**Blood analysis**



Imagine you’re a doctor.

You’ve been asked to go to a small island.

Some people on the island have an illness.

The only way to detect the illness is to look at the patient’s blood.

If the patient has the illness their blood cells are an odd shape.

**To discuss**

You are allowed to take three things to the island.

These things must help you to look at blood cells to detect the illness.

1. Write in the table the three things you would take.
2. Write in the table your reason why you would take each thing.

|  |  |
| --- | --- |
| **What I would take** | **The reason why I would take it** |
| 1 |  |
| 2 |  |
| 3 |  |

*Biology > Big idea BCL: The cellular basis of life > Topic BCL1: Cells > Key concept BCL1.3: Cell shape and size*

|  |
| --- |
| **Response activity** |
| **Blood analysis** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Cells are usually too small to be seen without a microscope, but have a range of three-dimensional shapes and sizes. |
| Observable learning outcome: | Recall that most (but not all) cells are too small to be seen without a microscope. |
| Activity type: | Discussion |
| Key words: | cell, microscope |

This activity can help develop students’ understanding by addressing uncertainty about what piece of apparatus would usually be required to observe cells, as revealed by the following diagnostic question:

* Diagnostic question: Seeing cells

**What does the research say?**

A number of researchers have reported that children aged 11-16 lack an appreciation of size and scale, and that this impacts their understanding of the relative sizes of cells and other biological structures (e.g. Arnold, 1983; Dreyfus and Jungwirth, 1988; Driver et al., 1994).

Dreyfus and Jungwirth (1989) acknowledge that the cell is, when first introduced, an abstract concept. When introducing ideas about cells, several sources advocate starting with hands-on light microscopy of cells from a range of tissues and organisms, to enable students to build their own understanding of the size of cells and what they look like (AAAS Project 2061, 2009; Skinner, 2011).

Some students at age 16 struggle to name appropriate apparatus that could be used to view structures at cellular level, with incorrect responses including magnifying glass, telescope and the eyes (OCR, 2018).

**Ways to use this activity**

Students should complete this activity in pairs or small groups, and the focus should be on discussion (it is through the discussions that students can check their understanding and develop their explanations). Students should work together to follow the instructions on the worksheet or the presentation.

Giving each group one worksheet to complete between them is helpful for encouraging discussion, but each member should be able to report back to the class. Listening in to the conversations of each group will often give you insights into how your students are thinking.

**Expected answers**

Students should include a (light) microscope to see the shape of the blood cells in the blood samples, and they should give as their reason that blood cells are too small to be seen without one. It could be assumed that if a student opts to take a microscope with them they appreciate that the blood cells are too small to see with the naked eye even if they do not state this explicitly.

Students may also mention glass slides, cover slips and stains, drawing on their knowledge of microscopy. They could mention pencils and paper for making drawings of the observed blood cells, and an identification guide or key. They may also mention gloves, safety glasses and other items related to working safely or preventing infection/contamination.

**Acknowledgments**

Adapted by Alistair Moore (UYSEG) from an activity developed for the York Science project.

Images: pixabay.com/rosanegra\_1 (1706646)

**References**

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

Arnold, B. (1983). Beware the molecell! *Biology Newsletter,* 42**,** 2-6.

Dreyfus, A. and Jungwirth, E. (1988). The cell concept of 10th graders: curricular expectations and reality. *International Journal of Science Education,* 10(2)**,** 221-229.

Dreyfus, A. and Jungwirth, E. (1989). The pupil and the living cell: a taxonomy of dysfunctional ideas about an abstract idea. *Journal of Biological Education,* 23(1)**,** 49-55.

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

OCR. (2018). *GCSE (9-1) Examiners' report - Breadth in biology foundation tier* [Online]. Available at: <https://www.ocr.org.uk/qualifications/gcse/twenty-first-century-science-suite-biology-b-j257-from-2016/assessment/>.

Skinner, N. (2011). Cells and life processes. In Reiss, M. (ed.) *ASE Science Practice: Teaching Secondary Biology.* London, UK: Hodder Education.