Cells & Heredity: 6.C.4

3-D Cell (Edible)

Grade Level	6
Sessions	1 – 50 minutes each
Seasonality	N/A
Instructional Mode(s)	Small groups
Team Size	3-6 (teacher discretion)
WPS Benchmarks	06.SC.LS.05 06.SC.LS.07
MA Frameworks	6-8.LS.3 6-8.LS.4 6-8.LS.16
Key Words	plant cell, animal cell, model, organelle

Summary

The students will create 3-dimensional cells out of edible materials. The students will be given materials and a cell type and list of organelles that should represent in their model. The students will use what they have learned about cells, what the cell organelles do, and what they look like to create realistic models.

Learning Objectives

2002 Worcester Public Schools (WPS) Benchmarks for Grade 6

03.SC.LS.05 Compare and contrast plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, cytoplasm, chloroplasts, mitochondria, vacuoles).

03.SC.LC.06 Observe a range of plant and animal cells to identify the cell wall, cell membrane, chloroplasts, vacuoles, nucleus and cytoplasm when present.

03.SC.LC.07 Recognize that within cells, many of the basic functions of organisms (e.g., extracting energy from food and getting rid of waste) are carried out. The way in which cells function is similar in all living organisms.

Additional Learning Objectives

1. 6-8.LS.3 Compare and contrast plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, cytoplasm, chloroplasts, mitochondria, vacuoles).

2. 6-8.LS.4 Recognize that within cells, many of the basic functions of organisms (e.g., extracting energy from food and getting rid of waste) are carried out. The way in which cells function is similar in all living organisms.
3. 6-8.LS.16
4. The students will practice material selection based on specific properties.
5. The students will reinforce what they learned about cells and cell organelles during the previous lesson in this unit.

Required Background Knowledge

The students should be familiar with the different organelles in both plant and animal cells.

Essential Questions

1. What organelles should be close to one another to help them function more effectively?
2. What are some limitations to building a model with the materials you were given?

Introduction / Motivation

** **Prior to this lesson, the teacher should create Jello cups shown in the picture below. The Jello does not have to be colored. Adjust the color with food color while preparing.**

Introduce the idea that 2-D models don't provide as much information as 3-D models. Some examples to introduce this may be plans for building a house, a space shuttle, or a car. Draw a side view of any of the examples and ask the students if they would be able to build these things. It may take some prompting for the students to catch on to

this concept since it requires the students to be able to visual ideas in 3-dimensions (an acquired skill that takes practice).

Procedure

The instructor will:

1. Explain to students that they will be designing and building their own 3-dimensional cell with provided materials.
2. Divide the students into groups.
3. Go over the requirements for each model.
    - The models should be accurate.
    - Groups should have thought out reasons for location and material selected for each organelle.
    - Each organelle in the model should be labeled.
4. Show the students the candy or other materials that will be used for the cell organelles. Ask the students if there is anything else they may need to make it 3-dimensional. Tell them about the Jello that they will be able to suspend the organelles in. They should be given toothpicks to be able to push the materials into the Jello with.
5. Pass out the all materials except for the Jello. Give the class 5 – 15 minutes to discuss how they will represent each organelle.
6. Pass out ***3-D Cell Tips.***
7. Pass out the Jello cups, plates, plastic knifes. Give the students a chance to read over the information. Tell the students that the Jello should be cut in half to put the nucleus in the center and then put back together again.
8. The time limit for designing and assembling the models is up to the teacher. At the end of the lesson the class can circulate to view other models or present their model to the class in a more formal way.

Materials List

Materials per class	Amount	Location
Large container or Knox	1	Grocery Store (Stop & Shop, Shaw's, etc.)

gelatin		
Food coloring (optional)	1	Grocery Store (Stop & Shop, Shaw's, etc.)

Materials per group	Amount	Location
Plastic cup of Jello (Knox)	1	Grocery Store (Stop & Shop, Shaw's, etc.)
Gumballs	1-3	Grocery Store (Stop & Shop, Shaw's, etc.)
Chocolate M&M's	4-6	Grocery Store (Stop & Shop, Shaw's, etc.)
Jelly Beans	4-6	Grocery Store (Stop & Shop, Shaw's, etc.)
Licorice candy	2-3	Grocery Store (Stop & Shop, Shaw's, etc.)
Twizzlers	1-3	Grocery Store (Stop & Shop, Shaw's, etc.)
Toothpicks	8-12	Grocery Store (Stop & Shop, Shaw's, etc.)
Paper	1 sheet	Office Supply Store (Staples, Office Max, etc.)

Vocabulary with Definitions (in alphabetical order)

1. *Cell membrane* – Organelle in animal cells that is the barrier between the cell and the environment. It is a semipermeable membrane; it allows nutrients to enter and waste products to leave the cell.
2. *Cell wall* – Organelle in plant cells that are the outermost layer. This organelle is thick and rigid. It gives plant cells an inflexible structure. It also keeps materials in the cell inside and keeps out unwanted things.
3. *Centriole* – Organelle found in animal cells that is important to cell division.
4. *Chloroplast* – Organelle in plant cells where photosynthesis occurs.
5. *Cytoplasm* – A fluid within plant and animal cells, which surrounds all organelles.
6. *Endoplastic Reticulum (ER)* – Organelle found in both plant and animal cells. It modifies proteins, creates macromolecules, and transports proteins. Proteins modified here are sent to the cell membrane in plant cells or sent to the central vacuole in the plant cells to be excreted.
7. *Golgi Bodies* – A complex organelle in both plant cells and animal cells that is considered to be the "post office" of the cell and also helps in the production of protein. It handles all incoming fat, protein, and other molecules and controls which molecules leave the cell. It works with the ribosomes and endoplasic reticulum to make proteins for the cell.

8. *Mitochondria* – Organelle in plant and animal cells that process sugar and oxygen to produce energy. The mitochondria is also referred to as the "power plant" of the cell.
9. *Nucleus* – Organelle in both plant and animals cells that controls all activities in the cells. It stores chromosomes, which hold DNA. It also creates ribosomes, structures that grow off the nucleus and help generate proteins to be used in the rest of the cell.
10. *Organelle* – Structure within a cell that performs a specific function.
11. *Photosynthesis* – A process in green plants where sunlight, water, and nutrients are turned in to sugars that can be stored and then used as energy.
12. *Ribosomes* – Small structures within both plant cells and animal cells that contains proteins and RNA. These structures act like a platform or template on which the cell's proteins are made.
13. *Semipermeable* - Partially permeable. Allowing passage of certain, especially small, molecules or ions but acting as a barrier to other things.
14. *Vacuole* – Organelle in both plant and animal cells. Vacuoles are small compartments in cells that store food, water, and waste. Animal cells typically have many small vacuoles while plant cells generally have one large vacuole.

Assessment / Evaluation of Students

The instructor may assess the students in any/all of the following manners:

1. Observe the construction of cell model
2. Collect the completed **Plant/Animal Cell Model** worksheets

Lesson Extensions

None

Attachments

1. "**3-D Cell Tips**"
2. "**Plant Cell Model**"
3. "**Animal Cell Model**"

Troubleshooting Tips

None

Safety Issues

None

Additional Resources

None

Key Words

Plant cell, Animal cell, Model, Organelle

3-D Cell Tips

1. Remove the Jello from the plastic cup onto the paper plate. You may need to run the knife around the very outside edge of the Jello to loosen it.

2. Cut the Jello in half as shown in the diagram below and remove the top half. Turn over the top and set it on the plate beside the bottom half.

3. Use the spoon to dig out a hole in the bottom half of the Jello cytoplasm. Just pushing the food pieces into the Jello causes it to crack and come apart, making for a very messy cell. Place the candy that represents the nucleus of the cell in this hole.

4. Using the spoon or toothpicks to make spaces and place the other cell parts into the cell. Parts can be put into both the top and bottom half of the Jello cell.

5. When completed, take the top part of the cell and carefully place it on the bottom. If the cell feels soft, you can put the parts back into the plastic cup, and then turn it over onto the paper plate. Then carefully remove the plastic cup.

Name: _____ Date: _____

Plant Cell Model

1. How many of each organelle does your model contain?

Organelle	# in Model?
Chloroplast	
Cell Wall	
Cell Membrane	
Mitochondria	
Vacuole	
Nucleus	
Ribosomes	
Centriole	
Endoplastic Reticulum	
Golgi Bodies	
Cytoplasm	

2. What material did you choose for the nucleus of the cell? Why?

3. What plant cell organelle determines how green the leaves are?

4. Plants that are darker in color generally need more or less sunlight? Why?

5. If you could make a plant cell model out of any materials in the world, how would you redesign your model? What materials would you use? Why?

Name: _____ Date: _____

Animal Cell Model

1. How many of each organelle does your model contain?

Organelle	# in Model?
Chloroplast	
Cell Wall	
Cell Membrane	
Mitochondria	
Vacuole	
Nucleus	
Ribosomes	
Centriole	
Endoplastic Reticulum	
Golgi Bodies	
Cytoplasm	

2. What material did you choose for the nucleus of the cell? Why?

6. What animal cell organelle determines how much “food” the cell consumes?

7. If you had twice as many ribosomes in your cell, how would it act compared to a regular cell?

8. If you could make a animal cell model out of any materials in the world, how would you redesign your model? What materials would you use? Why?