**What do bacteria look like?**

Some children were asked to draw what they think bacteria look like.

Here are their drawings:

|  |  |
| --- | --- |
| **A** | **B** |
|  |  |
|  |  |
| **C** | **D** |
|  |  |
|  |  |

**To talk about in your group**

1. Which is the best drawing of bacteria?
2. Why do you think it’s the best?
3. What is wrong with the other three drawings?

*Biology> Big idea BHD: Health and disease > Topic BHD3: Health and infectious disease > Key concept BHD3.1: Pathogens*

|  |
| --- |
| **Response activity** |
| **What do bacteria look like?** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | The health of humans, other animals and plants can be affected by infection with pathogens, including viruses and some bacteria and fungi. |
| Observable learning outcome: | Recall that ‘germs’ are disease-causing microorganisms also known as pathogens, including bacteria, fungi and viruses. |
| Activity type: | Discussion, critiquing a representation |
| Key words: | Health, disease, microorganisms, pathogens, bacteria, cells |

This activity can help develop students’ understanding of the nature, shape and size of bacterial pathogens, and can be used in response to the following diagnostic question:

* Diagnostic question: Timmy’s tummy ‘bug’

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

**What does the research say?**

In a classic study in which British and American children aged 5-11 were asked to draw what they thought ‘germs’ look like, half of the 5-7 year-olds drew nothing. Older children drew dots, stars and representations similar to insects and spiders – apparently conflating different types of ‘bugs’, or perhaps not appreciating the difference between pathogens and some of the animal vectors that carry them (Nagy, 1953). Similar depictions of bacteria have been reported in more recent studies involving students’ drawings (Prokop, Fancovicová and Krajcovicová, 2016; Haşiloğlu and Eminoğlu, 2017). Depictions of microorganisms as insects or spiders also reveals misunderstandings about what cells look like, their size and scale (Arnold, 1983), of the differences between unicellular and multicellular organisms, and indicates the prevalence of animistic and anthropomorphic views such as that cells can have limbs or faces (Dreyfus and Jungwirth, 1988; Byrne et al., 2009).

Asking children to draw, discuss and write is an established technique for probing their understanding of health and disease, which has been said to enhance participation by children; the drawing aspect in particular enables children to convey personal preferences and concepts that may be beyond their current vocabulary (Wetton and McWhirter, 1998; Backett-Milburn and McKie, 1999; Harrison, 2002).

**Ways to use this activity**

Working in groups, students should ‘peer assess’ the drawings provided on the worksheet and in the presentation (or their own drawings from the activity “Timmy’s tummy bug”), with an emphasis on small group discussion to provide constructive feedback rather than simply criticising or assigning a score. Each group could be asked to agree a ranking for the four pictures from best to worst, together with explanations for their rankings.

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 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**

The drawings provided on the worksheet and in the presentation are based on drawings reported by Haşiloğlu and Eminoğlu (2017). According to the system used in that study, the drawings would be categorised as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Correct | Partially correct | Partially incorrect | Incorrect |
| B | C | D | A |

Drawing C may indicate the misunderstanding that bacteria only exist in Petri dishes or in culture, perhaps based on students’ practical experiences of them in science lessons. Drawing D indicates understanding that the hands are a major sources of bacteria (from touching contaminated surfaces and substances) that could lead to infection, but also indicates the misunderstanding that individual bacteria are big enough to see with the unaided eye. The addition of facial features and limbs to drawing A reveals misunderstandings about what cells look like, their size and scale, of the differences between unicellular and multicellular organisms, and the presence of animistic and anthropomorphic ideas.

**Acknowledgments**

Developed by Alistair Moore (UYSEG), based on drawings reported in Haşiloğlu and Eminoğlu (2017).

Images: UYSEG

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