**Family resemblance**

**Part 1**



**Harry**

**Dad**

**Louis**

**Mum**

Harry looks similar but not identical to his mum and dad.

Some of the statements in the table could be used to explain this.

Tick **one** box for each statement.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Statements** | | I am **sure** this is right | I **think** this is right | I **think** this is wrong | I am **sure** this is wrong |
| **1** | Harry inherited half of his genome from his mum and half from his dad. |  |  |  |  |
| **2** | Similarities are caused by inherited genetic information in their genomes. |  |  |  |  |
| **3** | Harry inherited a random combination of his dad’s features and his mum’s features. |  |  |  |  |
| **4** | Some differences are due to Harry’s lifestyle and his environment. |  |  |  |  |

**Family resemblance**

**Part 2**



**Harry**

**Dad**

**Louis**

**Mum**

Harry looks similar but not identical to his brother Louis.

Some of the statements in the table could be used to explain this.

Tick **one** box for each statement.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Statements** | | I am **sure** this is right | I **think** this is right | I **think** this is wrong | I am **sure** this is wrong |
| **1** | Similarities are caused by inherited genetic information in their genomes. |  |  |  |  |
| **2** | They both inherited random combinations of features from their mum and dad. |  |  |  |  |
| **3** | Any differences between brothers must be because one of them is adopted. |  |  |  |  |
| **4** | Some differences are due to their lifestyles and environments. |  |  |  |  |

*Biology> Big idea BHL: Heredity and life cycles > Topic BHL1: Inheritance and the genome > Key concept BHL1.1: Heredity and genetic information*

|  |
| --- |
| **Diagnostic question** |
| **Family resemblance** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Similarities and differences between family members can be explained by the passing of genetic information from one generation to the next and the effects of the interaction of organisms with their environment. |
| Observable learning outcome: | Apply ideas about heredity and environmental factors to explain the similarities and differences between offspring and their parents and siblings. |
| Question type: | Confidence grid |
| Key words: | heredity, reproduction, genome |

**What does the research say?**

Research reported by a number of authors (Driver et al., 1994; Williams, 2012; Cisterna, Williams and Merritt, 2013; Allen, 2014; Ergazaki et al., 2015) suggests that children up to age 11 have numerous misunderstandings about family resemblance and how characteristics are passed from one generation to the next, including that:

* similarities between siblings are all due to “nurture” (e.g. because siblings are brought up together, or because they copy one another);
* differences between offspring and their parents must be due to adoption, “surprise”, or inheritance from grandparents (the randomness of genetic inheritance and environmental factors were not often cited as reasons for differences)
* acquired characteristics (resulting from interaction with the environment or from learning) can be passed from parents to offspring.

An organism’s characteristics are not only affected by the genome but by the organism’s lifestyle and environment as well. Research indicates that most students at secondary school level think of genes as the only determinants of an organism’s characteristics – a conception dubbed ‘genetic determinism’ (Jamieson and Radick, 2017).

Williams (2012) found that students found it more difficult to explain sibling-sibling similarity than parents-offspring similarity.

**Ways to use this question**

Students should complete the confidence grid individually. This could be a pencil and paper exercise, or you could use the presentation with an electronic voting system or mini white boards.

*Differentiation*

You may choose to read the statements to the class, so that everyone can focus on the science. In some situations it may be more appropriate for a teaching assistant to read for one or two students.

**Expected answers**

*Part 1*

1. Harry inherited half of his genome from his mum and half from his dad – **right**
2. Similarities are caused by inherited genetic information in their genomes – **right**
3. Harry inherited a random combination of his dad’s features and his mum’s features – **right**
4. Some differences are due to Harry’s lifestyle and his environment – **right**

*Part 2*

1. Similarities are caused by inherited genetic information in their genomes – **right**
2. They both inherited random combinations of features from their mum and dad – **right**
3. Any differences between brothers must be because one of them is adopted – **wrong**
4. Some differences are due to their lifestyles and environments – **wrong**

**How to respond - what next?**

Researchers have used formative assessments coupled with constructivist approaches that enable students to build explanations of heredity, which may help to develop students’ understanding and overcome misconceptions, including the use of group discussions (Chin and Teou, 2010).

If there is a range of answers, you may choose to respond through structured class discussion. Ask one student to explain why they gave the answer they did; ask another student to explain why they agree with them; ask another to explain why they disagree, and so on. This sort of discussion gives students the opportunity to explore their thinking and for you to really understand their learning needs. Responses often work best when the activities involve paired or small group discussions, which encourage social construction of new ideas through dialogue.

Students can work in small groups to discuss and build explanations of the similarities and differences between offspring and their parents and siblings using understanding of heredity and environmental factors. Family photographs brought in from home, or photographs of celebrities and their families could be used as stimulus for discussion. Listening in to the conversations of each group will often give insights into how students are thinking.

**Acknowledgments**

Developed by Alistair Moore (UYSEG).

Images: pixabay.com/White77 (521551)

**References**

Allen, M. (2014). *Misconceptions in Primary Science, Second* ednBerkshire, UK: Open University Press.

Chin, C. and Teou, L.-Y. (2010). Formative assessment: using concept cartoon, pupil's drawings, and group discussions to tackle children's ideas about biological inheritance. *Journal of Biological Education,* 44(3)**,** 108-115.

Cisterna, D., Williams, M. and Merritt, J. (2013). Students' understanding of cells & heredity: patterns of understanding in the context of a curriculum implementation in fifth & seventh grades. *American Biology Teacher,* 75(3)**,** 178-184.

Driver, R., et al. (1994). *Making Sense of Secondary Science: Research into Children's Ideas,* London, UK: Routledge.

Ergazaki, M., et al. (2015). Introducing a precursor model of inheritance to young children. *International Journal of Science Education,* 37(18)**,** 3118-3142.

Jamieson, A. and Radick, G. (2017). Genetic determinism in the genetics curriculum. *Science & Education,* 26(10)**,** 1261-1290.

Williams, J. M. (2012). Children and adolescents' understandings of family resemblance: a study of naïve inheritance concepts. *British Journal of Developmental Psychology,* 30(2)**,** 225-252.