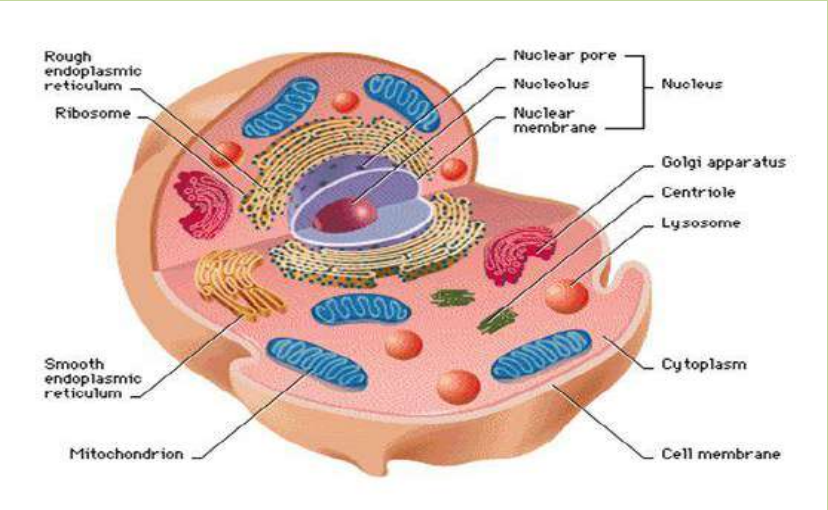
Science Unit 4 Plan
Grade 7

Structure and Function



Number of Days for Unit: 27 days

Unit 4: Structure and Function

NJDOE -Model Curriculum – NGSS

How do cells contribute to the functioning of an organism?

Students demonstrate age appropriate abilities to plan and carry out investigations to develop *evidence* that living organisms are made of cells. Students gather information to support explanations of the relationship between structure and function in cells. They are able to communicate an understanding of cell theory and understand that all organisms are made of cells. Students understand that special structures are responsible for particular functions in organisms. They then are able to use their understanding of cell theory to develop and use physical and conceptual models of cells. The crosscutting concepts of *scale, proportion, and quantity* and *structure and function* provide a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in *planning and carrying out investigations*, *analyzing and interpreting data*, and *developing and using models*, Students are also expected to use these to use these science and engineering practices to demonstrate understanding of the disciplinary core ideas

Student Objectives:

Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. *[Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.]* **(MS-LS1-1)**

Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. *[Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.] [Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.]* **(MS-LS1-2)**

Concepts:

Part A: How will astrobiologists know if they have found life elsewhere in the solar system

- distinguish between living and nonliving things.
- Cells are the smallest unit of life that can be said to be alive.
- All living things are made up of cells, either one cell or many different numbers and types of cells.
- Organisms may consist of one single cell (unicellular).
- Nonliving things can be composed of cells.

- Organisms may consist of many different numbers and types of cells (multicellular).
- Cells that can be observed at one scale may not be observable at another scale.
- Engineering advances have led to important discoveries in the field of cell
- biology, and scientific discoveries have led to the development of entire industries and engineered systems..

Formative Assessment:

Students who understand the concepts are able to:

- Conduct an investigation to produce data that provides evidence distinguishing between living and nonliving things.
- Conduct an investigation to produce data supporting the concept that living things may be made of one cell or many and varied cells.
- Distinguish between living and nonliving things.

Observe different types of cells that can be found in the makeup of living things

Part B: How do the functions of cells support an entire organism?

- The cell functions as a whole system.
- Identify parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.
- Within cells, special structures are responsible for particular functions.
- Within cells, the cell membrane forms the boundary that controls what enters and leaves the cell.
- Complex and microscopic structures and systems in cells can be visualized, modeled, and used to describe how the function of the cell depends on the relationships among its parts.
- Complex natural structures/systems can be analyzed to determine how they function.
- A model can be used to describe the function of a cell as a whole.
- A model can be used to describe how parts of cells contribute to the cell's function.
- The structures of the cell wall and cell membrane are related to their function

Students who understand the concepts are able to:

- Develop and use a model to describe the function of a cell as a whole.
- Develop and use a model to describe how parts of cells contribute to the cell's function.
- Develop and use models to describe the relationship between the structure and function of the cell wall and cell membrane.

NGSS

Performance Expectations:

MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. [Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.]
MS-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. [Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.] [Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.]

Science and Engineering Practices

1. Planning and Carrying Out Investigations Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.
   · Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation.
2. Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
   · Develop and use a model to describe phenomena.

Disciplinary Core Ideas:

LS1.A: Structure and Function
· All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).

LS1.A: Structure and Function
· Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.

Cross Cutting Concepts

Scale, Proportion, and Quantity

- Phenomena that can be observed at one scale may not be observable at another scale.

Structure and Function

- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function.

Connections to Engineering, Technology and Applications of Science Interdependence of Science, Engineering, and Technology

- Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems.

Suggested Formative Assessments:

- Participation in investigation (following the procedures of the lab and scientific drawing) and class discussion
- Journals (observations, claims and evidence, conclusion)
- Lab Report Responses to reading materials
- Notebook Investigation Entries
- Student Observations
- Anecdotal Notes during Performance task
- Homework

Summative Assessments:

Pre-Assessment
Essay Responses
Projects
Post Assessment

Discovery Education Tech Book Unit Overview

Part 1. Cell Theory

Teachers begin each part of the unit by **engaging** students in a phenomenon/anchoring event. The anchoring event is a specific event in which students observe and provide their explanation of the event. More information about anchoring events can be found here: goo.gl/ULVptn As students learn about forces and motion they will take their

learning and connect it back to their original explanation of the anchoring event. Groups are an effective method for working with explanatory models. More information about them can be found here: http://ambitiousscienceteaching.org/tools-face-to-face/#Smallgroup

After presenting students with the event, students will **explore** Cell Theory through reading core interactive text, inquiry based investigations, and videos. Listed below are high leverage resources teachers can use. Paired with the resources are links to instructional strategies that would be effective for implementation. Teachers are encouraged to have students work in a guided inquiry style lesson, but if students need additional structure the teacher should provide that

Additional detailed instructional ideas can be found at:
Part 1: https://app.discoveryeducation.com/learn/techbook/units/3391ad2d-bceb-45dc-a68b-8fd21ab33671/concepts/347de6c1-d9af-44b6-8286-e5a02996035b/lesson/overviewand
Part 2. https://app.discoveryeducation.com/learn/techbook/units/3391ad2d-bceb-45dc-a68b-8fd21ab33671/concepts/3fe1d99f-ade7-41b8-8232-49f21459f633/lesson/overview

This "model lessons" should not be implemented as is, but can be a valuable resource for teachers looking for strategies and suggestions as they craft their plan. The class should keep a summary table for all learning experiences. More on summary tables with samples can be found at: http://ambitiousscienceteaching.org/tools-face-to-face/#Summtable

Students will provide scientific **explanation** using their conceptual understandings of Cell Theory to explain phenomena through daily documentation. Students should regularly revisit and revise their original explanations around the phenomena. Strategies for working on and improving scientific explanations can be found here: http://ambitiousscienceteaching.org/tools-face-to-face/#Sticky

Students will finalize their scientific explanations of the anchoring event. They should use a teacher created rubric to evaluate their explanation and include evidence to support their claim. The rubric listed in the explain tab of Discovery Education is a starting point for the rubric, and could be used, but the teacher may want to add specific details related to force and motion. Student's original and revised explanations serve as formative assessments measuring progress, while the final explanation should be the summative assessment. Students could submit this as an essay, a digital media project, or some other representation that allows them to communicate their claim, evidence,

and reasoning. https://app.discoveryeducation.com/learn/techbook/units/3391ad2d-bceb-45dc-a68b-8fd21ab33671/concepts/347de6c1-d9af-44b6-8286-e5a02996035b/tabs/0df56444-5400-41eb-a6ce-de52b7efb950

**What students should understand: (To be shown in their final products)- comes from the evidence statement*

Key Vocabulary

Part 1

organ, osmosis, cell theory, virus, analyze, mitochondria, cytosol, prokaryote, cell, membrane, vacuole, energy transfer, cell division, asexual reproduction, model, theory, multicellular, microscope, cellular differentiation, neuron, biotechnology,organism, organelle, chromosome, tissue, structure, hypothesis, evidence, gene, cytoplasm, characteristic, cell, chloroplast, experiment, fair test, eukaryotic, parasite, cell wall, cell nucleus, DNA, data

Part 2

cell, chloroplast, tissue, organ, mitochondria, prokaryote, organism,eukaryotic, protist, cell membrane, chlorophyll , cytoplasm, cell wall, system, cell nucleus, vacuole, organelle, multicellular

Discovery Education Tech Book - Connection

Course:
Grade 6-8 Life Science NGSS
From Cells to Organ Systems

Unit:
Cells

Concepts:
Cell Theory
Structure of Life

High Leverage Learning Experience Materials

Part 1 Cell Theory

ENGAGE

Session 1 ***Introduction of Anchoring Event/Engage/Opening:***

During the engage session(s), events are used to capture students interest. During this time, you should uncover what students know and think about the topic as well as determine their misconceptions. Engagement activities might include video segments, a reading, a demonstration, or other activity that piques students' curiosity

Activate Prior Knowledge
The teacher will engage students in an anchoring event (relevant experience/phenomena) that relates to the topic of forces and motion. Several suggestions are listed below. For students to create an explanation of the phenomena they will need to learn about several topics over several days. Day one is the presentation of the topic and student's initial explanations. Working in small groups students should create a visual explanation of the anchoring event. **[SEP 1, 2, 6, 7, 8]**

Recommended Resources for Anchoring Events:

- Show student the image of a red blood cell to prompt a discussion. Ask students to think about the following questions:
- How big are they?
- How many do you think are in the human body?
- If you looked inside a cell, what do you think you would find?

Elicit students thinking. Use questioning practices and avoid providing any details or information for the students. The goal of the activity is for students to develop and share their current thinking. Image Link: https://app.discoveryeducation.com/player/view/assetguid/e15a5daf-96ef-4e19-8bf6-a20c0849671a

Stimulate Interest (possible Anchoring Event)

- Assign students to small groups and give each group a slice of fresh bread, a slice of moldy bread in a sealed plastic bag, and a magnifying glass. Ask students to write down their observations of the two slices of bread. Ask them to point out how the two slices differ from each other. As the students examine the bread, point to the mold and ask them what they think it is (most students will probably be able to correctly identify the substance as mold). Finally, ask students the following questions:

  1. Do you think the mold is alive?
  2. What do you think the mold is made of?
  3. Where did the mold on the bread come from?
  4. Do the slices of fresh bread have mold on them, too?
  5. Will the fresh bread eventually become moldy? Why or why not?

Teacher Notes:
The moldy bread is distributed in sealed bags to avoid issues with mold allergies. Caution students to leave the bags

sealed. (Be sure to prepare ahead of time.)

Post the Lesson Questions for this concept:

- Why are cells important?
- How are new cells formed?
- How do cells in single-celled and multicellular organisms differ?
- What are the main characteristics of cells?

EXPLORE

Sessions 2-6

Students will develop their current understanding of Cell Theory and its fundamental concepts, generate new ideas and begin developing their own questions. Students should document thinking, understandings and questions. Students should revisit and revise their original explanation regularly. In the **EXPLORATION** stage, students get directly involved with the scientific phenomena surrounding the motion of objects during collisions. As they work together in teams, students build a set of common experiences which prompts sharing and communicating. The teacher acts as a facilitator, providing materials and guiding the students' focus. The students' inquiry process drives the instruction during. Students are actively learning through inquiry-based science instruction and engineering challenges. Emphasis is placed on: Questioning, Data Analysis and Critical Thinking. Through self-designed and guided exploration students make hypotheses, test their own predictions, and draw their own conclusions. Using the anchoring event as a frame, they gather explore concepts and information necessary to design a solution to protect an object in a collision. Students work on an Assignment in which they analyze and graph the growth of a bacteria culture and develop a mathematical equation to describe it.

The Teacher should begin with Hands-on-Activities and then have the students use the resources listed to create learning experiences. Listed are some effective integration strategies for digital media and text that you may consider using. The performance expectation requires students to use resources to conduct research and gather evidence. ***The students should summarize their evidence after each learning experience, relate it back to the anchoring event, and add details to their explanation.***

Formative Assessment: Students will demonstrate understanding of cell theory by listing examples evidence from the video segments and reading passages and Hands-on-Activities.

Exploratory Resources:

Hands on Activities
Students will conduct Hands-On Investigations while documenting their work in their science notebooks and completing the student lab reports.

Mentally Modeling the Cell
https://app.discoveryeducation.com/player/view/assetguid/6d83c6a6-bade-43cc-b472-fd4a5c8b3fbf

Design and Create a Terrarium
https://app.discoveryeducation.com/player/view/assetguid/622ec011-5485-4570-9352-ca66594e4ffd

Video and Video Segments

Students investigate the Lesson Questions using video segments and other resources to gather and cite evidence. The Scientific Explanation is used as a model for evidence collection and citations.
Growing Skin Cells
https://app.discoveryeducation.com/learn/videos/32dcbc7a-1517-40b5-b254-424cbfe09271?hasLocalHost=false

Cell Theory
https://app.discoveryeducation.com/learn/videos/1c94c2b8-8407-4bd5-96bf-1b6682c309ad?hasLocalHost=false

Brief History of Cells
https://app.discoveryeducation.com/learn/videos/0f349698-abef-46b6-bc7c-5e2162505768?hasLocalHost=false

The Characteristic of Cells
https://app.discoveryeducation.com/learn/videos/b6be420e-0223-4a09-9dfd-f0574cdbae51?hasLocalHost=false

The Evolution of Complex Organisms
https://app.discoveryeducation.com/learn/videos/ec8d1e26-14d8-41ce-8002-5c5a549954b6?hasLocalHost=false

Bones Grown in Lab Could Be Used to Repair Badly Damaged Limbs
https://app.discoveryeducation.com/learn/videos/0b6586fe-fb18-4973-a33f-e5bcfe29c614?hasLocalHost=false

Transgenic Plants: Positives and Negatives
https://app.discoveryeducation.com/learn/videos/fd01405e-823a-49cd-a66a-3b83737e94a7?hasLocalHost=false

Delivering Targeted Chemotherapy
https://app.discoveryeducation.com/learn/videos/90cf81c6-1530-4a40-aa52-f3b2bc79dfa5?hasLocalHost=false

Body Organization
https://app.discoveryeducation.com/learn/videos/658e9b0c-0e29-4ba2-9dcf-40670e289648?hasLocalHost=false

Cells: Structures and Function
https://app.discoveryeducation.com/learn/videos/bcb66b9f-f68d-4c88-b108-f4b0a5e9b95e?hasLocalHost=false

Core Interactive Text:

Students will read the core interactive text using one of the literacy strategies below, or a strategy that the teach selects that is effective for their students. As students read they should cite evidence that will help them explain the motion during the rear end collision. Students should note the source of their evidence.
As a class, they students should summarize their learning and add evidence to their summary table.

Discovery of Cells and Cell Theory
https://app.discoveryeducation.com/player/view/assetguid/f36fa6df-e53b-4bf6-ba08-336e18bedf46

Safety during Investigations
https://app.discoveryeducation.com/player/view/assetguid/818dd61a-24ef-4d6b-81fb-3b83030a3015

Practicing Conservation during Scientific Investigations
https://app.discoveryeducation.com/player/view/assetguid/d1ffb468-c6b5-4a98-b80e-478e428b91ae

Discovery of Cells and Cell Theory (Spanish Version)
https://app.discoveryeducation.com/player/view/assetguid/de2c6693-bd02-4aba-81cb-48b1a0873e4e

Spigot Science: Cells: Welcome to Cell City
https://app.discoveryeducation.com/player/view/assetguid/993a403d-0706-42c0-9294-deffd749266d

As students read the reading passage, they should create a graphic organizers and record information in the appropriate column. Lead a class discussion instruct students to add to their charts as needed

Teacher Resources:
Literacy Strategies:
Encourage students to create their own notes to summarize the text. They can use the highlight and take notes features of tech-book to fill in notes in their digital notebook.

Think-Aloud:
The teacher can model reading the text, highlighting, and annotating the text with purpose. Talking through their cognitive processes. More about think-a-louds can be found at: http://www.readingrockets.org/strategies/think_alouds

Directed Reading Thinking Activity:
Informational text predicting and reading activity to build comprehension.
http://www.readingrockets.org/strategies/drta

Interactives

Data/Graphing Tool
https://app.discoveryeducation.com/player/view/assetguid/119f2ce2-1314-48ea-ac19-173875184037

Here a Cell, There a Cell
https://app.discoveryeducation.com/player/view/assetguid/3242fb1e-5517-43fc-9e86-b3fbacec41ce
Formative Assessment: At the end of these sessions, have students revisit their explanation (model) and adjust, modify, add to it.

EXPLAIN
Sessions 8-10
In the explain sessions students are provided with opportunities to communicate what they have learned so far and figure out what it means. Students begin to; 1) communicate what they have learned using scientific vocabulary in context, 2) use scientific language which provides motivation for sequencing events into a logical format and 3)

correct and or redirect any misconceptions. Communication occurs between peers, with the facilitator, and through the reflective process. Once students build their own understanding, they help summarize or EXPLAIN their own ideas.

Students observe elodea and amoeba to collect evidence supporting each of the tenets of cell theory. They then complete their Scientific Explanations by answering the Lesson Questions, supported by evidence and reasoning.

Teacher Resources:

Interactive Glossary Activity

- Have each student create a 2-column chart with the key vocabulary terms listed in the first column.
- Tell students that they can use the chart to write definitions of the terms as they learn about them from the resources.
- Encourage students to also take notes on separate paper using the essential questions as a guide.
- Have students complete the Vocabulary Chart for the term.

The additional resources below may help students understand the Lesson Questions "How do cells in single-celled and multi-cellular organisms differ?" and "What are the main characteristics of cells?"

- Core Interactive Text: How Do Cells in Single-Celled and Multicellular Organisms Differ?
- Core Interactive Text: What Are the Main Characteristics of Cells?
- Video Segment: Types of Cells: Human
- Video Segment: Characteristics of Cells
- Video Segment: What Is a Cell?
- Interactive Glossary: animal cell
- Interactive Glossary: plant cell
- Interactive Glossary: multicellular
- Interactive Glossary: cell nucleus
- Interactive Glossary: organelle
- Interactive Glossary: cell membrane
- Interactive Glossary: cytoplasm
- Interactive Glossary: cell wall
- Interactive Glossary: chloroplast
- Interactive Glossary: mitochondria

- Interactive Glossary: vacuole
- Interactive Glossary: tissue
- Interactive Glossary: organ
- Interactive Glossary: DNA
- Interactive Glossary: chromosome

Explaining Cell Theory
https://app.discoveryeducation.com/learn/techbook/units/3391ad2d-bceb-45dc-a68b-8fd21ab33671/concepts/347de6c1-d9af-44b6-8286-e5a02996035b/tabs/0df56444-5400-41eb-a6ce-de52b7efb950

Cell Theory Assignment
https://tools.discoveryeducation.com/assignment/viewAssignment.cfm?guidAssetId=59164AEF-AC3D-4DCC-8751-16D586F9ACB0&&blnPopup=1&strEditCopy=Copy&blnPlayer=1

Assignment 2 Cell Theory-Cell Division
Review the directions for the Assignment with the students to make sure they understand what the data is showing and what they are supposed to do. Instruct them to answer the lesson questions. Allow students time to construct their graphs and answer the questions, providing assistance when needed. Call on students to share their graphs and answers to the questions with the class. Instruct students to cite evidence as they add newly acquired information to their Scientific Explanation.

Formative Assessment: At the end of these sessions, have students revisit their explanation (model) and adjust, modify, add to it.

ELABORATE
Sessions 11-13
Students engage in elaboration activities which will help them correct any remaining misconceptions and generalize concepts in a broader context. These activities will challenge students to apply, extend, or elaborate upon concepts and skills in a new situation, resulting in deeper understanding.

The focus of this section of the lesson is to have students create connections between their observations and research

and the outside world.

Teacher Resources:

Optional Projects 1
Cell Theory Time Line
https://app.discoveryeducation.com/learn/techbook/units/3391ad2d-bceb-45dc-a68b-8fd21ab33671/concepts/347de6c1-d9af-44b6-8286-e5a02996035b/tabs/054d49d8-d8f5-4203-b276-19e25b56cc5f/pages/50994EE3-D24F-4F01-A6D7-6B34E18297E7

Optional Projects 2
Specialized Cell in Humans
https://app.discoveryeducation.com/learn/techbook/units/3391ad2d-bceb-45dc-a68b-8fd21ab33671/concepts/347de6c1-d9af-44b6-8286-e5a02996035b/tabs/054d49d8-d8f5-4203-b276-19e25b56cc5f/pages/5FA58466-FCF6-4865-81F7-6FE2001673F7

Optional Projects 3
Stem Cell and Controversies
https://app.discoveryeducation.com/learn/techbook/units/3391ad2d-bceb-45dc-a68b-8fd21ab33671/concepts/347de6c1-d9af-44b6-8286-e5a02996035b/tabs/054d49d8-d8f5-4203-b276-19e25b56cc5f/pages/B8CB572B-C5D7-4FC0-B272-69E11FFAD643

Evaluate

Sessions 14-15

Students understanding of concepts and their proficiency with various skills will be evaluated during this session. A variety of formal and informal procedures to assess conceptual understanding and progress toward learning outcomes will be used. The evaluation session also provides an opportunity for students to test their own understanding and skills.

Summative Assessments

1. Review Sheet: Students may review the information in previous sessions.

- Using the Brief Constructed Response (BCR), students will be assessed on their ability to:
https://app.discoveryeducation.com/core:assessment/science?assessmentGuid=c9ed9160-1a47-45c0-acd5-cf5d860fd8e8&conceptGuid=347de6c1-d9af-44b6-8286-e5a02996035b
- Explain that cells are the basic unit of living things.
- Explain that all organisms are made of one or more cells.
- Explain that all cells come from existing cells.

- You may also wish to assign the online concept assessment and use the results in the student's reports to guide you in assigning remediation to students if needed.

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Part 2 Structure of Life

ENGAGE
Session 16

During this engage session, students will activate prior knowledge about Structures of Life by participating in an in-class demonstration. They will also watch a video segment which will stimulate interest. During this time, you should uncover what students know and think about the topic as well as determine their misconceptions.

Activate Prior Knowledge

- Have students pinch the back of their hands and watch closely as the observe the skin quickly resume its former shape. Students will fell a gentle twinge. Inform them that behind such a simple action are many complex functions, most of which they are unaware of most of the time. Ask students to think about

1. How did a message go from this instruction to your brain, and
2. how did your brain send a message to your hand?
3. How did you feel the pinch, and why did your skin revert to its previous shape?

Stimulate Interest

- Have students watch the video segment: Brief History of Cells:

https://google.discoveryeducation.com/learn/techbook/units/3391ad2d-bceb-45dc-a68b-8fd21ab33671/concepts/3fe1d99f-ade7-41b8-8232-49f21459f633/tabs/5a1b6f8b-c6bf-4208-87dd-7b3b66692147 Have students use the Web/Concept Map Graphic Organizer https://app.discoveryeducation.com/player/view/assetGuid/33504938-2872-4353-91D4-D05DE9DC3B88. to answer the guided question How are forces related to the motion of objects?

- After students have viewed the video segment and recorded their ideas, place them in pairs to discuss their thoughts about forces and motion. Finally, post the lesson questions that constitute what students will be learning. Students may read them or you may wish to read them aloud together.
  1. What are cells and why are they important?
  2. What structures do most cells have in common?
  3. How do animal cells and plant cells differ?
  4. How do cells in unicellular and multicellular organisms differ?

- Tell students that they will be using microscopes to view different types of cells. Have students fill out the "K" and "W" columns of a KWL-Chart. Have students discuss as a class what they already know about cells and record these responses on a class chart to be used throughout the lesson.

- Show student the video segment to review proper microscope use. Demonstrate how to properly prepare slides of onions and cheek cells. Have students look at both slides on low and high power, sketching what they see with as much detail as possible. Have students write down, in their own words, descriptions of the structures they can see. revisit the class chart and make any necessary revisions together as a class, then set it aside to periodically revisit throughout the lesson at the beginning or end of class.

Video Segments:

Using Specimen Slides with a Microscope : Thin specimen slides are professionally prepared. This segment discusses the proper way of using a microscope. Brightfield illumination puts an object against a light background, whereas darkfield illumination puts an object against a dark background.3.21

EXPLORE
Sessions 17-19

Students will examine the structure of different types of cells and how they relate to the functions of those cells. Students will learn the differences between plant and animal cells as well as the difference between the cells that make up multicellular organisms and those that make up unicellular organisms. Continually challenge the students to recognize how each structural feature and difference is important to the function of those cells. Students will generate new ideas and begin developing their own questions. Students should document thinking, understandings and questions. Students should revisit and revise their original explanation regularly. As they work together in teams, students build a set of common experiences which prompts sharing and communicating. The teacher acts as a facilitator, providing materials and guiding the students' focus. The students' inquiry process drives the instruction during. Students are actively learning through inquiry-based science instruction and engineering challenges. Emphasis is placed on: Questioning, Data Analysis and Critical Thinking. Through self-designed and guided exploration students make hypotheses, test their own predictions, and draw their own conclusions.

Hands- On Activities

Students will conduct Hands-On Investigations while documenting their work in their science notebooks and completing the student lab reports. Teacher will encourage students to share their ideas

Cell Size
https://app.discoveryeducation.com/player/view/assetGuid/3160FD66-DF70-44A1-9D43-D11A2A1F5893
Students will look at the size of cells and how it relates to their volume and surface area. This may give some clues as to why they need a microscope to look at most cells. Students will compare the volume and surface area of model cells of different sizes.

Hands-On Activity: Looking at Tissues
https://app.discoveryeducation.com/player/view/assetGuid/C937F7C8-3DEF-4FFD-912F-6D99B9B39C2B
In this activity, students will use a microscope to analyze tissue samples.

Core Interactive Text. Students should complete a learning task which asks them read the text, respond to imbedded questions, interact with the embedded media, and summarize their learning.

"What Are Cells and Why Are They Important?"
https://app.discoveryeducation.com/learn/techbook/units/3391AD2D-BCEB-45DC-A68B-8FD21AB33671/concepts/3FE1D99F-ADE7-41B8-8232-49F21459F633/tabs/759DA9A7-2EDF-4CDE-9515-7081CA990764?assetGuid=09ced2fa-f53f-48ab-8efd-7da8ed499bca

"How Do Animal Cells and Plant Cells Differ?"

"How Do Cells in Unicellular and Multicellular Organisms Differ?"

As they read have students cite evidence about cells. This evidence should include reference to their:

- importance to living organisms
- cellular structures and functions
- differences between plant and animal cells
- differences between unicellular and multicellular organisms

Video Segments

This video segment Cell Theory goes on to explain how the three part cell theory was developed as scientists learned more and more about the composition of living things. All living things are made of cells; cells are the basic units of living things, and cell only come from other living cells. Tell students that the idea that all living things are made of cells is one part of what scientists refer to as the Cell Theory, which has three parts.

Have students use the Web/Concept Map to create a web with the term "Cell Theory" at the center and add the three parts of the cell theory as they watch the video segment Cell Theory. After the video, briefly discuss the three parts of the Cell Theory with the class. Check for understanding.

This video segment What Are Prokaryotic and Eukaryotic Cells? Explains that Prokaryotic cells lack internal membranes. Eubacteria and archaebacteria are prokaryotes. Eukaryotic cells contain membrane-bound structures like organelles. Most multicellular animals and plants are eukaryotes.

This video segment An Introduction to Cells explains that all living things, from whales, to amoebas, to flowers, are made of cells. After the video segment, ask students which types of organisms were shown in the segment and what they have in common.

In the interactive video Characteristics of Cells which explains the parts of the cells including the consideration of Charles Darwin's theories of natural selection and adaptation.

Reading passages:
Assign students to read these reading passages;

The Microscope: The Tool of Modern Biology which explains that microscopes have allowed biologists to study cells and to identify the different parts that make up cells.
Have students to complete the reading passage "The Microscope: The Tool of Modern Biology" and take notes as they read. Students should focus on these three questions:

1. Which structures are found in cells?
2. What are the functions of these structures?
3. What are the two different types of cells and how do they differ?

Once students have completed the reading passage, facilitate a discussion around their responses.

Are They Plants or Animals? explains that by studying the structure of coral cells, scientists were able to classify coral as animals.
Have students to complete the reading passage "Are They Plants or Animals?"

- After students have finished, tell them to complete a Venn Diagram comparing plant and animal cells to each other.

Many Layers of Multicellular Life explains that the most basic structure in a living organism is a cell. Both plant and animal cells contain tiny structures called organelles that perform specific functions for the cell. Once students have finished the reading, have them discuss the role cells play in multicellular organisms.

1. As they read, students should take notes.
2. Tell students that, as they read, they should assess whether the reasoning is sound and the evidence presented is relevant and sufficient to support the claims.
3. Have a class discussion in which students share the new information that they gained from the article. Include a discussion of the evidence presented in the article.

EXPLAIN
Sessions 20-21

In the explain sessions students are provided with opportunities to communicate what they have learned so far and figure out what it means. Students begin to; 1) communicate what they have learned using scientific vocabulary in context, 2) use scientific language which provides motivation for sequencing events into a logical format and 3) correct and or redirect any misconceptions. Communication occurs between peers, with the facilitator, and through

the reflective process. Once students build their own understanding, they help summarize or EXPLAIN their own ideas

- Have students use the evidence that they collected in the Explore sessions to complete the Scientific Explanation Student Sheet (sections "Claim" and "Explanation"). Scientific Explanation Middle. Have groups of 2-4 students share their explanation with each other and then revise or enhance their explanations based on group discussion. Bring the class together and have individual students summarize their thoughts around the question, "Which structures distinguish cells in multicellular plants and animals from those of unicellular organisms, and why are cells important for identifying organs and their functions"? Use these summaries to develop a class consensus on the answers to the Lesson Questions. Have students complete page 1 ("Key Question" section) of the Scientific Explanation.

Teacher Resources:

Graphic Organizer

4. Venn Diagram
5. KWL Chart
6. Comparison Chart
7. Vocabulary Chart
8. Web/Concept Map

- Techbook Unit
  1. Genetic Traits and Reproduction

- Glossary Term
  1. chloroplast
  2. cell nucleus
  3. cell
  4. vacuole
  5. cell membrane
  6. cell wall
  7. cytoplasm
  8. organelle

Three-Dimensional Learning in Focus

During the Scientific Explanation students draw on the evidence that they collected during Explore and create a Scientific Explanation about cells, their importance to living organisms, cellular structures and functions, differences between plant and animal cells, and differences between unicellular and multicellular organisms.

Students analyze their evidence, make a claim about the evidence, and tie their evidence to their claim using logical reasoning. When students complete the writing of their Scientific Explanation, they share them, critique others', and refine their own as needed (MS-LS1-1, LS1.A Structure and Function, Scale, Proportion, and Quantity, and WHST.6-8.7).

ELABORATE
Session 22

Students engage in elaboration activities which will help them correct any remaining misconceptions and generalize concepts in a broader context. These activities will challenge students to apply, extend, or elaborate upon concepts and skills in a new situation, resulting in deeper understanding.

The focus of this section of the lesson is to have students create connections between their observations and research and the outside world.

Video Segments

Single-Celled Organisms
FDA Approves Stem Cell Research
Organization of an Ecosystem
The Structure of Multicellular Organisms
Cell Parts in Plants and Animals

Personalizing Cancer Treatment

https://app.discoveryeducation.com/learn/techbook/units/3391ad2d-bceb-45dc-a68b-8fd21ab33671/concepts/3fe1d99f-ade7-41b8-8232-49f21459f633/tabs/054d49d8-d8f5-4203-b276-19e25b56cc5f/pages/a6a92ed2-971c-49ed-8ffc-8e46a3089305

Breakthrough in Early Cancer Detection

https://app.discoveryeducation.com/learn/techbook/units/3391ad2d-bceb-45dc-a68b-8fd21ab33671/concepts/3fe1d99f-ade7-41b8-8232-49f21459f633/tabs/054d49d8-d8f5-4203-b276-19e25b56cc5f

Stem Cell Scientist
https://app.discoveryeducation.com/player/view/assetguid/f0bec9ca-75f9-4c07-8310-d3368801c3e0

Genetics and Cancer Scientist
https://app.discoveryeducation.com/learn/techbook/units/3391ad2d-bceb-45dc-a68b-8fd21ab33671/concepts/3fe1d99f-ade7-41b8-8232-49f21459f633/tabs/054d49d8-d8f5-4203-b276-19e25b56cc5f

Teacher Resources:
Optional Project #1

Discovering Limits to Cell Size

https://app.discoveryeducation.com/learn/techbook/units/3391ad2d-bceb-45dc-a68b-8fd21ab33671/concepts/3fe1d99f-ade7-41b8-8232-49f21459f633/tabs/054d49d8-d8f5-4203-b276-19e25b56cc5f/pages/C3446FD0-8376-4E89-ABBA-84B1459BE9B8

Detecting Cancer in the Future

https://app.discoveryeducation.com/learn/techbook/units/3391ad2d-bceb-45dc-a68b-8fd21ab33671/concepts/3fe1d99f-ade7-41b8-8232-49f21459f633/tabs/054d49d8-d8f5-4203-b276-19e25b56cc5f/pages/7872CAA9-E9AD-44AC-B542-0DC0F99A7EEC

EVALUATE
Session 23
Students understanding of concepts and their proficiency with various skills will be evaluated during this session. A

variety of formal and informal procedures to assess conceptual understanding and progress toward learning outcomes will be used. The evaluation session also provides an opportunity for students to test their own understanding and skills. Students review the lesson questions, answer a constructed response, and create culmination of their learning by completing their KWL chart. Students are also evaluated on the Standards in ELA/Literacy.

Summative Assessments

- Review Sheet: Students may review the information in this section using the The Structure of Life
- Using the Structure of Life (BCR), students will be assessed on MS-LS1-1 by using evidence to explain that living things are made of cells; either one cell or many different numbers and types of cells. Have students complete the Brief Constructed Response Link.
- Have students fill in the "L" column of the KWL Chart to show what they have learned throughout the course of the lesson. Emphasis should be placed on the evidence they have collected to support what they have learned.

Materials: For Common Labs

Part 1: Cell Theory

Hands-On Activity: Cell Theory Evidence

Per group:

- Elodea sp.
- Amoeba sp. (optional)
- 2 beakers (500 mL)
- Dry active yeast
- Dropper
- Forceps
- Magnifying lens
- 3 microscope slides
- 3 cover slips
- Compound microscope
- Scissors

Hands-On Activity: Mentally Modeling the Cell

Per group:

- Large sheet of manila paper
- Felt-tip pens
- Internet access

Part 2: Structure of Life

Hands-On Activity: Cell Size

Per pair: Calculator

Per student: Student Investigation Sheet: Cell Size

Hands-On Activity: Looking at Tissues

Per pair:

- Microscope
- Several prepared slides of various tissues (e.g., muscle cells, blood cells, leaf cells, root cells, nerve cells)
- Colored pencils
- Paper
- Microscope camera (optional)
- Disinfectant wipes
- Dissecting kit
- Dissecting pan
- Paper towels

Per student:

- Gloves
- Lab apron

21st Century Teaching and Student Strategies

- Project Based Learning.
- Ownership and Engagement.
- Collaborative Teaching and Cooperative Learning.
- Citizenship, Leadership, and Personal Responsibility. ...
- Mastery of Curriculum and Higher Order Thinking Skills. ...
- Technology and 21st Century Skills.

Special Ed. and ELL Strategies and Resources

Special Education

In the Techbook, complex content is presented using supportive hyperlinks to definitions of key vocabulary and concepts. The Interactive Glossary provides a multimodal, scaffolded experience that enables students with a variety of learning styles/strengths to access grade level content. An inquiry approach using the 5E instructional model (Engage, Explore, Explain, Elaborate, and Evaluate) is an important tool for helping students to understand the scientific process and develop critical thinking skills. In many cases, the skills needed for successful inquiry will require additional support for students with learning disabilities.

Strategies or Tips

- Utilize Assignment Builder to provide a directed inquiry approach for specific students in which they are provided with a detailed procedure or specific set of questions to answer as they proceed to exploration.
- Provide graphic organizers such as spider maps, tables, or cause–and effect charts as appropriate to guide students in note-taking as they explore resources. Model for students how to take notes while watching a video or working through a reading passage. Show students how they can stop, start, and repeat a video clip so they can view materials as many times as necessary or stop to take notes. Allow students to explore the different buttons and links in an interactive or Virtual Lab for several minutes before actually starting the activity. Set a stopwatch or timer and tell students they have x minutes to click through the activity before they actually begin.
- Provide a Main Ideas and Details graphic organizer for students to use to summarize all of their notes. Model for students how to find the overall main ideas by looking for concepts that repeat in their notes (i.e., concepts covered in multiple resources). Take full advantage of the online medium by allowing students to rewatch videos, re-read passages, or redo activities multiple times. The variety of multimodal Discovery Education resources available makes it possible for students who learn differently to approach the content in the ways they learn best. Provide sentence starters and frames to support students in describing what they learned.
- Add linking questions to student worksheets to fill in more tightly any potential logic gaps. Linking questions should lead students through each thought process required, tying one idea directly to another. Allow students to choose from the various project ideas in order to better suit their learning styles.
- Allow students to type reports or answers to questions rather than writing them out. Allow students to use sketches and diagrams to explain their thinking. Allow students to collaborate with peers on Brief Constructed Responses (BCRs), either discussing their ideas beforehand or writing responses in pairs or small groups. Provide sentence starters, sentence frames, and word banks to support students in demonstrating what they have learned.

ELL's

General Strategies for Supporting ELLs in the Classroom Given the ever-increasing number of English Language Learners in

general education, it is in the best interest of school personnel to be aware of ways to support and help students at any English acquisition level. Self-contained classroom teachers as well as content teachers can use these tips to engage and invest ELLs.

- - Do not assume background knowledge or experience.
- - Do not assume accessibility to resources outside of school.
- - Be aware of and respectful of cultural behaviors and restrictions.
- - Teach vocabulary through direct instruction.
- - Connect vocabulary to the curriculum.
- - Provide context-based experiences.
- - Access students' prior knowledge, allowing use of L1.
- - Tie curriculum to students' life experiences.
- - Tie new objectives to past lessons, allowing use of L1.
- - Engage in conversational as well as instructional language.
- - Integrate reading and writing early on.
- - Model correct language.
- - Expand student responses.
- - Use multicultural materials.
- - Identify objectives appropriate to each student's current knowledge base.
- - Familiarize students with the writing process.

For Beginners:

- Use visual aids, especially the "real thing" (realia).
- Model the process and outcome.
- Enunciate clearly; speak slowly in short sentences, in the active voice (not "The trees were consumed by the fire that raged through the forest," but "The fire burned down all the trees.")
- Repeat and restate. Use facial expressions and body language.
- Allow students to demonstrate learning non-verbally.
- Front-load, post/provide, and demonstrate key vocabulary.
- Avoid idioms, colloquialisms, word play, jokes, and words with multiple meanings.
- Ask questions with single word answers, and repeat the answers in short sentences.
- Use cloze exercises.
- Pair students with English speaking partners.
- Reduce workload, especially research and home-based projects.

Intermediates:

- Use visuals (photos, objects).

- Model procedures and products.
- Frontload and reinforce content vocabulary.
- Maintain a posted list of specific science vocabulary.
- Give clear, explicit directions in short sentences.
- Provide assignments commensurate with ELL productive language skills.
- Offer students answer choices and/or provide verbal cueing – say the sentence frame(s) for the answer(s) or start the answer sentence. For example, “What is at the center of an atom? Is it a proton or a nucleus?” or “What is at the center of an atom?
- The center of an atom….” Allow reduced workload/output, extra time, and/or differentiated product.
- Allow English-speaking partners as needed. Provide multisensory input with closed captions and audio text, as in the Techbook.