing any of their own answers. They may question the others and only write down what they have been told. This strategy encourages contributions from more members of each group.

After their discussions, each group should be prepared to report the key points of their discussion to another group, or to the class.

**Expected answers**

There is likely to be considerable variation in the metaphors chosen by students, and how they are explained. How appropriately the metaphor represents the elements of the genome and their interactions, and how well the metaphor is explained, will indicate how secure students are in their understanding of the underlying key concepts.

Pramling and Säljö (2007) reported a number of types of metaphors commonly used in popular science magazine articles about genetics and the genome. These included:

* *Information, text and code* – the genome as instructions, a recipe, a book or a library, which can be read.
* *Map* – the genome as a map showing how things are arranged, which can be read as a set of directions.
* *Jigsaw puzzle* – elements of the genome (e.g. genes) are pieces that form a picture of the organism when all put together; all the pieces together are the genome.
* *Architecture* – the organism as a building and the genome as the blueprint (or, less appropriately, the building blocks) from which the building is made.
* *Theatre* – elements of the genome as actors and directors that play different roles (or perform in different ways) and work together to bring a script to life.
* *Strings and beads* – physical metaphors of the structure of DNA and of genes on chromosomes.

The also reported that anthropomorphic and teleological metaphors were commonly used, in which elements of the genome were inappropriately portrayed as acting with intention, purpose or knowledge, e.g. DNA “steering life”, and genes “knowing” or “deciding” when to make proteins.

In addition, Lewis and colleagues (2000) have reported that students aged 14-16 referred to DNA as a ‘barcode’, and also to DNA ‘fingerprinting’, perhaps due to familiarity with techniques that use DNA samples to identify individuals or their species.

**Acknowledgments**

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**References**

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