**Her mother’s eyes**

This couple have two children – a daughter and a son.

People sometimes say that their daughter “has her mother’s eyes”.



Look at the statements in the table. Some are right and some are wrong.

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** | A daughter can only inherit features from her mother. |  |  |  |  |
| **2** | A son can only inherit features from his father. |  |  |  |  |
| **3** | Children can only inherit features from their mother. |  |  |  |  |
| **4** | Children are identical to their parents. |  |  |  |  |
| **5** | Children inherit a mix of features from both of their parents. |  |  |  |  |

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

|  |
| --- |
| **Diagnostic question** |
| **Her mother’s eyes** |

**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: | Recall that offspring inherit characteristics from each of their parents. |
| Question type: | Confidence grid |
| Key words: | heredity, reproduction |

|  |  |
| --- | --- |
| **P** | **PRIOR UNDERSTANDING**  This diagnostic question probes understanding of ideas that are usually taught at age 5-11, to aid transition from earlier stages of learning. |

**What does the research say?**

From their everyday experiences (for example, of families and pets) students at age 11 should be aware that living organisms can reproduce to make offspring of the same kind (species resemblance), and that offspring are usually similar but not identical to their parents (body traits resemblance).

These ideas are likely to have been formalised through science education before age 11 (AAAS Project 2061, 2009; Department for Education, 2013). Nevertheless, 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:

* all characteristics are inherited from an organism’s mother – perhaps because the mother carries the child and gives birth;
* girls inherit most or all of their characteristics from their mother, and boys from their father.

Ergazaki (2015) found that most young children from the age of 5 were familiar with the concept of parents-offspring body traits resemblance. However, Williams (2012) reported that children can struggle to think about more than one source of inheritance simultaneously.

**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**

1. A daughter can only inherit features from her mother – **wrong**
2. A son can only inherit features from his father – **wrong**
3. Children can only inherit features from their mother – **wrong**
4. Children are identical to their parents – **wrong**
5. Children inherit a mix of features from both of their parents – **right**

**How to respond - what next?**

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.

Researchers have used formative assessments coupled with constructivist approaches that enable students to build their own explanations of heredity, which may help to develop students’ understanding and overcome misconceptions, including the use of group discussions and challenging students to use their understanding to make predictions (e.g. Chin and Teou, 2010). If students have misunderstandings about parents-offspring resemblance, the following BEST ‘response activity’ describes a group discussion and prediction activity that could be used in follow-up to this diagnostic question:

* Response activity: What will the offspring look like?

**Acknowledgments**

Developed by Alistair Moore (UYSEG).

Images: pixabay.com/bporbs (254683)

**References**

AAAS Project 2061. (2009). *Benchmarks for Science Literacy* [Online]. Available at: <http://www.project2061.org/publications/bsl/online/index.php>.

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.

Department for Education (2013). *Science programmes of study: key stages 1 and 2 - National curriculum in England (DFE-00182-2013),* London, UK.

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.

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.