Unit 1- Cells, Structure, & Function (Life Science)

Content Area: **Science**
Course(s): **Science 8 Honors**
Time Period:
Length: **45 Days & Grade 8**
Status: **Published**

Unit 1

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Science Honors, Grade 8

Unit 1: Cells, Structure, & Function

Belleville Board of Education

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Unit Overview

Unit 1: Cells, Structure, Function

- Molecules to organisms
- Structures and processes
- Cell Theory
- Cell Structure and function
- Cell cycle
- Information processing
- Levels of Organization
- Animal behaviors/stimuli
- Body systems

Cells - Module B Lesson 1

- Characteristics of cells
- Cell Structures and Functions

Organisms as Systems - Module B Lesson 2

- Levels of Organization in Organism
- Plant Bodies as Systems
- Animal Bodies as Systems
- Information Processing in Animals

Students should expect to learn:

- Compare and Contrast Prokaryotic and Eukaryotic cells and structures

- Cell theory
- Plant cell vs. animal cell
- Cell models
- Organs and organ systems
- Transport of waste and nutrients in organisms
- Photosynthesis/cellular respiration
- Levels of organization in living things
- Environmental factors that affect plants
- Information processing and animal behaviors
- Cause and effect relationship between environmental stimuli and behavior or memory in animals
- Unicellular vs. multicellular organisms
- Bacteria shapes and classification
- Beneficial and harmful bacteria
- Compare and contrast cells and viruses

Classification

- taxonomy
- Classification

Enduring Understanding

- The cell is the most basic unit of life
- Our body's systems are interrelated and rely upon one another to function and reproduce.
- Matter is either a substance (element or compound) or a mixture.
- All organisms are composed of cell(s), with specialized structures and processes.
- Food is broken down to provide energy for needed materials for the cell and organism as a whole.
- Scientific tools enable scientists the opportunity to explore the world around us.
- Living systems, from the organismic to the cellular level, demonstrate the complementary nature of structure and function
- Important levels of organization for structure and function include cells, tissues, organs, organ systems, and organisms
- Living organisms share common distinguishing characteristics: they grow, consume nutrients, exchange gases, respond to stimuli, reproduce, need water, eliminate waste, and are composed of cell(s)
- Living organisms are classified into 7 levels: kingdom, phylum, classes, order, families, genus, and species.
- The organisms are placed into these categories based on common characteristics.

Essential Questions

- How do organisms grow and develop?
- How do organisms get energy to survive?
- How do different scientific tools enhance investigations?

- How do organs, tissues, and organ systems interact with one another to carry out life's functions?
- How are the parts of a system related to the entire system?
- How are organisms structured to ensure efficiency and survival?
- How do scale, proportion and quantity affect what can be observed?
- How are body systems directly dependent on one another?
- What makes members of one species different from members of a different species? From one genus to another genus?

Exit Skills

- State the cell theory
- Distinguish between eukaryotic and prokaryotic cells
- Compare and contrast plant and animal cells
- Explain the statement "form follows function"
- Sequence the levels of organization
- Diagram virus replication
- Identify inorganic and organic compounds necessary for life
- Explain how cells get energy from photosynthesis, respiration and fermentation
- Compare and contrast Mitosis and meiosis
- Describe environments where bacteria live
- Compare and contrast aerobic vs. anaerobic bacteria
- Evaluate role of bacteria in human digestion
- investigate beneficial: antibiotic, nitrogen fixation, bioremediation, and food production
- Investigate pathogenic: bacteria that cause harm/disease
- Explain the role of cells in body systems and how those systems work to support the life functions of the organism
- Distinguish between unicellular and multicellular organisms
- Evaluate how the survival needs of plants are met by systems working together
- Explain the cause-and-effect relationship between the information animals gather from the environment and their resulting behaviors
- Gather information and use it support explanations of the structure and function relationship of cells
- Demonstrate basic understanding of the role of cells in body systems and how those systems work to support the life functions of the organism
- Communicate understanding of cells provides a context for the plant process of photosynthesis and the movement of matter and energy needed for the cell
- Construct an explanation for how environmental and genetic factors affect growth of organisms
- Make connections to the role of animal behaviors in reproduction of animals as well as the dependence of some plants on animal behaviors for their reproduction
- Analyze the common characteristics in which the animal kingdom are broken into.

New Jersey Student Learning Standards (NJSLS-S)

NextGen Science Standards

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.
MS-LS1-2	Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function.
MS-LS1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
MS-LS1-4	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
MS-LS1-5	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
MS-LS1-6	Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
MS-LS1-7	Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
MS-LS1-8	Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

Interdisciplinary Connections

LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
LA.WHST.6-8.1.B	Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
LA.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.WHST.6-8.2.D	Use precise language and domain-specific vocabulary to inform about or explain the topic.
LA.WHST.6-8.2.F	Provide a concluding statement or section that follows from and supports the information or explanation presented.
LA.WHST.6-8.6	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
LA.WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.

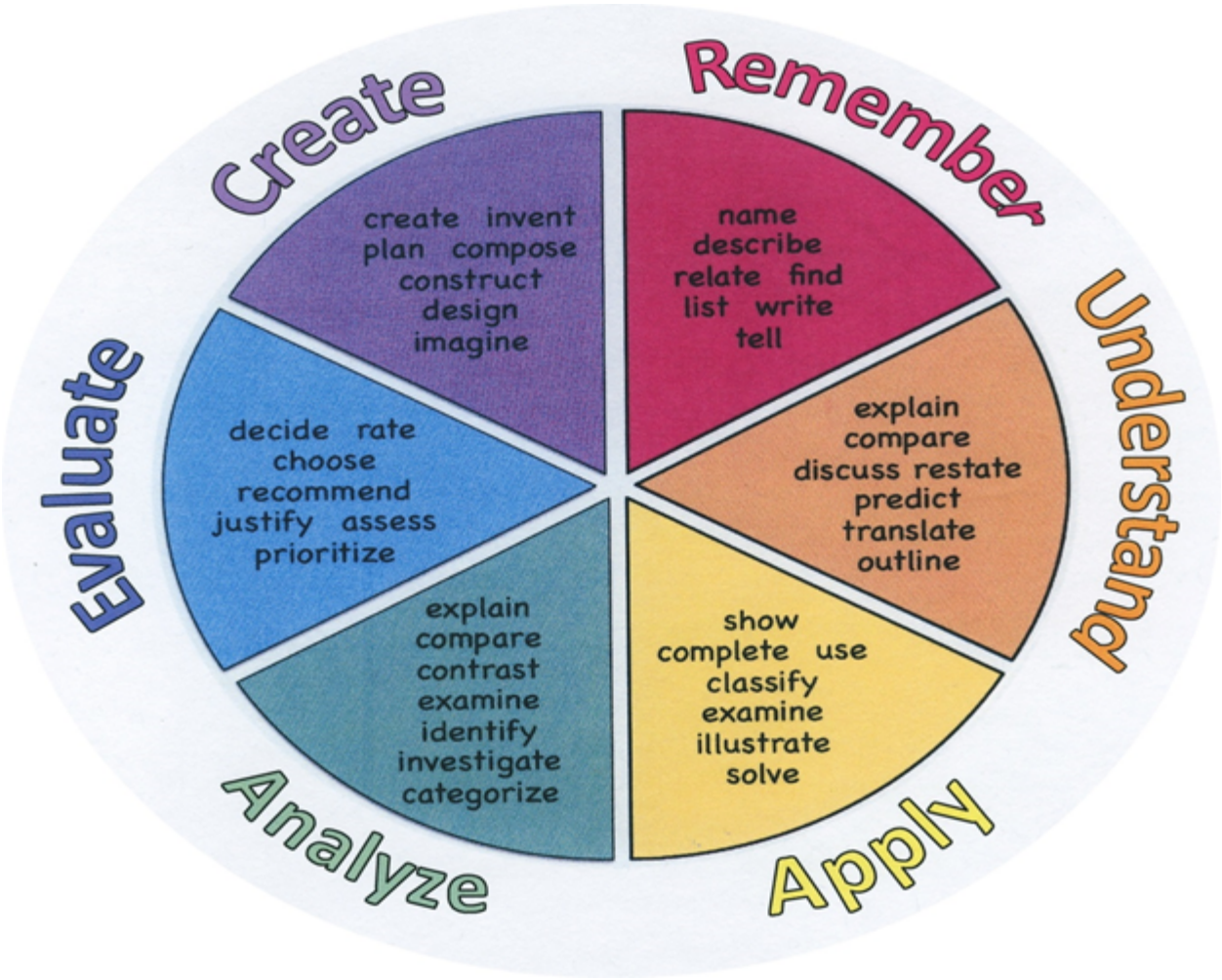
Learning Objectives

Students will be able to:

- create a 3D model of a cell with realistically proportional organelles with accompanying presentation.
- grow bacteria and culture colonies from various surfaces around the school to interpret and gather data.
- independently use their learning of the structures of cells, tissues, organs, and systems to examine an organism and determine how these structures support life.
- correctly use a microscope to identify cells, structures, and diagram different cell types based on their structure related to function.

- classify bacteria based on shape.
- create a virus model of your choice with a presentation.
- observe magnified images of living things in order to support the claim that living ;things are made up of tiny structures called cells
- describe functions of cells as a whole and the ways in which cells parts contribute to cell function
- study models of a variety of organisms to relate structure to function at each level in an organism
- investigate the structure and function of systems in plants/animals and evaluate how the systems meet the needs of plants/animals and respond to the environment
- explain the cause-and-effect relationship between the information animals gather from the environment and their resulting behaviors

Remember	Understand	Apply	Analyze	Evaluate	Create
Choose	Classify	Choose	Categorize	Appraise	Combine
Describe	Defend	Dramatize	Classify	Judge	Compose
Define	Demonstrate	Explain	Compare	Criticize	Construct
Label	Distinguish	Generalize	Differentiate	Defend	Design
List	Explain	Judge	Distinguish	Compare	Develop
Locate	Express	Organize	Identify	Assess	Formulate
Match	Extend	Paint	Infer	Conclude	Hypothesize
Memorize	Give Examples	Prepare	Point out	Contrast	Invent
Name	Illustrate	Produce	Select	Critique	Make
Omit	Indicate	Select	Subdivide	Determine	Originate
Recite	Interrelate	Show	Survey	Grade	Organize
Select	Interpret	Sketch	Arrange	Justify	Plan
State	Infer	Solve	Breakdown	Measure	Produce
Count	Match	Use	Combine	Rank	Role Play
Draw	Paraphrase	Add	Detect	Rate	Drive
Outline	Represent	Calculate	Diagram	Support	Devise
Point	Restate	Change	Discriminate	Test	Generate
Quote	Rewrite	Classify	Illustrate		Integrate
Recall	Select	Complete	Outline		Prescribe
Recognize	Show	Compute	Point out		Propose
Repeat	Summarize	Discover	Separate		Reconstruct
Reproduce	Tell	Divide			Revise
	Translate	Examine			Rewrite
	Associate	Graph			Transform
	Compute	Interpolate			
	Convert	Manipulate			
	Discuss	Modify			
	Estimate	Operate			
	Extrapolate	Subtract			
	Generalize				
	Predict				



Suggested Activities & Best Practices

Creating a 3D representation of a cell with different mediums, i.e. clay, shrinky dink paper, Styrofoam, cardboard, play-doh, etc.

- Within heterogeneous groups, students will design a cell with at least 7 organelles.
- An explanatory card with organelles' function will be attached
- Rubric for expectations and grading

Culturing Bacteria, Fungi & Yeast

- In groups of three, students will weigh out their algar using a triple beam balance
- Then they will prepare their petri dish by microwaving the appropriate water and algar solution
- Finally, after the petri-dish has cooled in the refrigerator overnight, the students will swab various surfaces around the school
- After 4 days, colonies will most likely have formed. Students will identify their colonies and explain their identification based on evidence. i.e. color, texture, edges of growths

Assessment Evidence - Checking for Understanding (CFU)

- Exit ticket: What organelle would serve as the brain of the cell? (Formative)
- Module B Google Assessment Test (Summative)

• Admit Tickets (Formative)

• Compare & Contrast.(Formative)

• Create a Multimedia Poster.(Alternate)

• Define.(Formative)

• Describe.(Formative)

• Evaluate.(Formative)

• Evaluation rubrics.(Alternate)

• Exit Tickets. (Formative)

• Explaining. (Formative)

• Fist- to-Five or Thumb-Ometer. (Formative)

• Illustration. (Formative)

• Kahoot. (Formative)

• KWL Chart. (Formative)

• Question Stems. (Formative)

• Quickwrite.(Formative)

• Quizzes.(Summative)

• Self- assessments. (Alternate)

• Study Guide. (Formative)

• Teacher Observation Checklist. (Alternate)

• Think, Pair, Share. (Formative)

• Unit test. (Summative)

- Admit Tickets
- Anticipation Guide
- Common Benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- DBQ's
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Learning Center Activities
- Multimedia Reports
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit review/Test prep
- Unit tests
- Web-Based Assessments

- Written Reports

Primary Resources & Materials

Textbook and Dimensions supplementary materials

- HMHco workbook and Website
- Brainpop
- Laboratory Materials
- Newsela

Ancillary Resources

- *https://www.cellsalive.com/*
- Outdoor area of school
- Computer carts for research when available

Technology Infusion

https://www.brainpop.com/health/bodysystems/cells/

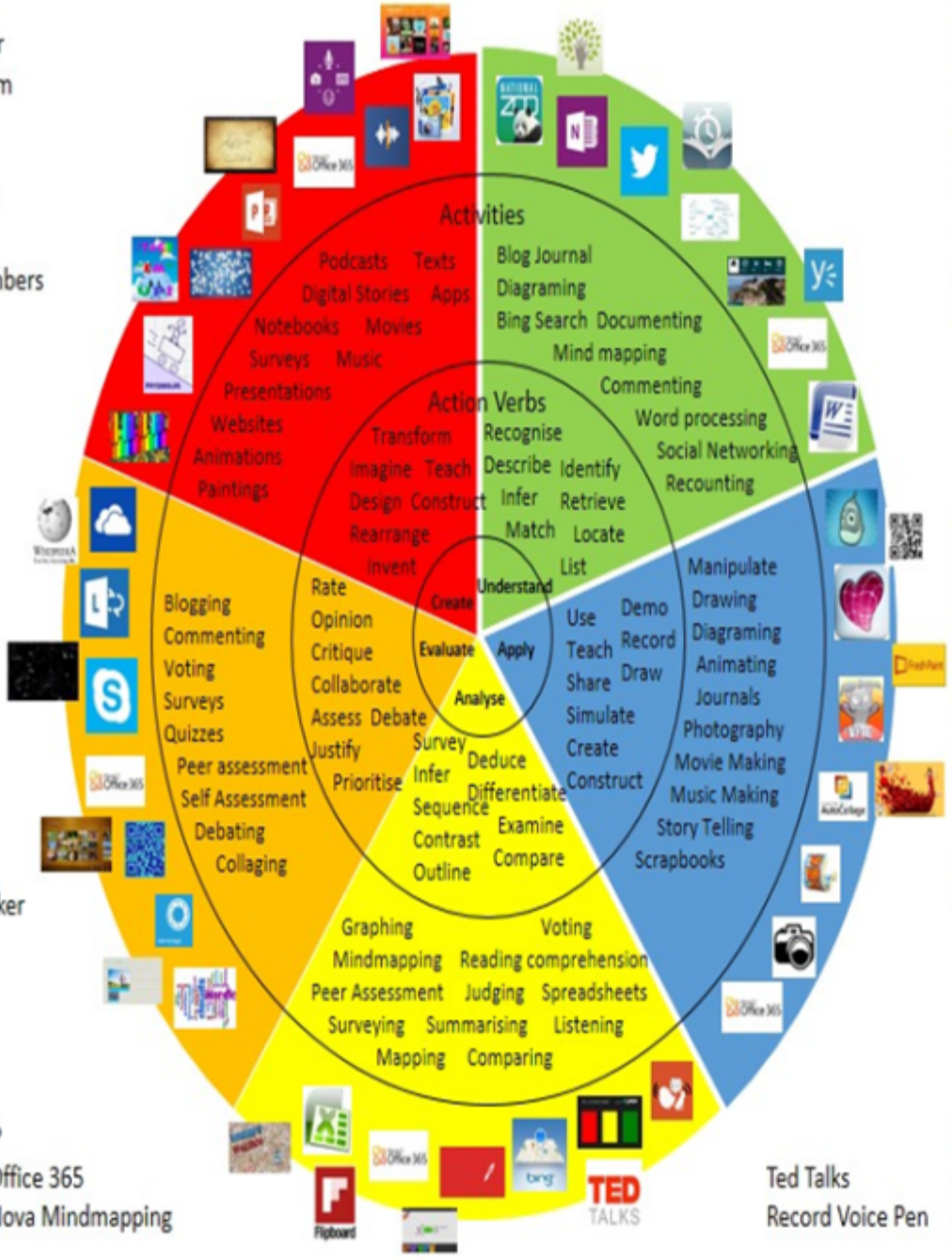
https://create.kahoot.it/share/cells-cells-cells/6c4054e1-ccc5-403f-a9c3-ffeceb7f417d

- Smart board
- www.cellsalive.com
- Document Camera
- Pod-casts video streams
- Discovery Education video streams
- You Tube video streams
- Brain-pop video streams
- Laptops
- Khan Academy
- Power Point presentation
- MS Word

Win 8.1 Apps/Tools Pedagogy Wheel

Podcasts
Photostory 3
Kid Story Builder
Music Maker Jam
Paint A Story
Office 365
MS PowerPoint
Stack 'Em Up
NqSquared Numbers
Physamajig
Xylophone 8

Wikipedia
Skydrive
Lync
SkyMap
Skype
Office 365
Puzzle Touch
Easy QR
Memorylage
Life Moments
Word Cloud Maker



Where's Waldo?
MS Excel Office 365
Flipboard Nova Mindmapping

Ted Talks
Record Voice Pen

Originally taken from http://www.coetail.com/vzimmer/files/2013/02/iPadagogy-Wheel.001.jpg
And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

Alignment to 21st Century Skills & Technology

- English, reading or language arts
- World languages
- Arts
- Mathematics
- Economics
- Science
- Geography
- History
- Government and Civics

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP11	Use technology to enhance productivity.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
CAEP.9.2.8.B.4	Evaluate how traditional and nontraditional careers have evolved regionally, nationally, and globally.
TECH.8.1.8	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.8.A.2	Create a document (e.g., newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.
TECH.8.1.8.A.CS1	Understand and use technology systems.
TECH.8.1.8.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.

21st Century Skills/Interdisciplinary Themes

- Environmental Literacy.
- Financial, Economic, Business and Entrepreneurial Literacy.
- Global Awareness.
- Health Literacy
- Civic Literacy

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

21st Century Skills

- Communication and Collaboration
- Creativity and Innovation
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- ICT (Information, Communications and Technology) Literacy
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- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

Differentiation

- Use a model to describe the function of a cell as a whole and ways parts of the cell of cells contribute to the function.
- Select 3 different microorganisms and put them under the microscope. Students will note the characteristics of different organisms and materials in each sample.

Differentiations:

- Small group instruction
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Study guides
- Teacher reads assessments allowed
- Rephrase written directions
- Multisensory approaches
- Additional time
- Highlight text

Lo-Prep Differentiations

- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Multiple texts
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products

Special Education Learning (IEP's & 504's)

- Use of 3D models to analyze cell organelles
- Use of Brainpop to reinforce cells and their functions https://www.brainpop.com/health/bodysystems/cells/

• printed copy of board work/notes provided

• additional time for skill mastery.

• assistive technology

• behavior management plan.

• Center-Based Instruction

• check work frequently for understanding

• computer or electronic device utilizes

• extended time on tests/ quizzes

• have student repeat directions to check for understanding

• highlighted text visual presentation

• modified assignment format

• modified test content

• modified test format

• modified test length.

• multiple test sessions.

• multi-sensory presentation

• preferential seating

• preview of content, concepts, and vocabulary.

• reduced/shortened reading assignments

• Reduced/shortened written assignments.

• secure attention before giving instruction/directions

• shortened assignments

• student working with an assigned partner.

• teacher initiated weekly assignment sheet.

• Use open book, study guides, test prototype

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length

- multi-sensory presentation
- multiple test sessions
- preferential seating
- preview of content, concepts, and vocabulary
- Provide modifications as dictated in the student's IEP/504 plan
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

English Language Learning (ELL)

- Use of 3D models to analyze cell organelles
- Use of Brainpop to reinforce cells and their functions https://www.brainpop.com/health/bodysystems/cells/

• reducing the number of answer choices on a multiple choice test

• tutoring by peers

• using computer word processing spell check and grammar check features

• using true/false, matching, or fill in the blank tests in lieu of essay teaching key aspects of a topic. Eliminate nonessential information.

• using videos, illustrations, pictures, and drawings to explain or clarify.

• allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning

• allowing students to correct errors (looking for understanding)

• allowing the use of note cards or open-book during testing

• decreasing the amount of work presented or required

• modifying tests to reflect selected objectives

• providing study guides

• reducing or omitting lengthy outside reading assignments

- teaching key aspects of a topic. Eliminate nonessential information
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- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

At Risk

Use of 3D models to analyze cell organelles
Use of Brainpop to reinforce cells and their functions https://www.brainpop.com/health/bodysystems/cells/

- Allowing students to correct errors (looking for understanding).
- teaching key aspects of a topic. Eliminate nonessential information.
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards
- charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing.
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to
- reflect objectives for the student, eliminate sections of the test, and determine how the grade will be
- determined prior to giving the test.
- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments.
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain

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- using videos, illustrations, pictures, and drawings to explain or clarify

Talented and Gifted Learning (T&G)

Creating a 3D representation of a cell with different mediums, i.e. clay, shrinky dink paper, Styrofoam, cardboard, play-doh, etc.

- Within heterogeneous groups, students will design a cell with at least 7 organelles.
- An explanatory card with organelles' function will be attached
- Rubric for expectations and grading

Culturing Bacteria, Fungi & Yeast

- In groups of three, students will weigh out their algar using a triple beam balance
- Then they will prepare their petri dish by microwaving the appropriate water and algar solution
- Finally, after the petri-dish has cooled in the refrigerator overnight, the students will swab various surfaces around the school
- After 4 days, colonies will most likely have formed. Students will identify their colonies and explain their identification based on evidence. i.e. color, texture, edges of growths

- Allowing students to chose their own method of representation, i.e. brochure, poster, powerpoint, youtube video, etc.
- Teaching explorations sections of workbook
- Allowing students to apply concepts to real-life scenarios and how they would be affected
- Higher order, critical & creative thinking skills, and discovery
- Flexible skill grouping within a class or across grade level for rigor
- Cluster grouping
- Project-based learning for greater depth of knowledge
- Utilize exploratory connections
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth

opportunities
- Allow students to work at a faster pace
- Multi-disciplinary unit and/or project

- Above grade level placement option for qualified students
- Advanced problem-solving
- Allow students to work at a faster pace
- Cluster grouping
- Complete activities aligned with above grade level text using Benchmark results
- Create a blog or social media page about their unit
- Create a plan to solve an issue presented in the class or in a text
- Debate issues with research to support arguments
- Flexible skill grouping within a class or across grade level for rigor
- Higher order, critical & creative thinking skills, and discovery
- Multi-disciplinary unit and/or project
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Utilize exploratory connections to higher-grade concepts
- Utilize project-based learning for greater depth of knowledge

Sample Lesson

Unit Name: Cells ,Structure, & Function

NJSLS:See Link

Statement of Objective: SWDAT compose a time line of the scientists' contributions to the cell theory via Google classroom slides.

Anticipatory Set/Do Now: In comparison to other cells, how much of the cell does the Nucleus take up? ANS: 10% and usually located near the center, not edges.

Learning Activity: 1) Review Do Now
2) Get into heterogeneous groups and decide who is doing which scientist
3) Google classroom slides- diagram-time line, dates 5 for 5 scientists.

- cell theory timeline notes (1).doc
- cell theory timeline rubric(2).docx

4) Exit ticket via google classroom. What are the 3 components of the cell theory in your own words

Student Assessment/CFU's: Exit ticket. Think- pair- share.

Materials: Notebooks, google classroom slides, module B

Differentiation: Heterogeneous groups, visual mediums to be used for students

Integration of Technology: Laptops for Google classroom for resources, slides

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.
MS-LS1-2	Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function.