**Timmy’s tummy ‘bug’**

Timmy is feeling sick. The school nurse says he has a tummy ‘bug’.

Draw what you think the ‘bug’ might look like.

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| **What the ‘bug’ might look like** |

What size do you think the ‘bug’ is?

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

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| **Diagnostic question** |
| **Timmy’s tummy ‘bug’** |

**Overview**

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| --- | --- |
| 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. |
| Question type: | Drawing |
| Key words: | Health, disease, microorganisms, pathogens |

**What does the research say?**

In a study of students aged 12-13 in England, the terms ‘microorganism’ and ‘microbe’ were not used spontaneously to describe organisms such as bacteria that are too small to see with the unaided eye; the term ‘germ’ was most commonly used, followed by ‘bug’ (Maxted, 1984).

In everyday language, the term ‘bug’ is often used indiscriminately to refer to microorganisms as well as to insects (e.g. flies) and arthropods such as arachnids (e.g. spiders), myriapods (e.g. centipedes and millipedes) and crustaceans (e.g. woodlice) (Shepardson, 2002; Allen, 2014).

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 question**

Students should complete the drawing task individually.

*Differentiation*

In some cases it may be helpful to prompt students to think about things that can cause you to feel ill or sick which they may have heard about from parents, friends, medical staff, teachers, TV, books and so on.

**Equipment**

For each student:

* pencils, pens or crayons
* paper (if not drawing on the student worksheet)

**Expected answers**

There is likely to be a wide range of depictions, but look out for the following:

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| --- | --- | --- |
| **Concept** | **Indications of understanding** | **Indication of a lack of understanding** |
| **The ‘bug’ is a germ / microorganism / pathogen** | Drawings that look like cells, bacteria or viruses.  Use of terms such as “germ”, “microorganism”, “bacterium / bacteria”, “virus” or “pathogen” to label drawings. | Drawings that look like insects, spiders or other animals.  Indications of spoilt food or poison, without reference to germs or microorganisms. |
| **The pathogen has infected Timmy** | Indications that it is inside his stomach or body, or that it has entered through his mouth. | Indications that it is on the outside of his body (e.g. on the hands), or no indications or location. |
| **The pathogen is very small (microscopic) in size** | Pathogen depicted as very small (e.g. dots), especially relative to the size of Timmy or his stomach.  A drawing of a microscope or other magnifying equipment.  An appropriate scale bar. | The addition of a face or limbs to the pathogen, or other animistic or anthropomorphic depictions. |

Prokop et al. (2016) reported that children’s own experiences with disease affected several aspects of their drawings, including the positioning of the microorganisms on the outside or inside of various parts of the human body. The researchers found that children who had more experience with disease tended to draw smaller microorganisms, and suggested that this may be due to greater familiarity with the nature of microorganisms as a result of learning about the diseases they have experienced, or a perception of microorganisms as less of a threat (perhaps because of greater familiarity with them). The researchers also found that children who had more experience with disease tended to use darker colours to draw the microorganisms, perhaps because of the association of darker colours with negative mood.

**How to respond - what next?**

Asking children to draw, write and discuss is an established technique for probing their understanding of health and disease (Wetton and McWhirter, 1998; Harrison, 2002). Thus, the drawings that students have produced could be used as the basis for small group discussions, which give students the opportunity to explore their thinking and encourage social construction of new ideas (meaning making) through dialogue.

The following BEST ‘response activity’ describes a small group discussion activity in which students discuss a series of provided drawings, and could be used in follow-up to this diagnostic question:

* Response activity: What do bacteria look like?

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Images: hand holding pencil - pixabay.com/HeatherPaque (1515895); boy feeling sick – pixabay.com/PaliGraficas (3176411)

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