**Match game! The role of the cell membrane**

Place a card in each box below to complete the sentence.

The cell membrane lets

|  |
| --- |
| *< substance card >* |

|  |
| --- |
| *< enter/leave card >* |

|  |
| --- |
| *< reason card >* |

*Biology > Big idea BCL: The cellular basis of life > Topic BCL1: Cells > Key concept BCL1.4: Diffusion and the cell membrane*

|  |
| --- |
| **Response activity** |
| **Match game! The role of the cell membrane** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Molecules move through the cell cytoplasm by diffusion, and some molecules can enter and leave a cell by diffusing through the cell membrane. |
| Observable learning outcome: | Use ideas about the needs and life processes of cells to explain the role of the cell membrane and why it must be selectively permeable. |
| Activity type: | Discussion |
| Key words: | cell, membrane |

This activity can help students to overcome misunderstandings about the function of the cell membrane, by linking ideas about the needs and life processes of cells to the role of the cell membrane. It can be used in response to the following diagnostic question:

* Diagnostic question: The right structure for the job

**What does the research say?**

Dreyfus and Jungwirth (1988) found that many 16-year-olds struggled to explain how cells carry out life processes; many of the students thought that cells contain macroscopic organs such as a digestive tract (e.g. for nutrition) or lungs (e.g. for respiration). This could be related to the misunderstanding that substances such as oxygen and food/glucose are taken into cells by breathing or eating, respectively, rather than by diffusion through the cell membrane (Allen, 2014).

Douvdevany *et al.* (1997) used a game to probe and develop junior high school science teachers’ understanding of the relationships between various substances, structures and life processes in cells. Participants were instructed to select three cards from a pile of cards representing substances, structures and processes, and then asked to describe relationships between the things named on the cards. A number of triangular (truly three-way), chain-like (A-->B-->C) and ‘pair of pairs’ (A-B & B-C, but not A-C) relationships were suggested by the participants, and misunderstandings were revealed and explored during their discussions.

Christianson and Fisher (1999) have described constructivist approaches that enable students to build their own explanations of diffusion, which may help to develop students’ understanding and overcome misconceptions, including teacher-led and student-student group discussion.

**Ways to use this activity**

The cards on the final page of this document should be printed and cut out. Students should be instructed to pick one substance card, one ‘enter/leave’ card and one reason card, and then to place them onto the worksheet to complete the sentence. Students should complete this activity in pairs or small groups to pick three cards and reach a consensus, through discussion, on which cards should be placed together on the worksheet to complete the sentence. These placements could be described to other groups, to the class, or to the teacher. The used cards should then be removed and the activity repeated using different selections of cards from the piles.

Giving each group one set of cards and one worksheet between them is helpful for encouraging discussion, but each group member should be able to report back to the class. Listening in to the conversations of each group will provide insights into how the students are thinking.

Students should be encouraged to use the group discussions to help them construct the best explanations as they can about the relationships between the cards they have picked. Class discussion or teacher intervention can help to address any remaining misunderstandings.

**Acknowledgments**

Developed by Alistair Moore (UYSEG), inspired by an instrument reported by Douvdevany *et al.* (1997).

**References**

Allen, M. (2014). *Misconceptions in Primary Science, Second* ednBerkshire, UK: Open University Press.

Christianson, R. G. and Fisher, K. M. (1999). Comparison of student learning about diffusion and osmosis in constructivist and traditional classrooms. *International Journal of Science Education,* 21(6)**,** 687-698.

Douvdevany, O., Dreyfus, A. , Jungwirth, E. (1997). Diagnostic instruments for determining junior high-school science teachers' understanding of functional relationships within the 'living cell'. *International Journal of Science Education,* 19(5)**,** 593-606.

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.

**Print and cut out cards for ‘Match game!’ activity**

*Substance cards*

✁

|  |  |  |
| --- | --- | --- |
| carbon dioxide | oxygen | water |
| substances from food |  |  |

*‘Enter/leave’ cards*

✁

|  |  |  |
| --- | --- | --- |
| enter the cell | enter the cell | enter the cell |
| leave the cell | leave the cell | leave the cell |

*Reason cards*

✁

|  |  |  |
| --- | --- | --- |
| to be used in respiration. | to be used in photosynthesis. | because it is a waste product of respiration. |
| because it is a waste product of photosynthesis. | to provide a medium for chemical reactions. | to fill up the cell. |