**Educational Epiphany ™**

Districtwide PLC Protocol for **Science**

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| Teacher/Teacher Team: A. Daniels |
| Grade: 10 |
| Date: August 28- September 15, 2023 |

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| **#** | **Planning Question**  | **Teacher/Teacher Team Response**  |
| 1 | Which **state standard** is your lesson progression addressing? | **BIO1.LS1.2** Evaluate comparative models of various cell types with a focus on organic molecules that make up cellular structures. |
| 2 | What **scientific concepts or phenomena** are embedded in the state standard? | **DCI: LS1: From Molecules to Organisms: Structures and Processes****Concept(s):** Cell Structure & Function**Phenomenon:** Differentiation and the Fate of Cells**\***See curriculum map. |
| 3 | What teacher **knowledge, reminders, and misconceptions** are assumed in the standard?  | **Knowledge:**The cells of a multicellular organism originate from a single cell. Repeated rounds of cellular division and varied expression of genes result in differentiation into a variety of cells types. Specialized cells (tissues) result from the differentiation of cells in multicellular organisms. Specialized cells perform specific functions based on their composition and the presence and/or prevalence of different organelles. The cells of multicellular organisms become specialized for particular tasks and communicate with one another to maintain homeostasis. Examples of specialized cells may include: enucleation of mature red blood cells, increased presence of mitochondria in muscle cells, large number of chloroplasts in a leaf cell, large number of mitochondria in tail of sperm cell.Carbon can bond with many elements to form compounds with many different chemical properties. Macromolecules are formed through the process of polymerization (i.e., condensation reaction). Macromolecules are broken down through the process of hydrolysis. Macromolecules include: carbohydrates, lipids, nucleic acids, and proteins. Carbohydrates store and release energy, and provide structural support and protection. Lipids store energy and form important parts of biological membranes and waterproof coverings. Nucleic acids store and transmit hereditary information. Proteins have a variety of structures and functions, including but not limited to: controlling the rate of reactions, regulating cell processes, transporting substances, fighting disease.**Reminders:** * The intent of this standard is not for students to construct models of a single cell, but rather to compare models for cells with differing roles in an organism.
* Students should focus on the relationship between: the function of the cell in the organism, the prevalence of various organelles within that cell, and the composition of the different organelles. The relationships between these components can connect to specific cellular examples such as: the absence (or enucleation) of the nucleus in red blood cells in mammals providing for increased levels of oxygen transport in organisms, abundant cytoskeletal protein for movement in animal muscle cells, or the lack of centrioles in most neurons.
* Models at the scale of cells-organelles can reveal patterns in the roles of cells based on the prevalence of particular organelles. At smaller scales, discussions at the organelle-macromolecule scale facilitate observations of patterns in the molecular composition of organelles based on their function within the cells.
* Student models should be practical and allow students to hypothesize about the structure/composition of cells performing a given function or function of a cell. Bundled with bio1.ls1.1, students can use their models as evidence to discuss the endosymbiont origin of eukaryotes.

**Misconceptions:*** **Prokaryotic cells have no DNA**. These cells have DNA, but not have a nucleus.
* **Plant cells have chloroplasts, but not mitochondria**. Plant cells have both chloroplasts and mitochondria, as they must perform both photosynthesis and cellular respiration.
* **The organelles are free floating in the cytoplasm**. Organelles are numerous and are held in place by the cytoskeleton.
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| 4 | What **objective(s)** must be taught? In what order? Why?  | 1. **SWBAT** evaluate comparative models of various cell types **IOT** identify organic molecules that make up cellular structures.
2. **SWBAT** write a model-based explanation using evidence of comparison **IOT** explain the relationship between the function of the cell in the organism, the prevalence of varying organelles within that cell, and the composition of the different organelles.
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| 5A | What is your **resource plan for each of the 5 Es** of inquiry-based science instruction?1. Engage
2. Explore
3. Explain
4. Elaborate
5. Evaluate
 | **Engage** Interactivity: Understanding molecules Cell theory class discussion Interactivity: Prokaryotes and Eukaryotes Interactivity: Cell structure Video: Cell theory Video: Biomolecules**Explore**-Biomolecule close read Macromolecule task cards Cell theory Station lab Speed dating cells Cell explorers **Explain** Cell theory PowerPoint Biomolecules PowerPoint Cell structure PowerPoint Case study What is happening to me?**Elaborate**  Cell theory-code breakerBiomolecule escape room Biomolecule matching Biomolecule boxing activity Macromolecule maker Cell structure and function escape room Cell structure and function-Who dunnit? Cell review board game  Cell organelle tarsia  **Evaluate** Macromolecules tarsia Macromolecules quiz  Cell organelles tarsia Cells quiz CFA macromolecules and cells  Cell clinic organelle malfunction  |
| 5B | What is yourresource plan for **blended learning?** | **SUGGESTED BLENDED LEARNING STATION ROTATIONS****Teacher Led:*** **Class Discussion:** [**Cell Theory**](https://www.savvasrealize.com/community/program/553df26a-1307-37cd-952f-f1e052907e12/13/tier/2908a01f-e88b-3ca3-a2b5-8d41f71b9669/14/lesson/1e9138e4-a67f-3312-995c-363936df6385/14/content/f3f48b85-9efa-3239-98da-98606c4f512e/14)(Savvas online resource, Ch. 8, Lesson 1)
	+ This discussion asks students to discuss the meaning of the cell theory.
* **Class Discussion:** [**Structure and Function**](https://www.savvasrealize.com/community/program/553df26a-1307-37cd-952f-f1e052907e12/13/tier/2908a01f-e88b-3ca3-a2b5-8d41f71b9669/14/lesson/048762d7-5f56-45b7-8713-fdac8397daa8/1/content/bb289190-e1a0-39ef-9ed9-9cc8ecb354ee/15) (Savvas online resource, Ch. 8, Lesson 2)
	+ Use this prompt to begin a class discussion on the various organelles of cells.
	+ Biomolecule card sort
	+ Biomolecule matching
	+ Cells domino
	+ Cells maze

**Online (Tech infused):*** **Interactivity: Prokaryotes vs. Eukaryotes** (Savvas online resource, Ch. 8, Lesson 1)
	+ This digital activity provides an opportunity for students to compare and contrast prokaryotes and eukaryotes, including different DNA structures.
* **Interactivity:** [**Cell Structure**](https://www.savvasrealize.com/community/program/553df26a-1307-37cd-952f-f1e052907e12/13/tier/2908a01f-e88b-3ca3-a2b5-8d41f71b9669/14/lesson/048762d7-5f56-45b7-8713-fdac8397daa8/1/content/1062db50-6f38-3f44-8b3d-f7db02db3449/16) (Savvas online resource, Ch. 8, Lesson 2)
	+ This digital activity provides an opportunity for students to compare and contrast plant and animal cells, learning the roles of each cell structure, and how they differ between plant cells and animal cells.
	+ Closer look at Science: Macromolecules
	+ Closer look at Science: Cells
	+ Closer look at Science: Prokaryote vs Eukaryote Maze Chase Game
	+ Closer look at Science: Side-by-Side Eukaryote vs Prokaryote Diagram
	+ Closer look at Science: Identify Prokaryotes vs Eukaryotes Game
	+ Closer look at Science: What do Eukaryotes have? Whack-a-mole game
	+ Closer look a Science: Plant cell activities
	+ Closer look at Science: Animal cells

**Offline (Small Group Collaboration):*** **Science Skills Activity:** [**Specialized Cells**](https://www.savvasrealize.com/community/program/553df26a-1307-37cd-952f-f1e052907e12/13/tier/2908a01f-e88b-3ca3-a2b5-8d41f71b9669/14/lesson/048762d7-5f56-45b7-8713-fdac8397daa8/1/content/9c072b7f-edcc-3197-a31c-32a218306438/15)(Savvas online resource, Ch. 8, Lesson 2)
	+ This digital activity provides an opportunity for students to study in detail the structures and functions of specialized cells.
* **Quick Lab:** [**How Can You Make a Model of a Cell**](https://www.savvasrealize.com/community/program/553df26a-1307-37cd-952f-f1e052907e12/13/tier/2908a01f-e88b-3ca3-a2b5-8d41f71b9669/14/lesson/048762d7-5f56-45b7-8713-fdac8397daa8/1/content/5d4a2741-6b5f-35d6-9232-ae7830eced25/16)**?** (Savvas online resource, Ch. 8, Lesson 2)
	+ Students work in small groups to construct a model of a particular cell structure or organelle. The entire class combines their structures to make a room-sized model of a plant cell. They calculate the scale of their model and consider its limitations.
	+ Prokaryotic and Eukaryotic cell maze
	+ Cell organelles and structures maze
	+ Plant and animal cell maze

***\*Note: Some activities can be used as activities for other stations other than suggested.***  |
| 6 | What **academic language** must be taught **before and after the explain phase**? How will the academic language be **taught and assessed**?  | **Academic Language**Evaluate – to decide the value or worth after study; to judge.Comparative – considered as if in comparison to something else as a standard not quite attained.Comparison – an examination of two or more items to establish similarities and dissimilarities.Model – a particular type or version of a product.Cell - basic unit of all forms of life.Identify – recognize and name.Organic - being or relating to or derived from or having properties characteristic of living organisms.Molecule - smallest unit of most compounds that displays all the properties of that compound. Explanation - a statement making something clear by describing it in more detail or by revealing relevant facts or ideas.Explain - a statement making something clear by describing it in more detail or by revealing relevant facts or ideas.Structure - the arrangement of and relationship between the parts or elements.Function - the special purpose or activity for which a thing exists or is used.Evidence - facts or information used as support for whether a belief or proposition is true or valid.Organism - a living thing that can act or function independently.Prevalence – the quality of prevailing generally; being widespread.Organelle - specialized structure that performs important cellular functions within a cell. Composition – the way in which someone or something is composed.**Taught** The academic language contained in the PBO as well as the following:  carbohydrate, lipid, protein, nucleic acid, monomer, polymer, nucleotide, amino acid, cytoplasm, organelle, ribosome, endoplasmic reticulum, golgi apparatus, vacuole, lysosome, cytoskeleton, chloroplast, mitochobdrion, cell wall, lipid bilayer, selectively permeable, cell membraneWill be taught as the students engage in the interactive tasks: Interactives: Understanding molecules, prokaryotes and eukaryotes, cell structure; Videos: Biomolecules, Prokaryotes vs. Eukaryotes, Introduction to cells; and Powerpoint notes on Biomolecules and Cells**Assessed** The student responses to the interactivities and open ended questions during class discussions, class assignments |
| 7  | What is your plan to ensure that assessment of instruction on this standard is not solely characterized by remembering or **regurgitating factual information**?  | Students will explain the importance of understanding macromolecules in biology. They will also relate the knowledge gained about macromolecules to real-life situations.Students will be given scenarios and will have to use their knowledge of the cell structure and function of life to determine what is wrong with the patient. When given multiple choice questions, students will have to explain why their answers are the correct answers.  |
| 8 | What **literacy concept** can be intertwined with instruction on this scientific concept or phenomenon?  | Students will develop their knowledge and skills of the following literacy concepts throughout instruction:  ∙ Citing Textual Evidence  ∙ Text Features  ∙ Media and Formats  ∙ Integrating Information from 2 or More Texts on the Same Topic  |
| 9 | How will instruction be impacted by the Cross Cutting Concepts and the Science & Engineering Practices? | **Crosscutting Concept(s):**Structure and Function* Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem.

**Science and Engineering Practice(s):**Constructing explanations and designing solutions* Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students’ own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
* Apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.
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