Unit 1 Cells, Structure and Processes (Life Science)

Content Area: **Science**
Course(s): **Science 8**
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Unit 1

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

8th Grade Life Science

Unit 1: Cells, Structure and Processes

Belleville Board of Education

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Unit Overview

- The theme of this unit is that cells are the smallest functional unit of life that is capable of performing all of the functions of living things.All living things are made up of one or more cells.
- The ideological direction of this unit is that there is a commonality that runs through all living things from the least complex to the most diverse and complex.
- Topics that will be explored include:
    - Characteristics of Life
    - Requirements of Life
    - Cell Theory
    - Cell Structure and function
    - Cell cycle
    - Information processing
    - Levels of Organization
    - Compare and Contrast plant and animal body systems.
    - behavior/stimuli & responses
    - Osmosis, Diffusion, and active transport

- Students will learn:
    - Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms
    - Compare and contrast animal and plant cells
    - Use Cell models to identify cell strictures and explain their respective function
    - Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
    - Use graphic organizers and models to describe organs and organ systems.
    - Transport of waste and nutrients in organisms
    - Photosynthesis/cellular respiration
    - Levels of organization in living things
    - Unicellular vs. multicellular organisms

Enduring Understanding

Enduring understandings:

- The cell is the most basic unit of life
- Our body's systems are interrelated and rely upon one another to function and reproduce.
- 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)
- Life can only come from other living things, all cells come from other cells.

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?
- How do we experience all of these concepts in the real world?

Exit Skills

By the end of 8th grade students will be able to:

- Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells
- Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
- Properly utilize a microscope to identify and diagram a variety of cells and their structures.
- Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
- Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
- 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.
- Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

New Jersey Student Learning Standards (NJSLS-S)

NextGen Science Standards

6-8.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.
6-8.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.
6-8.MS-LS1-5	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
6-8.MS-LS1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
6-8.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.
6-8.MS-LS1-8.2.1	Cause and effect relationships may be used to predict phenomena in natural systems.
6-8.MS-LS1-3.4.1	students can understand that systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. They can use models to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. They can also learn that models are limited in that they only represent certain aspects of the system under study.
6-8.MS-LS1-7.5.1	students learn matter is conserved because atoms are conserved in physical and chemical processes. They also learn within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. Energy may take different forms (e.g., energy in fields, thermal energy, energy of motion). The transfer of energy can be tracked as energy flows through a designed or natural system.
6-8.MS-LS1-6.5.1	Within a natural system, the transfer of energy drives the motion and/or cycling of matter.
6-8.MS-LS1-2.6.1	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.
6-8.MS-LS1-3.LS1.A.1	In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.
6-8.MS-LS1-1.LS1.A.1	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).
6-8.MS-LS1-4.LS1.B.1	Animals engage in characteristic behaviors that increase the odds of reproduction.
6-8.MS-LS1-4.LS1.B.2	Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.

Interdisciplinary Connections

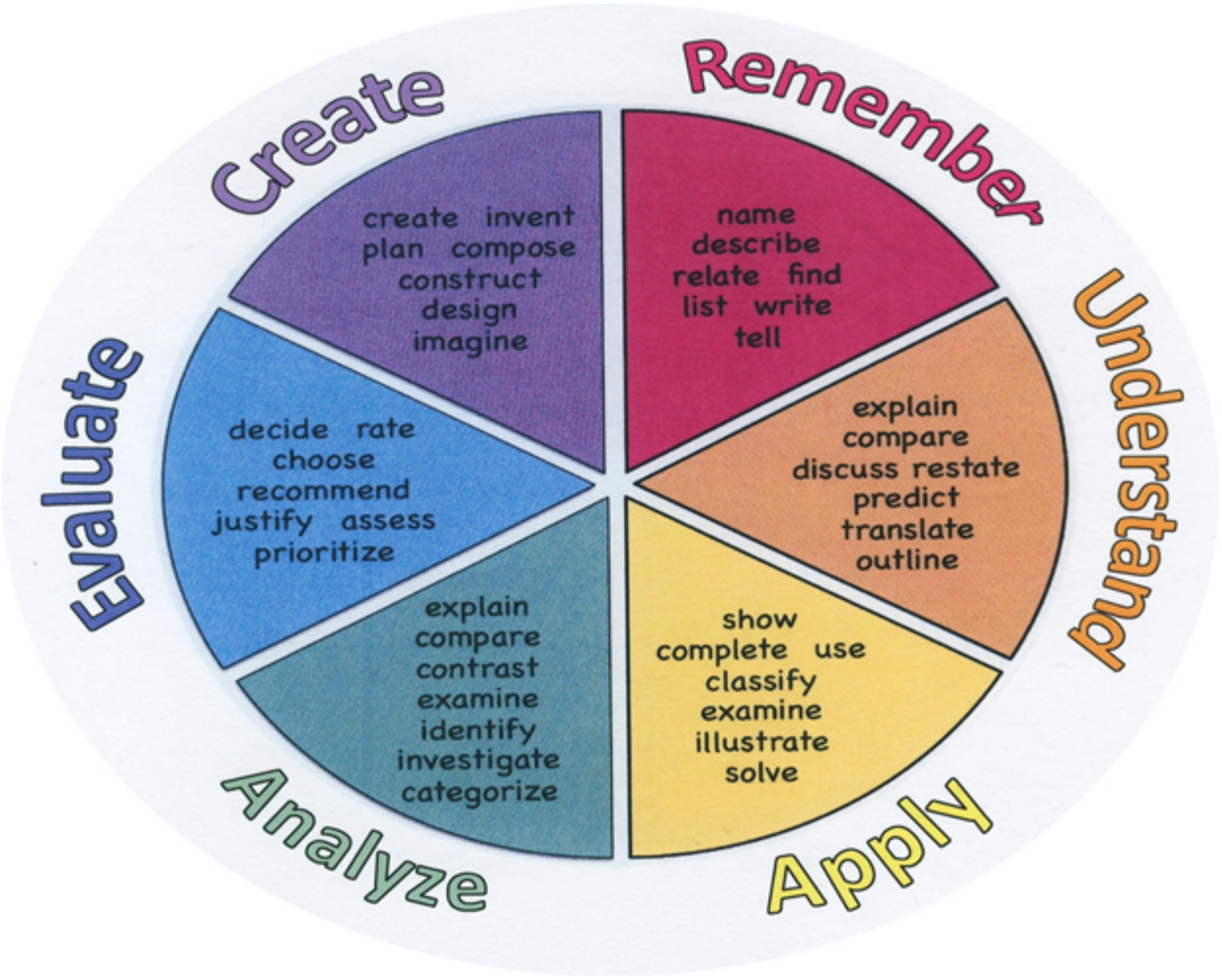
LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
LA.RI.8.1	Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
LA.RST.6-8.2	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
LA.RI.8.2	Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.
LA.RI.8.3	Analyze how a text makes connections among and distinctions between individuals, ideas, or events (e.g., through comparisons, analogies, or categories).
LA.WHST.6-8.1	Write arguments focused on discipline-specific content.
LA.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.WHST.6-8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
LA.WHST.6-8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
LA.WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
MA.6.EE.C.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.
MA.6.SP.A.2	Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
MA.6.SP.B.4	Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
MA.6.SP.B.5	Summarize numerical data sets in relation to their context, such as by:

Learning Objectives

Students will develop the ability to :

- Conduct an investigation to gather evidence to differentiate the structure and function of living from non-living things.
- Discover that the a cell is the smallest unit of structure and function of life.
- Explain that all living things are made up of cells.
- Observe phenomena at one scale to reconstruct at another scale.
- Describe how the organelles of a cell contribute to the cell's function and survival.
- Reconstruct the levels of organization within a multicellular organism by their structure and function.
- Evaluate models that integrate body systems within an organism.
- Compare and Contrast body systems of Plants and Animals.

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

Suggested activities and best practices include:

- Students will explore cell structures centers to compare and contrast Plant and Animal cells
- Microscope safety virtual lab and quiz
- Microscope Lab to investigate prepared slides of mutple types of cells
- Prepare slides of live elodea leaves to examine leaf cells
- Hot Seat Vocabulary Game using Module B vocabulary
- STudent created graphic organizers for Cell Structures Levels of Organization, and Body Systems
- Students work in heterogeneous teams to research and design a timeline that demonstrates how the development of Cell Theory coincided with the evolution of microscope technology.
- Sickle Cell Anemia Defined Stem Project

Assessment Evidence - Checking for Understanding (CFU)

Assessment Evidence:

- Madule B Why It Matters charts (KWL), Unit Opener for unit 1,2, and 3. (Formative)
- Graphic Organizers - "Cell Structure", "Levels of Organization", and "Body Systems" (Formative)
- BrainPop Video quizzes - "Cells", "Cell Structures", "Cell Specialization" (Summative)
- Newsela Article/Quz - "Facts about Cells" (Summative)
- HMH Workbook Module B students will Highlight important ideas and complete Questions (Formative)
- Notebook Entries & Diagrams (Formative)
- Cell Theory Timeline (Formative)
- Elodea Lab Report and Diagrams of cells of the Elodea leaf (Alternate)
- Common, Department Quarterly Benchmarks (Benchmark)
- Oncourse Assessment Tools (Formative)
- Unit Test/Quiz (Summative)
- "Do Now/Exit Ticket" Activity (Formative)

- 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

- Defined Stem
- Google Classroom
- HMH workbook and Website
- HMH Laboratory Kits
- Brainpop
- NewsELA
- You Tube
- School Tube

Ancillary Resources

- Legands of Learning website
- Bill Nye Videos - Cells,
- Untamed Science Videos about cells and cell theory
- Amoeba Sisters websight tutorials about Microscopes, Osmosis and Diffusion, Organelles
- Teacher prepared Powerpoint presentation

Technology Infusion

- Smart board/Interactive T.V.
- Google Classroom
- www.cellsalive.com
- Compound Microscopes
- Document Camera
- Pod-casts video streams
- Discovery Education video streams

- You Tube video streams "Amoeba Sisters: Introduction to Cells", "Inside the Cell Membrane"
- BrainPOP video streams "Cells", "Cell Structure", and "Cel Specialization"
- BrainPOP - "Using the Micrscope" virtual lab
- Laptops
- Khan Academy
- Teacher prepared Power Point presentations
- MS Word

Alignment to 21st Century Skills & Technology

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.
CAEP.9.2.8.B.7	Evaluate the impact of online activities and social media on employer decisions.
TECH.8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.

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.4	Graph and calculate data within a spreadsheet and present a summary of the results.
TECH.8.1.8.A.CS1	Understand and use technology systems.
TECH.8.1.8.A.CS2	Select and use applications effectively and productively.
TECH.8.1.8.C.CS1	Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media.
TECH.8.1.8.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
TECH.8.2.8.A.1	Research a product that was designed for a specific demand and identify how the product has changed to meet new demands (i.e., telephone for communication - smart phone for mobility needs).
TECH.8.2.8.A.CS1	The characteristics and scope of technology.
TECH.8.2.8.A.CS2	The core concepts of technology.

21st Century Skills/Interdisciplinary Themes

- 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

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

Differentiation

The following examples of differentiation will be employed in this unit:

- Working with paired partners to create graphic organizer on cell organization and structure, utilizing diagrams, and bullet point reporting
- Use of video, interactive technology, and hands on experience to become proficient in microscopy

Differentiations:

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Token economy
- Study guides
- Teacher reads assessments allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Story guides
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Large print edition
- Dictation to scribe
- Small group setting

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Choice boards
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Learning contracts
- Leveled rubrics
- Literature circles
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products
- Varying organizers for instructions

Lo-Prep Differentiations

- Choice of books or activities

- Cubing activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share
- Reading buddies
- Varied journal prompts
- Varied supplemental materials

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

The following **Special Education Learning** adaptations will be employed in the unit:

- a students work with paired homogenous partners to research and create a Cell Theory Timeline
- modified format on elodea leaf investigation
- use of closed captioned BrainPOP videos https://www.brainpop.com/health/bodysystems/cells/ and https://www.brainpop.com/science/cellularlifeandgenetics/cellstructures/

- 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)

English Language Learning adaptations that will be employed in the unit are:

- 3d Models of paremecium and amoebas as well as other hands on generic models of plant and animal cells
- pairing beginner ELL with an advanced ELL
- using captioned BrainPOP videos to reinforce understanding of cells and cell structures https://www.brainpop.com/science/cellularlifeandgenetics/cellstructures/ and https://www.brainpop.com/health/bodysystems/cells/

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarif
- 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

At Risk intervention strategies to be employed during this unit include:

- 3d Models of paremecium and amoebas as well as other hands on generic models of plant and animal cells
- using captioned BrainPOP videos to reinforce understanding of cells and cell structures https://www.brainpop.com/science/cellularlifeandgenetics/cellstructures/ and https://www.brainpop.com/health/bodysystems/cells/
- allowing students to correct errors on Module B Unit Tests

- 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 workpresented 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 or clarify

Talented and Gifted Learning (T&G)

Talented and Gifted adaptations that will be employed in the unit include:

- Utilize project based learning for greater depth of knowledge - Defined STEM Sickle Cell project
- Research and debate "Are viruses alive?"
- Flexible skill grouping within a class or across grade level for rigor Cell Theory Timeline

- 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 1 Cells, Structure and Processes

Unit Name: Cells and Heredity

NJSLS: See link

Interdisciplinary Connection: See link

Statement of Objective: SWDAT explain why our understanding of cells and their structure and function expanded as the development of microscope technology advanced.

Anticipatory Set/Do Now:
SW complete teacher prepared guided notes while they watch a short youtube animation on the history of cell theory.

https://www.youtube.com/watch?v=4OpBylwH9DU

Learning Activity:
1. Do Now/Anticipatory set.
2. SW work in heterogeneous groups to conduct research on their Chromebooks. Each group will be given web addresses and biographic templates to complete. They will gather information about the scientists that developed Cell Theory and the advancements in microscopy that allowed them to do it.
3. Each student will use these notes to create an illustrated timeline poster of the scientists and the microscopes.
4. Exit Ticket Fill Out. Which scientist did the most n the creation of cell theory?

Student Assessment/CFU's: See link

Materials: Teacher prepared notes and templates. Student notebooks, Chromebooks, Interactive TV. Exit tickets.
Wacky History cloze notes.docx Cell Theory WS and Rubric.docx

21st Century Themes and Skills: See link

Differentiation: See link

Integration of Technology: youtube video, teacher recommended websights (see attached sheet) Notes for Cell Theory Lesson.docx

MA.8.EE.B	Understand the connections between proportional relationships, lines, and linear equations.
LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8

	texts and topics.
6-8.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.
6-8.MS-LS1-1.3	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.
6-8.MS-LS1-1.3.1	Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation.
CAEP.9.2.8.B.4	Evaluate how traditional and nontraditional careers have evolved regionally, nationally, and globally.
TECH.8.1.8.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.8.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.