Gifted Education School Network 2023/24

STEAM Education

Key Learning Area: Biology

Acknowledgements: This lesson example was adopted from the try-out by Mr TAM Long-hei of HKMA David Li Kwok Po College

Level	Secondary 4
Topic	Osmosis (Why are cucumbers pickled?)
Lesson Duration	1 hour
Learning Objectives	Knowledge - To understand the concept of osmosis and its role in pickling cucumbers. - To identify the key terminologies associated with osmosis. - To differentiate between diffusion and osmosis. Skills - To apply the principles of osmosis to explain various biological phenomena. - To analyse and interpret diagrams and visuals related to osmosis. Attitude - Develop a curiosity and appreciation for the process of osmosis in daily life scenarios (e.g., pickled cucumber)
Highlights of this lesson	In this lesson, students are engaged in a "Notice and Wonder" activity where they observe and question slices of pickling cucumber. Using a simulation, students notice that cucumbers placed in a salt solution become firmer and acquire a tangy taste. The understanding of osmosis helps them make connections to daily life scenarios. The lesson rearranges the lesson sequence, allowing students to explore the biological concepts using their own words and understanding. Biological terminologies are then introduced to support students' articulation of the ideas of osmosis that help explain more wonders about the pickled cucumbers. It can foster a deeper conceptual understanding of osmosis.
Differentiation Strategies employed	- Higher-ordering questioning

Activities	Rationales and Tips for Implementation
(A) Engagement Students are asked to complete the notice-and-wonder T-chart by examining slices of fresh cucumber and pickled cucumber. Students are encouraged to observe and note down their observations and questions in the T chart posted on a whiteboard.	The teacher can provide students with actual slices of fresh cucumber and pickled cucumber to examine. This allows them to engage their senses and make direct observations. The teacher should encourage open-ended thinking. There are no right or wrong answers in the "wonder" column. It is important to promote students to think creatively and ask questions that spark curiosity. The questions stated in the wonder will then be reviewed and answered by the students at the end of the lesson.
(B) Exploration Students explore what would happen when a fresh cucumber is immersed into a concentrated salt solution at the particle level by watching a simulation. Student takes notes and describes about the changes in both the number of solute particles and water particles in the and out of the cucumber using their own words.	The teacher should scaffold student exploration of the simulation by setting some guiding questions that help them notice the number of particles (i.e., water particles and solute particles) at different times of the simulation and different regions (i.e., in and out of the cucumber). Students can also start to develop their explanations that answer the wonders they posed in the previous task. They are encouraged to articulate their thinking using their own words. This can help build their conceptual understanding about osmosis.
(C) Explanation The teacher introduces biological concepts and terminologies about osmosis (e.g. sequence, mechanism, and events taking place during osmosis). Students then apply the concept to compare between diffusion and osmosis. Students annotate the particle diagrams and explain using the terminologies. Students are then encouraged to review and answer the wonders they posed at the beginning using the concept of osmosis.	The teacher can provide a clear and concise introduction of the biological concepts and terminologies related to osmosis. The teacher can break down the sequence, mechanism, and events that take place during osmosis. Using visuals, diagrams, or animations can help aid students' understanding. The annotation task can help students highlight key differences between osmosis and diffusion. Students explain the processes depicted in the diagrams using accurate terminology. After students have gained a deeper understanding of osmosis, revisit the notice-and-wonder T-chart from the beginning of the lesson. Students are encouraged to review their initial wonders and answer them using their

	knowledge of osmosis. This activity promotes reflection and helps students see how their understanding has evolved.
(D) Elaboration The teacher then introduces the biological terminologies of osmosis when animal cells and plant cells are placed in a solution of different water potentials.	The teacher may also consider using visuals, diagrams, or animations to illustrate the concepts of osmosis in animal and plant cells. Show the movement of water across cell membranes and the changes in volume and pressure in different solutions. The teacher may also connect to some common scenario about the concepts such as discuss situations such as red blood cells in different saline solutions. For plant cells, explore scenarios like the wilting of plants in dehydrated soil or plasmolysis in hypertonic solutions. This can help sustain the interests and curiosity of gifted students.
(E) Evaluation The teacher assesses student learning about osmosis by asking students to complete public exam questions of different difficulties.	After students have attempted the questions, the teacher can provide them with model answers. Use these solutions to discuss and explain the correct approaches, highlighting common mistakes or misconceptions. This feedback session helps gifted students understand the expectations and allows them to learn from their errors.