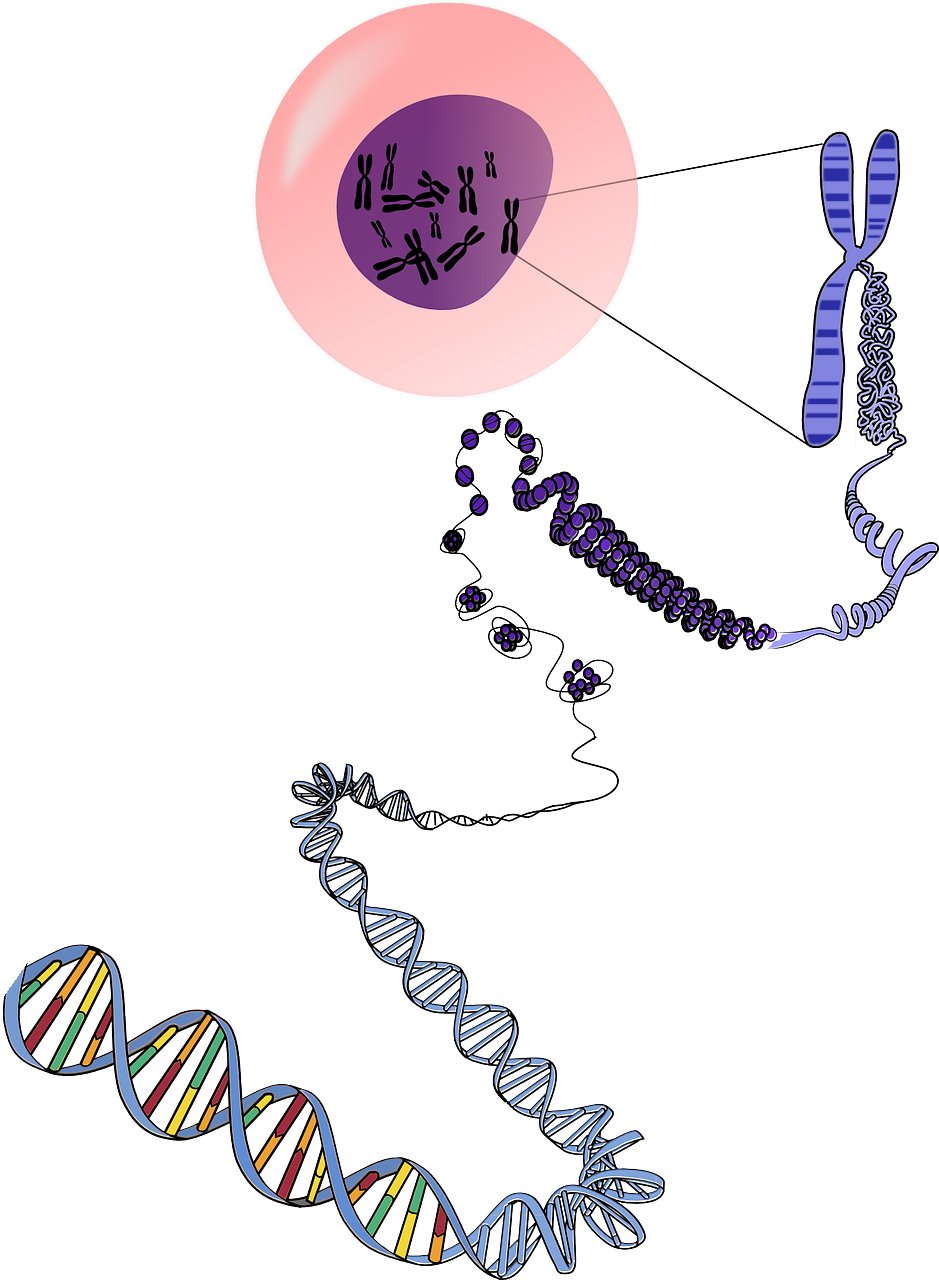
**How does it all fit together?**

……………………………………..



……………………………………..

……………………………………..

……………………………………..

……………………………………..

……………………………………..

**To discuss in your group**

How would you complete the missing labels on the diagram?

Choose from the following labels:

**cell chromosomes DNA genes genome nucleus**

*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*

|  |
| --- |
| **Response activity** |
| **How does it all fit together?** |

**Overview**

|  |  |
| --- | --- |
| 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: | Distinguish between the terms DNA, chromosome, gene and genome. |
| Activity type: | Discussion |
| Key words: | DNA, chromosome, gene, genome, nucleus |

This activity can help develop students’ understanding of the hierarchical relationship between DNA, genes, chromosomes and genomes through a discussion-based image labelling task. It can be used in response to the following diagnostic questions:

* Diagnostic question: DNA, chromosomes, genes and genomes

**What does the research say?**

Numerous researchers have reported that students mix up the terms ‘gene’, ‘chromosome’ and ‘DNA’, perhaps thinking that they are synonyms, and struggle to understand the relationship between them (e.g. Lewis and Kattmann, 2004; Donovan and Venville, 2012). Lewis, Leach and Wood-Robinson (2000) reported that students aged 14-16 performed poorly when asked to rank them in order of size.

Science education researchers have acknowledged that teaching and learning about inheritance and genetics at school must aim to prepare students to live and work in the genomic era, in which the genomes of many organisms have been sequenced and the study of whole genomes (rather than just genes) generates numerous applications and implications for our everyday lives (Stern and Kampourakis, 2017). Up to the age of 14, a useful approach may be to embed ‘pro-genomics’ and ‘pre-genomics’ practices – for example, use of language and concepts that dispose students to thinking about whole genomes rather than just genes, and ensuring that students understand the difference between DNA, chromosomes, genes and the genome (Airey, Moore and Bennett, 2018).

Researchers have used constructivist approaches that enable students to build their own explanations of the structure and function of the genome, which may help to develop students’ understanding and overcome misconceptions, including the use of group discussions (e.g. Lewis and Kattmann, 2004).

**Ways to use this activity**

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 how to label the diagram. 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.

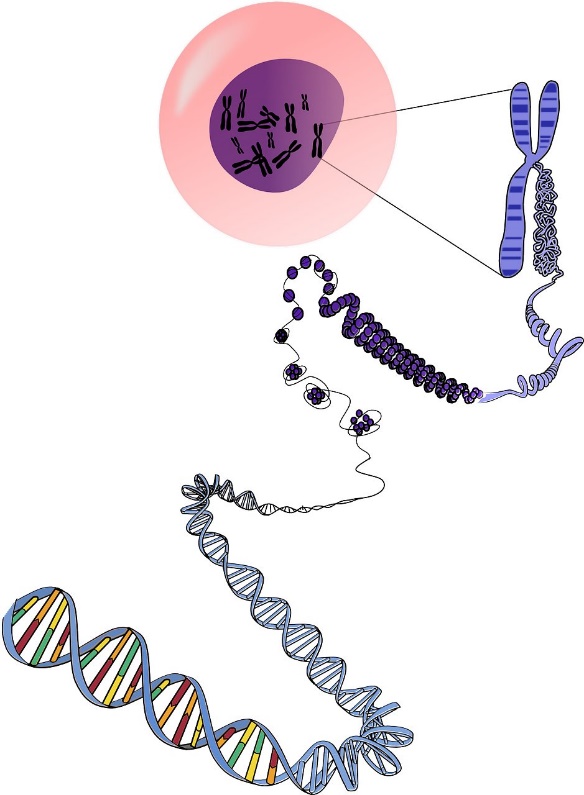
After their discussions, each group should be prepared to report the key points of their discussion to another group, or to the class.

*Differentiation*

The list of labels from which to choose could be omitted to make a more challenging activity for some students.

**Expected answers**

chromosomes



cell

genes

genome

nucleus

DNA

**Acknowledgments**

Developed by Alistair Moore (UYSEG).

Images: pixabay.com/OpenClipart-Vectors (156404)

**References**

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