

Lesson plan Title: Diffusion and Osmosis in cells

School	<input type="radio"/> Primary	<input type="radio"/> Middle	<input checked="" type="radio"/> High		
Year / Class	<input type="radio"/> 1	<input checked="" type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
Subject : Biology	Topic: Diffusion, osmosis (100min)				
CLIL language	English				

Teacher / Teaching team profile	Teacher's role:	<input checked="" type="radio"/> Main Teacher	Subject taught: natural sciences
		<input type="radio"/> Co-teacher	
		<input type="radio"/> Other: _____	
	Teacher's role:	<input checked="" type="radio"/> Main Teacher	Subject taught: _____English_____
		<input type="radio"/> Co-teacher	
		<input type="radio"/> Other: _____	

Student group profile (general)	CEFR Level:	<input type="radio"/> A1	<input checked="" type="radio"/> A2	<input type="radio"/> C1
		<input checked="" type="radio"/> B1	<input type="radio"/> B2	<input type="radio"/> C2
	The students have had one experience of CLIL in the previous year with a module on chemistry. Their mother tongue is Italian.			
topic of a series of lessons	This lesson is the first lesson of a clil module of 15 hours on the transport of substances in cells: diffusion, osmosis, passive vs active transport, endocytosis, exocytosis and communication between adjacent cells: gap junctions and plasmodesmata.			
topic of the lesson	understanding diffusion and osmosis through experiments and videos			

Timetable fit	<input checked="" type="radio"/> Module <input type="radio"/> Lesson	Previous lessons: The structure of cells and cell organelles
		Future lessons: Active and passive transport (see worksheet)

Resources & tools	Textbook, worksheets, videos, word banks, sentence starters
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Students' prior knowledge, skills, competencies	Subject	Language
	The pupils started studying biology this year and have studied biomolecules and the different structures of cells in Italian	This is their second CLIL module. They know about solutions from the previous chemistry CLIL module.

Learning Outcomes expected for this lesson	<p>Cognitive-linguistic competencies to develop:</p> <p>Knowledge: students will be able to define diffusion and osmosis, recall information and specific vocabulary regarding the cell, they will be able to describe the characteristics of semipermeable cell membranes and how simple molecules diffuse across cell membranes.</p> <p>Comprehension: they will be aware of how and when osmosis occurs, they will explain what happens in the two experiments on diffusion and osmosis</p> <p>Application: they will be able to give examples of when diffusion and osmosis occur in everyday life. They will be able to describe what happens when plant cells and animal cells are placed in solutions with different salt concentrations. They will predict and explain the effects of osmosis on cells</p> <p>Analysis: after having obtained the results of the 2 experiments on diffusion and on osmosis, they will analyse and give an interpretation to their results. They will identify and describe osmosis as the special diffusion of water through semi-permeable membranes</p> <p>Synthesis: Define and describe the process of diffusion and osmosis. They will be able to explain what happens if cells are put in isotonic, hypotonic and hypertonic solutions giving an explanation to why osmosis occurs in each case.</p>
Methodology	<p><i>How the teacher in the lesson manages to integrate language and content</i></p> <p>The initial activities activate prior knowledge on the subject. The students work in pairs and acquire the necessary subject specific vocabulary by completing small guided exercises and by inserting the specific vocabulary in their spaces after having watched brief videos. They work on a worksheet with visual organisers and language support. The students work in small groups and perform an experiment on osmosis and one on diffusion guided by the teacher and by instructions written on a worksheet. They talk together about the results of these experiments in order to formulate hypotheses to explain and interpret their observations. Knowledge and competencies on the subject are reinforced at the end of the lesson with a small brainstorming activity to review important concepts of the lesson.</p>

Activity	Activity aims	Activity Procedure	Language	Interaction	Materials (please cite all sources)	Timing	Assessment
1	This activity aims to help students recall prior knowledge of the cell structure and learn subject specific vocabulary necessary to understand diffusion and osmosis in cells.	The teacher briefly introduces the learning outcomes and the structure of the lesson. The students watch a 7 minutes video on the cell and on its components. They then work in pairs on a worksheet and have to fill in the missing words in sentences and in a diagram of a plant and animal cell. The teacher assists the students in difficulty and the students talk together and help each other in order to complete the exercise correctly	This is an activity which stimulates lower order thinking skills LOTS. Students have to recall prior knowledge of the cell and specific vocabulary. They have already studied the cell in Italian and the subject specific vocabulary is very similar in English. Since they don't yet know how to spell all the words, the subject specific vocabulary is already written on the worksheet. The students just have to insert the given words in the right spaces. In this way they should begin to familiarise with the subject specific vocabulary regarding the cell and they should notice that it is quite similar to the Italian vocabulary they already know.	Pair work	Video: https://www.youtube.com/watch?v=URUJD5NEXC8 and worksheet exercises: 1a. and 1b.	15 minutes	The teacher moves around the class and checks if the students are completing the worksheet correctly. Peer assessment: students correct each other and help each other in completing the worksheet
2	Learn and recall simple words necessary to make sentences to describe the experiments they will perform in the next activities on diffusion and osmosis	The students match opposites that they use to explain the results of the experiments on diffusion and osmosis (activities 4 and 5).	Students have to connect the words to their opposite meaning. The students already know most of the words. This activity activates LOTS.	Pair work	worksheet exercise 1c.	5 min	The teacher moves around the class and checks if the students are completing the worksheet correctly. Peer assessment.

3	<p>Be aware of the substances which must enter and exit plant and animal cells. This activity will make students talk together in order to understand what cells need and what they have to get rid of. In the end they should all conclude that water is the compound which necessarily has to enter all cells.</p>	<p>The students are given a few sentence starters and have to complete the sentences thinking of what cells need for cell respiration and for photosynthesis and what will exit and enter animal and plant cells. After the students have talked together, each group reads their sentences to the class and the teacher uses the whiteboard noting the names of the substances that enter and exit plant and animal cells. To facilitate comprehension the teacher draws a diagram representing a plant cell and an animal cell and draws labelled arrows to show the substances which move in and out of the two cells. The students check their sentences to see if they missed out anything.</p>	<p>Sentence starters and the previous activities will help the students complete the sentences. They should have acquired some subject specific vocabulary and be aware of how to make a sentence using their knowledge on cells. This activity activates HOTS and will definitely make students talk together to complete the task. They will be reasoning and hypothesising in their conversations. The hint the teacher can give to the groups in difficulty is that plants use photosynthesis and cell respiration whereas animals use only cell respiration; these two processes take place in the cell and will consume and produce substances that must enter and exit the cell. (CO₂, H₂O, O₂)</p>	Group work 4 students	Worksheet exercise 1d.	10 min	Peer and self assessment
4	<p>Experiment 1 on diffusion. Observe and explain the process of diffusion in hot and cold liquids</p>	<p>The students are given the following materials: one beaker with hot water, one with cold water, ink and a pipette. They add a drop of ink to each beaker and observe what happens in both beakers. They talk together to explain the phenomenon taking place and have a worksheet with the words they need to use to be able to describe what is happening. Each group then reads out their description to the class and the teacher gives a feedback to each group and then writes the general definition of diffusion on the whiteboard. The students copy the definition on the worksheet in the space below the description of the experiment. They then watch a brief video on diffusion to see what is happening at a molecular level.</p>	<p>Pupils learn how to make short sentences using the present tense and subject specific vocabulary. A word bank is given on the worksheet to help them use appropriate vocabulary. This practical activity will make the students better understand the process of diffusion. This activity makes students use HOTS such as hypothesising, reasoning, describing observations. Therefore both communicative and writing skills are developed.</p>	Group work: 4 students	<p>Tools: 2 2 beakers, a pipette, ink, hot and cold water</p> <p>Worksheet: experiment 1 on page 2</p> <p>Video: http://highered.mheducation.com/sites/0072495855/student_view0/chapter2/animation_how_diffusion_works.html</p>	15 min	Peer assessment and formative assessment

5 etc.	<p>Experiment 2</p> <p>This practical activity will help them understand osmosis and what happens when cells are placed in solutions with different solute concentration.</p>	<p>experiment on osmosis. Materials: 2 pieces of potato: length 4-5cm, width: 1cm. 2 beakers with 50ml di distilled water in them, 10g of sugar on a watch glass, ruler and scale. Method: the students weigh the 2 pieces of potato (long sticks) and measure their lengths. They put one piece in a beaker with 50ml of distilled water and the other one in a beaker with a solution 10g of sugar and water. They wait 15 min and again weigh and measure the lengths of the pieces of potato registering their results in a table. During the 15 minutes wait the students watch a video on osmosis and will watch it again for homework in order to answer some questions on the process. The teacher stops the video to show some important images and to explain the key points of osmosis. The students try to hypothesize what will occur in the experiment. After having measured and weighed the potato slices, the students have to record the data in a table on the worksheet and talk together to describe what has happened and why the potatoes have changed size and weight. The students have to keep in mind that what they are observing is osmosis and that osmosis is only a special case of diffusion. The video on osmosis will help them interpret the results of the experiment. The students talk together and finally write their explanations on the worksheet. The teacher observes the group work and fills in a table with descriptors.</p>	<p>They learn how to communicate and write short sentences using subject specific vocabulary. They have guided questions and sentence starters on their worksheet to help them communicate. After having discussed the questions on the worksheet, they will write down their explanations. They will observe that after 15 minutes the piece of potato in distilled water increased its length and weight whereas the piece of potato in water and sugar lost weight and became smaller. The HOTS question asks the students to explain their observations (why do the weight and length of the potatoes change?). The students will be hypothesising, reasoning and maybe using creative thinking skills to try to interpret their results. The teacher gives the students a hint by saying that sugar cannot diffuse into the cells, only water can move freely in and out of the cells.</p>	<p>Group work: 4 students</p>	<p>Tools : 2 beakers, sugar, water, potato, a knife, a digital scale, a ruler and a stopwatch. They always have a worksheet to help them with some key words</p> <p>video http://highered.mheducation.com/sites/0072495855/student_view0/chapter2/animation_how_osmosis_works.html.</p>	<p>30 min</p>	<p>Formative assessment. While the students are working in groups the teacher will fill in a table with the following descriptors: listen and follow instructions, participate in the group work, take turns to communicate in groups, answers questions correctly. In alternative the teacher could collect the sheet they worked on and correct it giving them a feedback to their answers.</p>
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6	Help students visualise osmosis at a molecular level. Students should be able to describe solutions as hypertonic, hypotonic, or isotonic. They should also be able to use knowledge of diffusion and osmosis to explain how substances move across a membrane	The teacher uses a power point on diffusion and osmosis to show the process at a molecular level. The students then work in pairs making short sentences to describe the different solutions cells can be placed in. They describe what happens to animal and plant cells in hypertonic, hypotonic, or isotonic solutions.	The power point will help them reinforce their knowledge of osmosis in cells. They will learn 3 subject specific words (hypertonic, hypotonic and isotonic solutions). The worksheet has examples of sentences with the subject specific vocabulary and sentence starters which will help them formulate short phrases. There are some images which can help them visualize the different salt concentrations of the solutions. They will be using both LOTS and HOTS by first recalling past concepts and then reasoning when drawing the arrows to show in which direction water moves.	Pair work	Worksheet p.3 and power point created by the teacher	15 min	Peer assessment
7	Review the most important concepts learned during the lesson and thus reinforce knowledge and understanding of osmosis and diffusion.	The teacher asks the students to brainstorm the key concepts and key words and creates a mind map with their words to summarize the lesson. During this activity the teacher draws a mind map on the whiteboard with the keywords and asks the students brief definitions of each key word.	the students recall the main subject specific vocabulary seen in the lesson and define some words	Whole class	Whiteboard. Mind map on the white board with the words which the students brainstorm	10 min	Formative assessment
8	Review concepts seen in the lesson to reinforce their knowledge of osmosis.	Homework: watch the video on osmosis and complete page 4 of worksheet The teacher describes the homework the students have to do for the next lesson and collects their worksheets. The teacher will correct their worksheets and will give a feedback the next lesson. The homework is useful to reinforce their knowledge on this topic.	Exercises to reinforce their knowledge on osmosis. Short quiz. Most subject specific vocabulary is given on the worksheet	Individual work	Worksheet P.4	0 min	Formative assessment