**Nucleus**

Some students are discussing the nucleus of an atom.

Who do you agree with, and why?

**Flo:** If an atom has a nucleus it must be alive.

**Greg:** The nucleus is at the centre of the atom.

**Phyllis:** I think the nucleus controls the atom.

**Freddie:** An atom can reproduce.

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| Cards for  **Nucleus** |  |
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*Chemistry > Big idea CPS: Particles and structure> Topic CPS6: Periodic table > Key concept CPS6.1: Atomic model*

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| **Diagnostic question** |
| **Nucleus** |

**Overview**

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| Learning focus: | The structure of an atom may be represented by an atomic model. |
| Observable learning outcome: | Distinguish the nucleus of an atom from the nucleus of a cell. |
| Question type: | talking heads |
| Key words: | nucleus |

**What does the research say?**

A research study (Harrison and Treagust, 1996) interviewed students about their mental models of atoms. A surprising finding was that a small number of students considered an atom to be alive and even thought that an atom could reproduce. It was thought that this substantial misunderstanding may have arisen from confusion when the term nucleus was introduced as forming part of the structure of an atom. Students may have applied previous understanding about the role of the nucleus in a cell.

**Ways to use this question**

This task is intended for discussion in pairs or small groups. It can be done as a pencil and paper exercise or projected onto a screen.

Students should read the statements and follow the instructions on either the worksheet or the PowerPoint. Listening in to the conversations of each group will often give you insights into how your students are thinking. Each member of a group should be able to report back to the class.

Feedback from each group can be used, with careful teacher questioning, to bring out a clear description or explanation of the science.

*Differentiation*

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 the scribe. They may question the others and only write down what they have been told. This strategy encourages contributions from more members of each group.

NB in any class, small group discussions typically improve over time and a persistence with this strategy is often very successful in the medium to long term.

**Expected answers**

The nucleus is found at the centre of an atom.

**How to respond - what next?**

A student who agrees with Flo, Phyllis or Freddie may be applying their understanding of the word nucleus in the context of a cell to an atom. It may help to clarify that whilst the same word is used, the nucleus of an atom and a cell are completely different. The common word is used due to its derivation from the Latin word meaning kernel (i.e. central part).

If students have misunderstandings about the use of the word nucleus in both cells and atoms it may help to compare differences between cells and atoms. The following BEST ‘response activities’ could be used in follow-up to this diagnostic question:

* Cell v atom

**Acknowledgments**

Developed by Helen Harden (UYSEG)

Images: None

**References**

Harrison, A. G. and Treagust, D. F. (1996). Secondary students' mental models of atoms and moelcules: Implications for teaching chemistry. *Science Education,* 80(5)**,** 509-534.