

Standard: Biology 2.4

Episode: 2

<b>Title:</b> Cell Transport Using Spheros <b>Time:</b> 60 minutes		
<b>DCI:</b> Plan and carry out an investigation to determine how cells maintain stability within a range of changing conditions by the transport of materials across the cell membrane. Emphasize that large and small particles can pass through the cell membrane to maintain homeostasis. (LS1.A)	<b>CCCs:</b> <ul style="list-style-type: none"><li><input type="checkbox"/> Structure and Function</li><li><input type="checkbox"/> Cause and Effect</li><li><input type="checkbox"/> Patterns</li><li><input type="checkbox"/> Systems</li><li><input type="checkbox"/> Energy and Matter</li><li><input type="checkbox"/> Stability and Change</li><li><input type="checkbox"/> Scale, Proportion, and Quantity.</li></ul>	<b>Practices:</b> <ul style="list-style-type: none"><li><input type="checkbox"/> Ask Questions</li><li><input type="checkbox"/> Make and Use Models</li><li><input type="checkbox"/> Plan and Do Investigations</li><li><input type="checkbox"/> Analyze Data.</li><li><input type="checkbox"/> Use Math</li><li><input type="checkbox"/> Construct Explanations</li><li><input type="checkbox"/> Argue from Evidence.</li></ul>

**Whole Standard Phenomena:** Salmon living in freshwater and saltwater

**Anticipated Questions:** How can the cells in salmon maintain homeostasis in both freshwater and saltwater?

**Supporting Phenomena:** Molecules enter and leave cells via the cell membrane and the principles of active and passive transport.

**Teacher Clarity**

**Students Will...**simulate 3 types of cell transport using Sphero Bolt robots.

**So that they can...**understand the similarities and differences of each method.

**Students will know they've got it when...**they successfully drive their Sphero into or out of the cell according to the type of cell transport that was called for and explain their rationale.

	<b>Student Does:</b>	<b>Teacher Does:</b>
<b>Gather</b>	<ol style="list-style-type: none"><li>1. Connect to and pick up their Sphero.</li><li>2. Aim their Sphero.</li><li>3. Play the Cell Transport game.<ol style="list-style-type: none"><li>a. When simple diffusion is called they move into the cell over the tape (cell membrane) until there are too many Spheros in the cell; then they move out of the cell because of the concentration gradient.</li><li>b. When facilitated diffusion is called they move into the cell over ONLY through the tunnels until there are too many Spheros in the cell; then they move out of the cell because of the concentration gradient.</li><li>c. When Protein Pump is called they move into the cell over the ramp (representing the need for energy to get over the hump). Sometimes this</li></ol></li></ol>	<ol style="list-style-type: none"><li>1. Rearrange the classroom so there is a large open area.</li><li>2. Create a boundary for the Spheros (rope, pool noodles, insulation tubing).</li><li>3. Clean the floor and make the cell membrane with tape on the floor including tunnels (cut up 2 liter bottles) and ramps.</li><li>4. Prepare the Spheros so they are charged and ready to connect.</li><li>5. When students are ready to play, the teacher or another student calls out different cell transport methods: simple diffusion, facilitated diffusion, and protein pump.</li></ol>

	will be called to enter the cell and sometimes to exit the cell.	
<b>Reason</b>	Students answer questions and come up with scenarios to play the next round. For example what if this is the cell of a salmon in freshwater or saltwater?	<p>The teacher pauses the game to ask clarifying questions as needed.</p> <ul style="list-style-type: none"> <li>● What is simple diffusion?</li> <li>● Can all molecules enter/exit by simple diffusion? Why or why not?</li> <li>● What is a concentration gradient?</li> <li>● What is facilitated diffusion?</li> <li>● Can all molecules enter/exit by facilitated diffusion? Why or why not?</li> <li>● What is a protein pump?</li> <li>● What is needed for molecules to enter/exit through a protein pump?</li> <li>● Which types of cell transport are passive? Active?</li> <li>● What is the structure of the cell membrane?</li> <li>● What is the function of the cell membrane?</li> </ul>
<b>Communicate</b>	Students turn to their neighbor and explain the types of cell transport.	

<p><b>Formative Assessment:</b> At the end of the activity the teacher asks questions and the students have to turn their Sphero a certain color meaning they know the answer.</p>	<p><b>Materials, resources, handouts, etc:</b></p> <ol style="list-style-type: none"> <li>1. Sphero bolts</li> <li>2. Tape, tunnels, ramps</li> <li>3. Rope for the boundary</li> </ol>
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