Lesson Plan

Teacher: Mr. Strang | **Course:** Science

Grade: 8 | **Unit:** Cells

Last Lesson: The cell membrane

This Lesson: Osmosis

Supplies/Tools:
- Per group:
  - 2 stalks of celery
  - 2 clear containers
  - Water
  - Blue food coloring
- Knife
- Osmosis video worksheet
- Diffusion and osmosis worksheet

GLOs: B4 - demonstrate a knowledge of and personal consideration for a range of possible science and technology related interests, hobbies, and careers
C1 - recognize safety symbols and practices related to their daily lives and apply this knowledge in appropriate situations
C2 - demonstrate appropriate scientific inquiry skills when seeking answers to questions

SLOs: 8-0-3a - Formulate a prediction/hypothesis that identifies a cause and effect relationship between the dependent and independent variables
8-0-4a - Carry out procedures that compromise a fair test
8-1-07 - Describe the movement of nutrients and wastes across cell membranes and explain its importance

Essential Questions:
- What is osmosis and how does it differ from other forms of passive transport?
- How do cells regulate the movement of water through the process of osmosis?
- Can you explain the role of the cell membrane in facilitating osmosis?
- What factors influence the rate of osmosis?

Enduring understandings:
- The cell membrane controls the movement of substances
- Osmosis is a passive process
- Water balance is essential for cell function
- The concentration gradient drive osmosis

Activate (10 mins) - Play this video: https://www.youtube.com/watch?v=L-osEc07vMs Provide students with a worksheet containing questions related to the video, to be filled out while watching. Discuss the answers as a class afterwards.

Acquire (5 mins) - Short lecture about osmosis, transpiration, and diffusion. This should occur first thing in the morning so the experiment can be started early.

Apply (30 mins for setup, plus 5 minutes every hour of the school day) - Students will conduct an experiment using celery and food coloring, tracking water movement up the celery. They will measure water movement up the stem every hour of the school day, plus at the beginning of the next school day.

Assess (15 mins) - Students will complete a worksheet including a table for their measurements of water movement, and some questions about osmosis.

Modifications: - Students can work in larger groups if needed - Provide diagrams and visuals to help demonstrate transpiration and osmosis	**Extensions:** - Encourage students to graph the height of the water over time - Students can add different substances to the water to see if it affects how fast or how high the water rises
Post Lesson Notes:	

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Last Lesson: Tissue specialization

This Lesson: Building a model cell IN MINECRAFT!

Supplies/Tools:
- Computer lab with Minecraft Education

GLOs: C4 - demonstrate appropriate critical thinking and decision making skills when choosing a course of action based on scientific and technological information
C6 - employ effective communication skills and utilize information technology to gather and share scientific and technological ideas and data
D1 - understand essential life structures and processes pertaining to a wide variety of organisms, including humans

SLOs: 8-1-01 - Use appropriate vocabulary related to their investigations of cells and systems
8-1-03 - Describe cell theory
8-1-05 - Identify and compare major structures in plants and animal cells, and explain their function

Essential Questions:
- What are the main components of a cell and how do they function together to sustain life?
- How can we represent the different parts of a cell using Minecraft blocks and features?
- What similarities can we draw between the structures in Minecraft and the actual components of a cell??

Enduring understandings:
- Cells are the basic units of life
- Cells have specialized structures
- Cells can vary in structure and function

Activate (1 min) - Tell students they will be building a model of a cell IN MINECRAFT. That should be all they need to get excited.

Acquire (5 mins) - Give students a brief overview of how to play Minecraft Education and what the expectations of the assignment are

Apply (30 mins) - Students will build a model of either a plant or animal cell, using different blocks and objects to represent different organelles of the cell. The model organelles should resemble their real life counterparts but also demonstrate the organelle's function. This will be continued into the next class.

Assess (10 mins) - This will occur at the end of the second class. Students will show the instructor their model, explaining the different parts and why they used them.

Modifications:
- If students are unable or unwilling to play minecraft, they can make their model in the real world, as a diorama, a cake, or something else agreed upon by the student and teacher

Extensions:
- If students complete the assignment quickly, they can make their model more complex, or build a second model of the cell type (plant/animal) they did not use for their first model

Post Lesson Notes:

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Last Lesson: The circulatory system

This Lesson: The Heart

Supplies/Tools:
- Several copies of the circulation game, printed out and assembled (this could be done by students who finish a previous assignment assignment early)
- Heart worksheet

GLOs: D1 - understand essential life structures and processes pertaining to a wide variety of organisms, including humans

SLOs: 8-1-01 - use appropriate vocabulary related to their investigations of cells and systems
8-1-11 - describe the structure and function of the heart and path of blood to and from the heart through its four chambers

Essential Questions:
- What is the primary function of the heart and why is it considered a vital organ?
- How many chambers does the heart have, and what are their specific roles in blood circulation?
- How does blood flow through the different chambers of the heart and the circulatory system?
- What role do valves play in maintaining the proper flow of blood within the heart chambers?

Enduring understandings:
- The heart has four chambers
- Each chamber has a specific role
- Values maintain one-way blood flow
- Blood travels through two distinct pathways

Activate (10 mins) - Play this video https://www.youtube.com/watch?v=_vZ0lefPg_0 Ask students to pay extra attention to the path of blood through the heart, as that's what we're looking at today.

Acquire (5 mins) - Short powerpoint lecture

Apply (30 mins) - Students will split up into groups of 4-6 to play the circulation game found here https://www.ellenjmchenry.com/homeschool-freedownloads/lifesciences-games/documents/CirculationGame.pdf

Assess (10 mins) - Students will fill out a worksheet labeling the chambers, veins, and valves of the heart. They will also draw out the path of the blood through the heart.

Modifications:
- Students can play the board game in teams

Extensions:
- Encourage students to make up their own additional rules for the board game
- Students can also play this game if they have extra time. https://www.geoguessr.com/vgp/3805

Post Lesson Notes:

Lesson Plan

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Last Lesson: The heart

This Lesson: Heart dissection

Supplies/Tools:
- Pig hearts for each student
- Class set of Dissection kit, including scalpels, forceps, pins, tray, etc…
- Nitrile gloves, various sizes
- Lab coats for each student
- Biohazard disposal
- Cleaning equipment
- Safety goggles

GLOs: C1 - recognize safety symbols and practices related to scientific and technological activities and to their daily lives, and apply this knowledge in appropriate situations
D1 - understand essential life structures and processes pertaining to a wide variety of organisms, including humans

SLOs: 8-1-01 - use appropriate vocabulary related to their investigations of cells and systems
8-1-11 - describe the structure and function of the heart and path of blood to and from the heart through its four chambers

Essential Questions:
- What is the primary function of the heart and why is it considered a vital organ?
- How many chambers does the heart have, and what are their specific roles in blood circulation?
- How does blood flow through the different chambers of the heart and the circulatory system?
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Enduring understandings:
- The heart has four chambers
- Each chamber has a specific role
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- Blood travels through two distinct pathways

Activate (5 mins) - Gear up with safety equipment. Students will be excited about this activity already

Acquire (10 mins) - Discuss lab safety with students. Cover the different hazards involved and how to mitigate their risks. Go over the dissection tools and how to use them properly. Finally, go through the plan for the lab before handing out the hearts.

Apply (30 mins) - Take students through a guided dissection, showing the various chambers and valves of the heart.

Assess (15 mins) - Students will fill out an exit slip discussing what they learned. This will be done at the start of next class, as the dissection and cleanup will take the entire time.

Modifications: - Arrange for another staff member to be available to watch any students who may not wish to participate in the dissection - Students can choose to do the dissection in groups or pairs - Pre-dissected hearts could be set up in stations to demonstrate different parts of the heart	**Extensions:** - Students can look for evidence of heart disease - Students can assist their peers
Post Lesson Notes:	

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Last Lesson: Parts of the cell

This Lesson: The Microscope Lab

Supplies/Tools:
- Microscopes (1 per 2 students)
- Sample slides (1 per 2 students)
- Microscope handout
- Microscope worksheet
- Paper, pencil crayons

GLOs: A3 - distinguish critically between science and technology in terms of their respective contexts, goals, methods, products, and values
B4 - demonstrate a knowledge of and personal consideration for a range of possible science and technology related interests, hobbies, and careers
C2 - Demonstrate appropriate scientific inquiry skills when seeking answers to questions
C7 - Work cooperatively and value the ideas and contributions of others while carrying out scientific and technological activities

SLOs: 8-0-5c - Select and use tools to observe, measure, and construct
8-1-01 - Use appropriate vocabulary related to their investigations of cells and systems
8-1-05 - Identify and compare major structures in plants and animal cells, and explain their function
8-1-06 - Demonstrate proper use and care of the microscope to observe the general structure of plant and animal cells

Essential Questions:
- Why do we use a microscope?
- How is total magnification calculated in a compound microscope?
- How do you properly handle and care for a microscope?
- How does the field of view change with different objective lenses, and how does this affect the amount of detail visible in a specimen?
- In what scientific fields and industries are microscopes commonly used?

Enduring understandings:
- Microscopes magnify objects, revealing details not visible to the naked eye
- A compound microscope combines the magnifying power of multiple lenses
- Proper microscope use involves careful handling and adjustment
- Microscopes are essential tools in scientific research across various fields

Activate (5 mins) - Play this video https://www.youtube.com/watch?v=ZyXrtODhJEA Ask students what clip they found most interesting. What else would they like to see under a microscope?

Acquire (15 mins) - Provide students with a handout describing the functions and parts of the microscope. Demonstrate how to mount a slide onto the stage and get it into focus. Discuss how the objective lens and ocular lens combine together to make the final magnification. Demonstrate how to calculate this final magnification.

Apply (25 mins) - In partners, students will work through the provided sample slides, finding, drawing, and labeling different cells.

Assess (15 mins) **-** Students will complete a worksheet that includes labeling parts of a microscope, and calculating the magnification of different lenses.	
Modifications: - If students have trouble finding cells on the slides, encourage them to ask their peers for help - Print out photos of cells for students to label - If available, allow students to use a microscope that displays the view on a screen, as opposed to an eyepiece.	**Extensions:** - Show students how to make a wet mount slide - Encourage students to make more detailed drawings of cells - Provide students with a hemocytometer, and show them how to do a cell count
Post Lesson Notes:	