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

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| **Response activity** |
| **Build a cell model** |

**Overview**

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| 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: | Apply the idea that cells have a three-dimensional shape. |
| Activity type: | Discussion, modelling |
| Key words: | cell |

This activity can help develop students’ understanding of the three-dimensional nature of cells by asking them to work in groups to build their own models of cells, with an emphasis on group discussion to decide how the model should look. It can be used after the following diagnostic question:

* Diagnostic question: A good cell model?

**What does the research say?**

Research has shown that students at age 11-14 resist accepting that cells are three-dimensional object, believe instead that they are flat (Vijapurkar, Kawalkar and Nambiar, 2014).

Clément (2007) notes that the cell concept is generally introduced by two, two-dimensional, cross-sectional line drawings, comprising a plant cell that is generally polygonal and adjacent to other cells and an animal cell that is more rounded in shape and isolated. Clément has dubbed the common depiction of an animal cell as two concentric circles (cell membrane and nucleus, lacking other organelles or internal structures) the “fried-egg model”. If students are not presented with a greater variety of images of cells they may come to think that all animals cells and all plants cells have the same shape and structures as these two archetypal depictions; Clément found exactly this misunderstanding persisting in students up to undergraduate level.

Several studies have advocated the building and use of three-dimensional models of cells during teaching to help overcome this (e.g. Tregidgo and Ratcliffe, 2000; Lazarowitz and Naim, 2014).

**Ways to use this activity**

Students should complete this activity in pairs or small groups. Ask each pair or group to build a model of a cell. The emphasis should be on group discussion to reach a consensus on how the model should be built, how it should look, and what features should be included. 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.

**Equipment**

For each pair/group:

* a range of materials for model making (e.g. plastic or cardboard boxes, balloons, sponge, polystyrene, cotton wool, plastic bags, pipe cleaners, modelling dough, glue, etc.)

**Expected answers**

A good model will represent the cell and subcellular structures as three-dimensional. All of the common features of a plant cell are represented, including cell wall (the cardboard box), cell membrane (plastic tub), nucleus (ping pong ball), vacuole (red sack), chloroplasts (peas) and mitochondria (peppercorns). All of the structures are labelled.

**Acknowledgments**

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**References**

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Vijapurkar, J., Kawalkar, A. and Nambiar, P. (2014). What do cells really look like? An inquiry into students' difficulties in visualising a 3-D biological cell and lessons for pedagogy. *Research in Science Education,* 44(2)**,** 307-333.