**Groups within groups**

Animals can be classified into groups.

The diagram shows some groups of animals.

**Animals**

Myriapods

Arachnids

Worms

Starfish

Molluscs

Jellyfish

**Invertebrates**

**Vertebrates**

Amphibians

Reptiles

Mammals

Fish

Birds

**Arthropods**

Crustaceans

Insects

How do you feel about the statements in the table below?

Tick **one** box for each statement.

Use the diagram to help you decide.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Statements** | | I am **sure** this is right | I **think** this is right | I **think** this is wrong | I am **sure** this is wrong |
| **1** | All animals are vertebrates. |  |  |  |  |
| **2** | All reptiles are vertebrates. |  |  |  |  |
| **3** | All insects are invertebrates. |  |  |  |  |
| **4** | Jellyfish are a type of fish. |  |  |  |  |
| **5** | Some birds are mammals. |  |  |  |  |
| **6** | Fish have more features in common with birds than they do with starfish. |  |  |  |  |

*Biology> Big idea BVE: Variation, adaptation and evolution > Topic BVE2: Classification > Key concept BVE2.1: Identifying and classifying organisms*

|  |
| --- |
| **Diagnostic question** |
| **Groups within groups** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Organisms can be identified and classified into hierarchical groups based on their characteristics at the macroscopic and cellular levels. |
| Observable learning outcome: | Use the idea that organisms can be classified hierarchically into groups within groups. |
| Question type: | Confidence grid, classifying/sorting |
| Key words: | classification |

**What does the research say?**

A study by Leach et al. (1992) found that students aged 7 could assign organisms into groups of their own choosing, but the groups were usually mutually exclusive (such that, for example, “birds” and “animals” would be separate groups) and children struggled to cope with more than two groups at a time. By age 13 most students could work with a group included within another group (e.g. “birds” as a sub-group of “animals”) when prompted, and by age 16 most students used hierarchical groups spontaneously.

Several studies found that students relied upon names rather than features when classifying organisms into groups, such that – for example – jellyfish and starfish would be misclassified as fish (Ryman, 1974; Trowbridge and Mintzes, 1985).

**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 question and 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. All animals are vertebrates – **wrong** (some are vertebrates and some are invertebrates)
2. All reptiles are vertebrates – **right**
3. All insects are invertebrates – **right**
4. Jellyfish are a type of fish – **wrong** (jellyfish are invertebrates, but fish are vertebrates)
5. Some birds are mammals – **wrong** (birds and mammals are separate groups of vertebrates)
6. Fish have more features in common with birds than they do with starfish – **right** (fish and birds both have a backbone (and other features such as eyes), while starfish do not)

**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 (meaning making) through dialogue.

Allen (2014) suggests that Venn diagram-type depictions of circles within circles may help students to understand hierarchical classification of groups within groups, and that they may be easier for some students to understand than depictions in the style of a “family tree”. The following BEST ‘response activity’ challenges students to discuss and construct Venn diagram-type depictions to classify organisms typically found in a garden, and could be used in follow-up to this diagnostic question:

* Response activity: Garden groups

**Acknowledgments**

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Images: UYSEG

**References**

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Leach, J., et al. (1992). Progression in conceptual understanding of ecological concepts by pupils aged 5-16. University of Leeds, UK: Centre for Studies in Science and Mathematics Education.

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Trowbridge, J. E. and Mintzes, J. J. (1985). Students' alternative conceptions of animals and animal classification. *School Science and Mathematics,* 85(4)**,** 304-316.