

Course Title – MD BIOLOGY

Implement start year – 2016-2017

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Unit #1 - From Molecules to Organisms: Structures and Processes

Transfer Goal –

Students will be able to independently use their learning to make good choices that promote healthy cell structure.

Stage 1 – Desired Results

HS-LS1 From Molecules to Organisms: Structures and Processes

LS1.A: Structure and Function

- Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) (*Note: This Disciplinary Core Idea is also addressed by HS-LS3-1.*)
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

LS1.B: Growth and Development of Organisms

- In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and

21st Century Themes (www.21stcenturyskills.org)

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

21st Century Skills

Learning and Innovation Skills:

- Creativity and Innovation
- Critical Thinking and Problem Solving
- Communication and Collaboration

Information, Media and Technology Skills:

- Information Literacy
- Media Literacy
- ICT (Information, Communications and Technology) Literacy

Life and Career Skills:

<p>maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4)</p> <p>LS1.C: Organization for Matter and Energy Flow in Organisms</p> <ul style="list-style-type: none"> • The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS1-5) • The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (HS-LS1-6) • As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. (HS-LS1-6),(HS-LS1-7) • As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment. (HS-LS1-7) 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Flexibility and Adaptability <input checked="" type="checkbox"/> Initiative and Self-Direction <input type="checkbox"/> Social and Cross-Cultural Skills <input checked="" type="checkbox"/> Productivity and Accountability <input checked="" type="checkbox"/> Leadership and Responsibility
<p><u>Enduring Understandings:</u> <i>Students will understand that . . .</i></p> <p><i>EU 1</i> systems of specialized cells within organisms help them perform the essential functions of life.</p> <p><i>EU 2</i> mitosis has wide reaching effects that maintain growth of a complex organism.</p> <p><i>EU 3</i> all organisms transfer and convert energy from one form to another. Both matter and energy are necessary to build and maintain structures within the organism.</p>	<p><u>Essential Questions:</u></p> <p><i>EU 1</i></p> <ul style="list-style-type: none"> • How does structure relate to function in living systems from the organism to the cellular level? • What is life? <p><i>EU 2</i></p> <ul style="list-style-type: none"> • Why does the process for cellular division occur? • How does mitosis sustain life? <p><i>EU 3</i></p> <ul style="list-style-type: none"> • How is energy made and transferred within an organism? • How does energy flow through a living system?

<p>Knowledge: Students will know . . .</p> <p><i>EU 1</i></p> <ul style="list-style-type: none"> • all the organelles of a cell. • the function of each organelle. • an organism needs air, water, food, and shelter to survive. • living and nonliving differ because living things have needs. • organ systems, their function, and how they are arranged <p><i>EU 2</i></p> <ul style="list-style-type: none"> • the stages of mitosis. • mitosis is the process of cell reproduction. <p><i>EU 3</i></p> <ul style="list-style-type: none"> • the structures of a plant including roots, xylem, phloem, stem, leaves, seed, and flower. • the input and output of photosynthesis. • the input and output of respiration. 	<p>Skills: Students will be able to . . .</p> <p><i>EU 1</i></p> <ul style="list-style-type: none"> • develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. HS-LS1-2 <p><i>EU 2</i></p> <ul style="list-style-type: none"> • use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. HS-LS1-4. <p><i>EU 3</i></p> <ul style="list-style-type: none"> • use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. HS-LS1-5. • depict the various aspects of the carbon cycle, including plants, animals, and the environment.
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Stage 2 – Assessment Evidence

Recommended Performance Tasks:

You are an organelle who must teach other organelles what their job is within a cell. You must create a lesson plan to effectively teach what you look like, what your tasks are in the cell, what other organelles you work closely with, and what would happen to your host (plant or animal) if you as an organelle did not do your job well. In addition to your role in the cell, you will then explain the process of mitosis in general, as well as your specific role in the cell division process. Your lesson plan must include visual aides (ie. powerpoint, poster, handout) as well as all the information listed above. You will teach your lesson plan to the class and you will be recorded, which will then be evaluated using a checklist. (EU 1 & 2)

You are an environmental investigator that is given the task of solving the mystery of dying plants and animals in the local forest. Members of the community started noticing dying species in different forests around the state; one forest had dying pine trees, one had a decreased squirrel population, and another forest had lower numbers of hawks. Your job is to identify which type of organism is missing and write an investigative report explaining how the missing organisms have affected those remaining organisms. Your memo must include the species that is dying, its position in the environment (producer, consumer, or decomposer), 3 other organisms that the species relies on to survive, your hypothesis on the cause of the species dying (the missing organism), and one possible solution to save the species. Your report will be evaluated by the Chief Investigator using a rubric. (EU 3)

Other Recommended Evidence: *Tests, Quizzes, Prompts, Self-assessment, Observations, Dialogues, etc.*

- Participate in various labs and write lab reports using the scientific method
- Tests/quizzes (organelle and cell structure and function, phases of mitosis, carbon cycle including photosynthesis)
- Class discussion/teacher observation
- Student reflection
- Multimedia presentations (powerpoint, Prezi, iMovie, Keynote) on organelle and cell structure and function, phases of mitosis, carbon cycle including photosynthesis

Stage 3 – Learning Plan

Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections:

- Create a pop-up diagram of plant and animal cell parts (A/M)
- Create a model of a plant or animal cell with a corresponding written report of the organelle's function and how they interact (M)
- Write a story about what would happen if a plant or animal cell lost an organelle (T)
- Grow mold on bread in different environments (M)
- Describe the cells of mold, plant, yeast and humans using a microscope (A,M)
- Draw and describe phases of mitosis (A)
- Build mitosis phases out of objects (M)
- Identify phases of mitosis under a microscope (M)
- Explain how mitosis is shown in phases of fetus development (M)
- Create a powerpoint of the process of how a broken bone heals through mitosis (T)
- Journal and reflect on the benefits of plants compared to humans (A/M/T)
- Label a diagram of the parts of a plant and their function (A/M)
- Create a diagram of the carbon cycle (A)
- Choose an ecosystem and explain how 5 different organisms of different levels are interdependent (M)
- Write and sing an original jingle about photosynthesis (M/T)
- Make a list of how life revolves around plants and debate another group (M/T)
- Take apart a small plant and identify its parts (M/T)
- Plant seeds and record the growth of a plant (T)

- Using an iPad, take pictures of the components of the carbon cycle in your environment and create a flow chart, also including captions to explain connections between organisms (T)