DELAWARE VALLEY SCHOOL DISTRICT

PLANNED INSTRUCTION

A PLANNED COURSE FOR:

7th Grade Honors Life Science

Grade Level: 7

Date of Board Approval: _____2019_____

Planned Instruction

Title of Planned Instruction: 7th Grade Honors Life Science

Subject Area: Life Science Grade(s): 7

Course Description: 7th Grade Honors Life Science is a course that covers concepts in scientific thinking and problem solving, experimental design, data collection and analysis, experimental variables, closed and open loop systems, Human Anatomy, Biological Science and Environmental Science. Each concept that is covered in this course is taught for mastery. The intent of this curriculum is to provide all 7th grade students with a sound and firm foundations in its topics to better prepare our students to master the concepts that will be presented to them on their 8th grade PSSA Science exam. As an honors level course, students will participate in designing and executing a long term research based project. This project will require all students to produce a technical writing laboratory report and data analysis presentation.

Time/Credit for the Course: Full Year

Curriculum Writing Committee: Gina McCarthy, Mallory Gilhooley

Curriculum Map

- **Marking Period One (45 days):**
  - Nature of Science and Metric Measuring
  - Cells and Heredity Book Unit 1 Lesson 1,2,3
    - ❏ Lesson 1: Characteristics of Cells
    - ❏ Lesson 2: Chemistry of Life
    - ❏ Lesson 3: Cell Structure and Function

  - **Goals:**
    Nature of Science (9 days)
    Microscopes and Scientific Tools (10 days)
    Characteristics of Living Things (5 days)
    Cell Theory (3 days)
    Types of Cells (3 days)
    The Major Cell Organelles and Their Functions (15 days)

- **Marking Period Two (45 days):**
  - Cells and Heredity Book Unit 1 Lessons 4,5,6
    - ❏ Lesson 4: Levels of Cellular Organization
    - ❏ Lesson 5: Homeostasis and Cell Processes
    - ❏ Lesson 6: Photosynthesis and Cellular Respiration
  - Body Systems

  - **Goals:**
    Cellular Organization (2 days)
    Active transport (7 days)
    Passive Transport (7 days)
    Fluid Mosaic Model (3 days)
    Homeostasis (3 days)
    Feedback Loops (5 days)
    Photosynthesis (5 days)
    Cellular Respiration (5 days)
    Overview of Human Body Systems (8 days)

- **Marking Period Three (45 days):**
  - Cells and Heredity Book Unit 2 Lessons 6, 1,3,2, 4,5,7
    - ❏ Lesson 6:DNA Structure and Function
    - ❏ Lesson 1: Mitosis
    - ❏ Lesson 3: Sexual and Asexual Reproduction
    - ❏ Lesson 2: Meiosis

- ❏ Lesson 4: Heredity
- ❏ Lesson 5: Punnett Squares and Pedigrees
- ❏ Lesson 7: Biotechnology (optional if time allows)

- **Goals:**

DNA Structure (4 days)
Mitosis/Cell Cycle (8 days)
Sexual and Asexual Reproduction (3 days)
Meiosis (8 days)
Mendelian Genetics (8 days)
Punnett Squares (4 days)
Non-Mendelian Genetics (5 days)
Pedigrees (4 days)

- **Marking Period Four (45 days):**
  - Ecology Book Units 1 and 2 Lessons 1,2,3,4
    - ➢ Unit 1: Interactions of Living Things
      - ❏ Lesson 1: Introduction to Ecology
      - ❏ Lesson 2: Roles in Energy Transfer (add Energy Pyramids)
      - ❏ Lesson 3: Population Dynamics
      - ❏ Lesson 4: Interactions in Communities

    - ➢ Unit 2: Earth's Biomes and Ecosystems
      - ❏ Lesson 1: Land Biomes
      - ❏ Lesson 2: Aquatic Ecosystems
      - ❏ Lesson 4: Changes in Ecosystems

  - Diversity of Living Things Book Unit 1 Lessons 2,3,5
    - ❏ Lesson 2: Theory of Evolution by Natural Selection
    - ❏ Lesson 3: Evidence of Evolution
    - ❏ Lesson 5: Classification of Living Things

  - **Goals:**

Levels of Ecological Organization (3 days)
Energy Transfer through Food Webs and Pyramids (2 days)
Limiting Factors and Competition (5 days)
Organism Interactions (Symbiosis, Competition) (5 days)
Land and Water Biomes (5 days)
Succession (5 days)
Evolution by Natural Selection with Evidence (10 days)
Classification of Organisms (5 days)
Final Review (5 days)

Curriculum Plan

Major Concept #1: Nature of Science **Marking Period:** 1

Standard(s):
PA Academic Standards
PACS Reading and Writing for Science and Technology

Standards Addressed:
3.1.6.A2, 3.1.6.A9, 3.1.7.A8, 3.1.7.A9, 3.1.8.A9, 3.1.6.B6, 3.1.7.B6, 3.1.8.B5, 3.1.6.C4, 3.1.7.C4, 3.1.8.C4, 3.2.6.A6, 3.2.7.A6, 3.2.8.A6, 3.2.6.B7, 3.2.7.B7, 3.2.8.B7, 3.3.6.A7, 3.3.7.A7, 3.3.8.A7, 3.3.6.B1, 3.3.6.B3, 3.3.7.B3, 3.3.8.B3, CC.3.5.6-8.C, CC.3.5.6-8.D, CC.3.5.6-8.F, CC.3.5.6-8.G, CC.3.5.6-8.H, CC.3.5.6-8.I, CC.3.5.6-8.J
https://www.pdesas.org/Standard/View#

Anchor(s):
S6.A.1. S6.A.2, S6.A.3, S7.A.1, S7.A.2, S7.A.3, S8.A.1, S8.A.2, S8.A.3
http://static.pdesas.org/content/documents/CF-Science_MS_LifeScience.pdf

Overview: This major concept is designed to inform students that scientific thinking skills are very useful both inside and outside of their Science classroom. Students will master the steps involved in the process of solving valid testable questions in a methodical way, learn to interpret their results and data, and use those interpretations to correct experimental flaws, draw conclusions and make inferences about the world around them. Students will receive hands on experience with experimental design as it applies to the laboratory as well as their everyday lives. Students will also learn how to measure liquids and solids in a scientific manner while learning and using various scientific tools.

Big Idea #1: All scientists use an organized method to attempt to solve problems.

Essential Questions:

- What is a scientist?
- What is science?
- What makes a question an acceptable and testable scientific question?
- What are the basic steps that scientists use to attempt to solve any problem that the pose?
- What are the basic parts of a scientific experiment?
- What happens to the outcome of scientific experiments?
- Why is it crucial for scientists to analyze and record their data accurately?

Concepts:

- Scientific theories are well tested conclusions that attempt to answer a specific scientific question that still have some flaws.
- Scientific laws are scientific conclusions or answers to scientific questions that are tested many times by many different scientists and are proven or strongly supported to be true.
- The basic steps in the scientific method are:
    - Ask a question
    - Gather information from research
    - Form a hypothesis
    - Perform an experiment
    - Record and analyze data
    - Form a conclusion
- There are three types of variables in a scientific experiment:
    - Controlled variables
    - Independent variables
    - Dependent variables
- There are two different types of data that a scientist can collect, record and analyze:
    - Qualitative Data
    - Quantitative Data
- Observations should be meaningful and objective

Competencies:

- Master all key vocabulary terms associated with this unit of instruction
- Successfully identify all types of variables in many different examples of scientific experiments
- Successfully be able to integrate pertinent mathematics concepts into their data recording and analysis (graphing, charting, averaging)
- Successfully be able to identify the two different types of data that can be produced by a scientific experiment
- Increase the ability to think critically through problems both inside and outside of the Science classroom
- Make meaningful observations that are free from opinion
- Make inferences based on data and scientific information
- Formulate well thought out conclusions following scientific experiments
- Identify experimental flaws and provide solutions to those flaws

Big Idea # 2: Scientists use tools to help in their scientific problem solving processes and scientific observations.

Essential Questions:

- What types of tools can scientists use to help them solve scientific questions?
- Why are accuracy and precision important for proper science methods?
- What tool was invented as an aid to scientists that were trying to learn more about the structure of living things that were not able to be seen by the naked eye?
- What Scientists were pivotal in developing the above mentioned tool and what did they use these tools to observe?

- What was the result of these observations and experiments?

Concepts:

- Precision and accuracy are important details for scientific methods, observations and data collection
- Scientists use microscopes to see very small objects than cannot easily be seen with the eye alone
- The microscope is the tool that played one of the most important roles in discovering the existence of cells as well as one of the major differences between living and non-living things.

Competencies:

- Properly utilize scientific measuring tools focusing on precision and accuracy.
- Be able to identify the parts of a modern microscope and be able to successfully use that tool to examine different types of cell specimen Successfully create a wet mount slide of their own cell specimen, including staining that cell specimen
- Be able to identify the parts of a modern microscope and be able to successfully use that tool to examine different types of cell specimen
- Successfully create a wet mount slide of their own cell specimen, including staining that cell specimen

Goals:

- For 7th grade honors students to build a solid body of knowledge about scientific thinking skills, experimental design and data analysis
- For 7th grade honors students to become better critical thinkers and problem solvers
- For 7th grade honors students to better understand what science is and why it is important
- For 7th grade students to become familiar with scientific tools and methods

Objectives:

1. Identify the controlled, independent and dependent variables in an experiment (DOK Level 1)
2. Compare and contrast hypothesizes, scientific laws and scientific theories (DOK Level 2)
3. Draw meaningful inferences and conclusions from lab work (both real world and fictitious) (DOK Level 3)
4. Differentiate between qualitative and quantitative data from experiments (DOK Level 3)
5. Investigate the use and application of the scientific method in order to attempt to solve a real world problem (DOK Level 3)
6. Analyze experimental flaws in presented laboratory experiments (DOK Level 4)
7. Be able to identify the parts of a modern microscope and be able to successfully use that tool to examine different types of cell specimen (DOK Level 1).
8. Successfully create a wet mount slide of their own cell specimen, including staining that cell specimen (DOK Level 4).

9. Design a body of work exemplifying a complete understanding of the scientific thought process and all of its steps, ability to design an experiment from scratch to test a scientific question and ability to critique and analyze conclusions in order to either obtain an answer to the original scientific question or revise the thought process in order to attempt to achieve an acceptable answer to that question (DOK Level 4)
10. Confidently apply measuring techniques using various scientific measuring tools. (DOK 2)

Core Activities and Corresponding Instructional Methods:

1. Give students a sample of a scientific experiment and have them identify the controlled, independent and dependent variables as well as experimental flaws.
2. Lead a class discussion that prompts students to compare and contrast different known hypotheses, scientific theories and laws based on their knowledge of those terms.
3. Have students work through a graded laboratory experiment, beginning with a testable question and working through the steps in the scientific method to conclusion where they have to produce a summary of their experiment.
4. Present all unit vocabulary to students in a format that they can study for retention and application of knowledge. See appendix for the MANDATORY list of vocabulary words.
5. **Long Term Project** – Students will need to design and complete an experiment. This project will last up and through the 2nd marking period. For this project students will exemplify a complete understanding of the scientific thought process and all of its steps, ability to design an experiment from scratch to test a scientific question and ability to critique and analyze conclusions in order to either obtain an answer to the original scientific question or revise the thought process in order to attempt to achieve an acceptable answer to that question.

Assessments:

- **Diagnostic:**
  - Pretests
  - Class Discussion

- **Formative:**
  - Teacher Observation
  - Class Discussion
  - Quizzes
  - Assignments
  - Homework Assignments

- Practice Tests
- Laboratory Exploration

- **Summative:**

  - Major Concept Test
  - Major Projects

Extensions:

- Optional recommended Inquiry Labs and Digital Path interactive multimedia practices.
- Students will be asked to read experimental designs and indicate flaws within the experimental design.
- Students will be given different cards containing various parts of a scientific experiment and they will need to identify what parts of the scientific method are indicated while adding parts that are missing.
- Lesson Review and end of Lesson in text.
- Alternative Assessments provided by the text.

Correctives:

- Give students extra practice identifying variables in an experiment.
- Re-teach and retest important concepts including mandatory vocabulary.
- Have students complete their body of work according to a skeleton outline that the teacher provides with clues along the way to help students follow the steps of the scientific method
- Give students practical hands-on practice in stations using scientific measuring tools
- Have students properly observe, analyze and draw specimen visuals while using a compound light microscope.
- Students will be asked to create flash cards, quizlet, and concept maps if necessary.
- Re-teach concepts using online lessons provided by the text.

Materials and Resources:

Primary Textbook: Science Fusion
SAS Website
Various websites and online resources
Supplemental teacher resources

Major Concept #2: Living Things and Basic Cellular Biology **Marking Period:** 1

Standard(s):
PA Academic Standards
PACS Reading and Writing for Science and Technology

Standards Addressed:
3.1.6.A1, 3.1.7.A1, 3.1.8.A1, 3.1.6.A4, 3.1.7.A4, 3.1.8.A4, 3.1.6.A6, 3.1.7.A6, 3.1.8.A6, 3.1.6.A8, 3.1.7.A8, 3.1.8.A8, 3.1.6.A9, 3.1.7.A9, 3.1.8.A9, 3.1.6.B6, 3.1.7.B6, 3.1.6.C4, 3.1.7.C4, 3.1.8.C4, 3.2.6.A6, 3.2.7.A6, 3.2.8.A6, 3.2.6.B7, 3.2.7.B7, 3.2.8.B7, 3.3.6.A7, 3.3.7.A7, 3.3.8.A7, 3.3.6.B1, 3.3.6.B3, 3.3.7.B3, 3.3.8.B3, CC.3.5.6-8.C, CC.3.5.6-8.D, CC.3.5.6-8.F, CC.3.5.6-8.G, CC.3.5.6-8.H, CC.3.5.6-8.I, CC.3.5.6-8.J
https://www.pdesas.org/Standard/View#

Anchor(s):
S8.A.1.1, S8.A.1.2, S8.A.1.3, S8.A.2.1, S8.A.2.2, S8.A.3.2, S8.B.1.1
http://static.pdesas.org/content/documents/CF-Science_MS_LifeScience.pdf

Overview: This major concept is designed to provide students with a basic knowledge of the discoveries, experiments and scientists that have contributed to the development of cell theory. Students will master comparing and contrasting prokaryotic and eukaryotic cells and different types of cells that fall under those categories. Students will also learn the basic structural difference between prokaryotic and eukaryotic categories of cells. Students will understand the characteristics that all living things have in common and how viruses replicate.

Big Idea #1: All organisms have characteristics in common.

Essential Questions:
- What are the six characteristics that all living things have in common?
- What makes something living?
- How did we learn the differences between living and non living things?

Concepts:
- All living things share six characteristics in common:
  - Movement
  - Reproduce
  - Respond to stimuli
  - Complete complex chemical activities
  - Made of one or more cells
- They are composed of levels of organization
  - Cell, tissue, organ, organ system and organism
- If something is living, it must possess all of the above mentioned characteristics.
- The list of six characteristics of living things was compiled after years and years of

scientific research, observation and experimentation of many things, both living and nonliving.
- We call any living thing an organism.

Competencies:
- Be able to classify something as living or nonliving by identifying if it possesses the six characteristics of life
- Readily integrate the vocabulary word into their everyday Science class vernacular in a useful and meaningful way
- Have a working knowledge of how scientists spent many years making meaningful, scientific observations about the world around them in order to delineate between living and nonliving things.

Big Idea #2: All living things are made up of cells.

Essential Questions:
- What are the contributions of the cell theory?
- What are the two basic categories of cells?
- What are the structural differences between those two types of cells?
- What are some examples of those categories of cells?
- How do viral cells reproduce?

Concepts:
- The result of these scientific experiments, inventions and discoveries was what is known as Cell Theory, consisting of three principals:
  o All cells come from preexisting cells
  o The cell is the basic unit of structure and function of all living things
  o All living things are made up of cells
- There are two basic categories of cells:
  o Eukaryotic
  o Prokaryotic
- Prokaryotic cells do not have a true nucleus
- Eukaryotic cells do have a true nucleus
- Two examples of Eukaryotic cells are:
  o Plant cells
  o Animal cells
- Life cycle of a virus

Competencies:
- List the 3 components of the cell theory
- Distinguish between prokaryotic and eukaryotic cells
- Identify bacterial and viral cells as prokaryotic types of cells
- Identify plant and animal cells as eukaryotic cell types
- Identify and explain the specific steps of viral reproduction

Goals:

- For 7th grade students to build a solid body of knowledge about the six characteristics that all living things have in common, the three principles of cell theory and how cell theory has developed and the scientists that have contributed to cell theory.
- For 7th graders to be able to compare and contrast prokaryotic and eukaryotic cells and the different types of cells in those categories.
- For 7th graders to be able to understand the differences between viruses and bacteria

Objectives:

1. Be able to classify something as living or nonliving by identifying if it possesses the six characteristics of life (DOK Level 2).
2. Readily integrate the vocabulary word organism into their everyday science class vernacular in a useful and meaningful way (DOK Level 4).
3. Have a working knowledge of how scientists spent many years making meaningful, scientific observations about the world around them in order to delineate between living and nonliving things as well as to explain why certain things happened in each of the scientific experiments (DOK Level 3).
4. Be able to discuss the beginnings of Cell Theory, its contributing scientists, their experiments and inventions in both oral and written formats (DOK Level 4).
5. Successfully create a wet mount slide of their own cell specimen, including staining that cell specimen (DOK Level 4).
6. Distinguish between prokaryotic and eukaryotic cells (DOK Level 2).
7. Identify bacterial and viral cells as prokaryotic types of cells (DOK Level 1).
8. Identify plant and animal cells as eukaryotic cell types (DOK Level 1).
9. Identify and explain the specific steps of viral reproduction (DOK Level 1).

Core Activities and Corresponding Instructional Methods:

1. Present the six characteristics of living things and the three principles of Cell Theory in a format where the students can study for retention and application of knowledge.
2. Provide students with an activity in which they will decide whether or not something is living or not based on their knowledge of the six characteristics of living things.
3. Provide students with a graphic organizer that outlines the three important scientists (Pasteur, Redi and Leeuwenhoek), the years they were alive, the basic premise of their experiment, and what their conclusions were.

4. Present the two categories of cell types, the basic structural differences between them and the two examples for each of those types in a format that the students can study for retention and application.
5. Present the differences between viruses and bacteria and the effects of antibiotics.
6. Present all unit vocabulary to students in a format that they can study for retention and application of knowledge. See appendix for the MANDATORY list of vocabulary words.

Assessments:

- **Diagnostic:**
  - Pretests
  - Class Discussion

- **Formative:**
  - Teacher Observation
  - Class Discussion
  - Quizzes
  - Assignments
  - Homework Assignments
  - Practice Tests
  - Laboratory Exploration

- **Summative:**
  - Major Concept Test
  - Major Projects

Extensions:

- Labeling plant vs animal cells (3D model optional)
- Optional recommended Inquiry Labs and Digital Path interactive multimedia practices.
- Lesson Review and end of Lesson in text.
- Alternative Assessments provided by the text.

Correctives:

- Students will be asked to create flash cards, quizlet, and concept maps if necessary.
- Re-teach concepts using online lessons provided by the text.

Materials and Resources:

Primary Textbook: Science Fusion
SAS Website
Various websites and online resources
Supplemental teacher resources

Major Concept #3: Cell Organelles and Their Functions **Marking Period:** 1

Standard(s):
PA Academic Standards
PACS Reading and Writing for Science and Technology

Standards Addressed:
3.1.6.A1, 3.1.7.A1, 3.1.8.A1, 3.1.6.A4, 3.1.7.A4, 3.1.8.A4, 3.1.6.A6, 3.1.7.A6, 3.1.8.A6, 3.1.6.A8, 3.1.7.A8, 3.1.8.A8, 3.1.6.A9, 3.1.7.A9, 3.1.8.A9, 3.1.6.B6, 3.1.7.B6, 3.1.6.C4, 3.1.7.C4, 3.1.8.C4, 3.2.6.A6, 3.2.7.A6, 3.2.8.A6, 3.2.6.B7, 3.2.7.B7, 3.2.8.B7, 3.3.6.A7, 3.3.7.A7, 3.3.8.A7, 3.3.6.B1, 3.3.6.B3, 3.3.7.B3, 3.3.8.B3, CC.3.5.6-8.C, CC.3.5.6-8.D, CC.3.5.6-8.F, CC.3.5.6-8.G, CC.3.5.6-8.H, CC.3.5.6-8.I, CC.3.5.6-8.J
https://www.pdesas.org/Standard/View#

Anchor(s):
S8.A.1.1, S8.A.1.2, S8.A.1.3, S8.A.2.1, S8.A.2.2, S8.A.3.2, S8.B.1.1
http://static.pdesas.org/content/documents/CF-Science_MS_LifeScience.pdf

Overview: This major concept is designed to inform students that eukaryotic cells contain tiny, membrane bound structures called organelles. These organelles perform specific functions that keep the cell alive. Each organelle has structural characteristics that help it to perform its functions. There is a direct correlation between the structural characteristics and the necessary functions of the organelles. There are two distinct differences between eukaryotic plant and animal cells.

Big Idea #1: Eukaryotic cells contain membrane bound structures called organelles that perform process that keep the cell alive .

Essential Questions:
- What are the basic ten organelles that all eukaryotic cells contain?
- What are the two organelles that a plant cell has that an animal cell does not?
- How does the structure of an organelle dictate that organelles function?
- What are the basic structural characteristics of the twelve basic plant and animal organelles?
- What are the basic functions of the twelve basic plant and animal cell organelles?

Concepts:
- Plant cells contain all of the following organelles:
  - o Cell membrane
  - o Cytoplasm
  - o Cell wall
  - o Chloroplast
  - o Ribosome
  - o Mitochondria

  - o Golgi bodies
  - o Endoplasmic reticulum
  - o Nucleus
  - o Vacuoles
  - o Lysosomes
  - o Nucleolus
- Animal cells contain all of the above organelles except cell wall, chloroplasts
- Each of the twelve major organelles have a specific function and structural characteristics that enable them to perform their functions.
- All organelles work together as a system to keep the cell alive

Competencies:

- Discuss the functions of the organelles in the classroom setting.
- Attempt to correlate the structural characteristics of specific organelles to the functions of those organelles.
- Master all key vocabulary terms associated with this unit of instruction.
- Successfully identify all twelve cell organelles in a diagram of a plant or an animal cell.
- Successfully be able to compare the functions of the cell organelles to their counterparts in a city.

Goals:

- 7th graders should be able to discuss the functions of the organelles in the classroom setting.
- 7th graders will attempt and successfully correlate the structural characteristics of specific organelles to the functions of those organelles in written and visual formats.
- 7th graders will master all key vocabulary terms associated with this unit of instruction.
- 7th graders will successfully identify all twelve cell organelles in a diagram of a plant or an animal cell.
- 7th graders will successfully be able to compare the functions of the cell organelles to their counterparts in a city.

Objectives:

1. Give students a diagram of a plant cell and an animal cell and have them label the twelve major cell organelles.
2. Lead class discussions that prompt students to compare and contrast the structure and function of a cell wall and a cell membrane as well as why plant cells need both structures and animal cells only have a cell membrane.
3. Have students work through a graded laboratory experiment that exemplifies the structural characteristics of the twelve major cell organelles and correlates those characteristics to the organelles function.

4. Present all unit vocabulary to students in a format that they can study for retention and application of knowledge. See appendix for the MANDATORY list of vocabulary words.

Core Activities and Corresponding Instructional Methods:

1. Present all functions of organelles using pictures and diagrams.
2. Have students label organelles in a cell model.
3. Make connections using a functional concept map to teach organelles and their function.

Assessments:

- **Diagnostic:**
  - Pretests
  - Class Discussion

- **Formative:**
  - Teacher Observation
  - Class Discussion
  - Quizzes
  - Assignments
  - Homework Assignments
  - Practice Tests
  - Laboratory Exploration

- **Summative:**
  - Major Concept Test
  - Major Projects

Extensions:

- Cell City - Students will correlate parts of a city to organelles in a cell.
- 3D - Cell Model labeling organelles
- Optional recommended Inquiry Labs and Digital Path interactive multimedia practices.
- Lesson Review and end of Lesson in text.
- Alternative Assessments provided by the text.

Correctives:

- Students will be asked to create flash cards, quizlet, and concept maps if necessary.
- Re-teach concepts using online lessons provided by the text.

Materials and Resources:

Primary Textbook: Science Fusion
SAS Website
Various websites and online resources
Supplemental teacher resources

Major Concept #4: Cellular Organization and Systems **Marking Period:** 2

Standard(s):
PA Academic Standards
PACS Reading and Writing for Science and Technology

Standards Addressed:
3.1.6.A4, 3.1.6.A5, 3.1.6.A8, 3.1.7.A1, 3.1.7.A2, 3.1.7.A5, 3.1.7.A6, 3.1.7.A8, 3.2.7.A1, CC.3.5.6-8.C, CC.3.5.6-8.D, CC.3.5.6-8.F, CC.3.5.6-8.G, CC.3.5.6-8.H, CC.3.5.6-8.I, CC.3.5.6-8.J
https://www.pdesas.org/Standard/View#

Anchor(s):
S7:A:1.3, S7.A.3.1, S7.B.1.1, S8.A.1.3, S8.B.1.1
http://static.pdesas.org/content/documents/CF-Science_MS_LifeScience.pdf

Overview: This major concept will focus on having students understand levels of cellular organization and movement of materials into and out of a cell. Through discussion of cell regulation students will understand that maintaining homeostasis is important. Students will also understand that homeostasis relies on feedback loops within the human body. Through discussions on the human body systems students will understand that multiple body systems work together to maintain homeostasis.

Big Idea #1: Maintaining homeostasis through cell transport and feedback loops.

Essential Questions:

- How are living things organized?
- What is the connection between structure and function?
- How do organisms maintain homeostasis?
- What are the 11 organ systems in the human body?
- How do cells exchange materials?
- What is the fluid mosaic model?
- What does selectively permeable mean?
- What are the differences between active and passive transport?
- What are the different types of active transport?
- What are the different types of passive transport?
- What type of environments can cause a cell to gain water? Lose water? Remain at equilibrium?

Concepts:

- In multicellular organisms, there is a systems framework of organization from cells to tissues, to organs to organ systems. These systems are specialized for particular body functions of an organism.
- Homeostasis is the ability to maintain an internal stable environment through the process of feedback loops.

- Human body systems work together to help maintain homeostasis.
- The cell membrane is made up of many parts that are not fused together and those parts are constantly moving.
- A membrane can pick and choose what enters and exits it.
- When any molecule moves across the cell membrane without using energy, it is called passive transport.
- When any molecule moves across a cell membrane and uses energy, it is called active transport.
- There are three types of passive transport:
  o Facilitated diffusion
  o Diffusion
  o Osmosis
- There are three types of active transport:
  o Protein pumps
  o Endocytosis
  o Exocytosis

Competencies:

- Provide evidence to support the concept of an organism is composed of interacting subsystems composed of a group of cells.
- Understand the importance of maintaining homeostasis
- Understand the 11 body systems responsible for maintaining homeostasis
- Distinguish between active and passive transport
- Identify the three types of passive transport
- Identify the three types of active transport
- Understand the concept of the fluid mosaic model of the cell membrane
- Analyze what cell situations would call for specific types of active or passive transport

Goals:

- 7th grades will understand that organisms are organized of cells, tissues, organs and organ systems that work together to maintain homeostasis.
- 7th graders will recognize that the cell membrane is made up of many parts that are not fused together. Those parts are constantly moving.
- 7th grader will understand that a membrane can pick and choose what enters and exits it.
- 7th graders will understand that when any molecule moves across the cell membrane without using energy, it is called passive transport.
- 7th graders will understand that when any molecule moves across a cell membrane and uses energy, it is called active transport.
- 7th graders will understand that there are three types of passive transport:
  o Facilitated diffusion
  o Diffusion
  o Osmosis

- 7th graders will understand that there are three types of active transport:
  o Protein pumps
  o Endocytosis
  o Exocytosis
- 7th graders will understand that there are different extracellular conditions that can make the cell's water content change.

Objectives:

1. Identify the difference between active and passive transport (DOK Level 1)
2. Identify the meaning of selectively permeable (DOK Level 1)
3. Identify the basic components of the fluid mosaic model (DOK Level 1)
4. Identify the three types of passive transport and the situations and molecules that utilize them (DOK Level 1)
5. Identify the three types of active transport and the situations and molecules that utilize them (DOK Level 1)
6. Compare and contrast the requirements of active transport and passive transport (DOK Level 2)
7. Draw meaningful inferences and conclusions from lab work involving exploration of diffusion, osmosis, hypertonic, hypotonic and isotonic environments (DOK Level 3)
8. Differentiate between osmosis and diffusion (DOK Level 3)
9. Investigate the differences between facilitated diffusion, protein pumps and diffusion (DOK Level 3)
10. Analyze a real world demonstration of the principles of osmosis based on a classroom demonstration (DOK Level 4)
11. Design a body of work exemplifying a complete understanding of membrane permeability and the fluid mosaic model (DOK Level 4)

Core Activities and Corresponding Instructional Methods:

1. Present the idea of homeostasis as a negative feedback loop to maintain an internal stable environment.
2. Compare and contrast passive vs. active transport.
3. Present through illustrations isotonic, hypertonic, and hypotonic solutions.
4. Show a fluid mosaic model when demonstrating a concentration gradient.

Assessments:

- **Diagnostic:**
  - Pretests
  - Class Discussion

- **Formative:**
  - Teacher Observation
  - Class Discussion
  - Quizzes
  - Assignments
  - Homework Assignments
  - Practice Tests
  - Laboratory Exploration

- **Summative:**
  - Major Concept Test
  - Major Projects

Extensions:

- Students will label the parts of a fluid mosaic model.
- Students will use extra practice to identify passive vs active transport.
- Provide online simulations to model and apply concepts of passive and active transport.
- Optional recommended Inquiry Labs and Digital Path interactive multimedia practices.
- Lesson Review and end of Lesson in text.
- Alternative Assessments provided by the text.

Correctives:

- Students will be asked to create flash cards, quizlet, and concept maps if necessary.
- Re-teach concepts using online lessons provided by the text.

Materials and Resources:

Primary Textbook: Science Fusion
SAS Website
Various websites and online resources
Supplemental teacher resources

Major Concept #5: Photosynthesis and Cellular Respiration **Marking Period:** 2

Standard(s):
PA Academic Standards
PACS Reading and Writing for Science and Technology

Standards Addressed:
CC.3.5.6-8.C, CC.3.5.6-8.D, CC.3.5.6-8.F, CC.3.5.6-8.G, CC.3.5.6-8.H, CC.3.5.6-8.I, CC.3.5.6-8.J
3.1.6.A1, 3.1.6.A2, 3.1.6.A4, 3.1.6.A5, 3.1.7.A2, 3.1.7.A7, 3.2.6.A5, 3.2.7.A1, 3.2.7.A2, 3.2.8.A3
https://www.pdesas.org/Standard/View#

Anchor(s):
S8.A.1, S8.A.2, S8.A.3, S8.B.1, S8.C.1, S8.C.2
http://static.pdesas.org/content/documents/CF-Science_MS_LifeScience.pdf

Overview: This major concept is designed to give students a deeper understanding of where cells get their energy from, and how that energy is transformed into usable energy for organisms. Students will gain an understanding of the role of photosynthesis for plants and the transfer of this energy to other organisms in an ecosystem. As well as gaining an understanding of the role of cellular respiration and the importance of it for all living things.

Big Idea #1: Cells must be able to convert energy to a usable form as well as to make copies of important materials.

Essential Questions:
- How do all cells convert chemical energy that is stored in glucose into usable energy?
- How do plant cells convert the light energy from the sun into chemical energy in the form of glucose for all living things to sustain life?

Concepts:
- All cells break the chemical bonds that hold a molecule of glucose together to release stored energy to fuel cell functions. This occurs in the mitochondria and is a process called cellular respiration.
- Plant cells are able to convert light energy into stored chemical energy. This stored chemical energy is used by all living things to fuel life. This process happens in the chloroplast and occurs by a process known as photosynthesis.

Competencies:
- Understand the process of cellular respiration as a chemical reaction as well as where it happens and what organelle is involved in the process.
- Understand the process of photosynthesis as a chemical reaction as well as where it happens and what organelle is involved in the process.

Goals:

- 7th graders will understand that all cells break the chemical bonds that hold a molecule of glucose together to release stored energy to fuel cell functions. This occurs in the mitochondria and is a process called cellular respiration.
- 7th graders will understand that plant cells are able to convert light energy into stored chemical energy. This stored chemical energy is used by all living things to fuel life. This process happens in the chloroplast and occurs by a process known as photosynthesis.

Objectives:

1. Identify the purpose of the process of photosynthesis and what organelle it takes place in (DOK Level 1)
2. Identify the purpose of the process of cellular respiration and the organelle that it takes place in (DOK Level 1)
3. Identify the reactants and the products of the chemical reaction that takes place during photosynthesis (DOK Level 1)
4. Identify the reactants and the products of the chemical reaction that takes place during cellular respiration (DOK Level 1)
5. Compare and contrast the processes of cellular respiration and photosynthesis (DOK Level 2)
6. Draw meaningful inferences and conclusions from lab work involving exploration of photosynthesis, cellular respiration and protein production (DOK Level 3)

Core Activities and Corresponding Instructional Methods:

1. Present the concept of photosynthesis in relation to the role of producers in an ecosystem.
2. Present the concept of cellular respiration in all living things.
3. Show through illustration the biochemical cycle of photosynthesis in relation to cellular respiration.
4. Present the concept of fermentation in relation to cellular respiration.

Assessments:

- **Diagnostic:**
  - Pretests
  - Class Discussion

- **Formative:**

- Teacher Observation
- Class Discussion
- Quizzes
- Assignments
- Homework Assignments
- Practice Tests
- Laboratory Exploration

- **Summative:**

  - Major Concept Test
  - Major Projects

Extensions:

- Students will label the reactants and products to both cellular respiration and photosynthesis.
- Students will identify organelles utilized in the process of both photosynthesis and cellular respiration.
- Students will use online simulations to demonstrate the impact sunlight has on the processes of photosynthesis and cellular respiration.
- Optional recommended Inquiry Labs and Digital Path interactive multimedia practices.
- Lesson Review and end of Lesson in text.
- Alternative Assessments provided by the text.

Correctives:

- Students will be asked to create flash cards, quizlet, and concept maps if necessary.
- Re-teach concepts using online lessons provided by the text.

Materials and Resources:

Primary Textbook: Science Fusion
SAS Website
Various websites and online resources
Supplemental teacher resources

Major Concept #6: DNA and Cell Cycle **Marking Period:** 3

Standard(s):
PA Academic Standards
PACS Reading and Writing for Science and Technology

Standards Addressed:
3.1.7.A1, 3.1.7.A7, 3.1.8.A8, 3.1.7.B1, CC.3.5.6-8.C, CC.3.5.6-8.D, CC.3.5.6-8.F, CC.3.5.6-8.G, CC.3.5.6-8.H, CC.3.5.6-8.I, CC.3.5.6-8.J
https://www.pdesas.org/Standard/View#
Anchor(s):
S8.A.1. S8.A.2, S8.B.1, S8.B.2
http://static.pdesas.org/content/documents/CF-Science_MS_LifeScience.pdf

Overview: This major concept is designed to give students a deeper understanding of what the molecules of DNA are made up of as well as the connection between how terminology regarding DNA is related (i.e. chromosomes, allele, genes, etc…). Students will gain an understanding of the difference between sexual and asexual reproduction. The process of mitosis will be discussed, and students will understand cellular reproduction/division. To conclude this major concept, students will learn the process of meiosis and the formation of sex cells in order for sexual reproduction to take place.

Big Idea #1: DNA is replicated and cells grow and develop, thereby producing more cells.

Essential Questions:
- What is DNA made up of?
- What happens if there is a mistake in DNA replication?
- How do cells make more cells?
- What are the different types of reproduction in living things?
- How does a human make gametes?

Concepts:
- DNA is a complex chemical molecule that is made up of three parts:
  - o Deoxyribose sugar
  - o Phosphate
  - o Nitrogen bases
    - Adenine and Thymine
    - Guanine and Cytosine
- If a mistake in DNA replication occurs, a mutation happens.
- Cells reproduce through a series of three stages called the Cell Cycle:
  - o Interphase
  - o Mitosis
  - o Cytokinesis
- Each of these stages contain a series of very important steps to create two identical cells from one parent cell.
- Mitosis, the second stage of the cell cycle, is composed of four phases, each

with a distinct set of processes:
- o Prophase
- o Metaphase
- o Anaphase
- o Telophase

- There are two types of reproduction:
  - o Asexual
    - Budding
    - Regeneration
  - o Sexual
    - Gamete fission
- Gametes are formed by the process of Meiosis.

Competencies:

- Understand the components of the DNA
- Understand and identify the three stages of the Cell Cycle
- Understand and identify the major processes of each of those stages.
- Understand and identify the four phases of mitosis.
- Understand and identify the major processes that take place in those four stages of mitosis.
- Analyze the processes and the differences of asexual and sexual reproduction.
- Analyze the process of Meiosis and the steps that that process entails.

Goals:

- 7th graders will understand that DNA is a complex chemical molecule that is made up of three parts.
- 7th graders will understand that if a mistake in DNA replication occurs, a mutation happens.
- 7th graders will understand that cells reproduce through a series of three stages called the Cell Cycle.
- 7th graders will understand that each of these stages contain a series of very important steps to create two identical cells from one parent cell.
- 7th graders will understand that mitosis, the second stage of the cell cycle, is composed of four phases, each with a distinct set of processes.
- 7th graders will understand that there are two types of reproduction and be able to compare and contrast those two types.
- 7th graders will understand that gametes are formed by the process of Meiosis.

Objectives:

1. Identify the parts of a DNA molecule (DOK Level 1)

2. Identify the steps and organelles involved in DNA and RNA replication (DOK Level 1)
3. Identify the outcomes of a mistake that occurs in DNA or RNA replication (DOK Level 1)
4. Draw meaningful inferences and conclusions from lab work involving exploration of DNA (DOK Level 3)
5. Differentiate between a good mutation and a bad mutation (DOK Level 3)
6. Identify the stages of the cell cycle (DOK Level 1)
7. Identify the phases of mitosis (DOK Level 1)
8. Identify the processes in each of the six phases of the cell cycle (DOK Level 1)
9. Identify two types of reproduction of living things (DOK Level 1)
10. Compare and contrast asexual and sexual reproduction (DOK Level 2)
11. Draw meaningful inferences and conclusions from lab work involving exploration of the six phases of the cell cycle (DOK Level 3)
12. Differentiate between the purpose of the cell cycle and mitosis (DOK Level 3)
13. Analyze why each process of each of the six phases of the cell cycle are so very important and what the impact of even just one of those process going wrong could mean for the reproduction of the cell (DOK Level 4)
14. Analyze why each process of each of the phases of the process of Meiosis and are so very important and what the impact of even just one of those phases in the process going wrong could mean for the reproduction of the organism (DOK Level 4)

Core Activities and Corresponding Instructional Methods:

1. Present the terminology associated with DNA including terms from appendix.
2. Present the cell cycle through illustration and video clips to help with understanding.
3. Compare and contrast sexual vs. asexual reproduction
4. Present the concept of meiosis and the formation of gametes.

Assessments:

- **Diagnostic:**
  - Pretests
  - Class Discussion

- **Formative:**
  - Teacher Observation
  - Class Discussion
  - Quizzes

- Assignments
- Homework Assignments
- Practice Tests
- Laboratory Exploration

- **Summative:**

  - Major Concept Test
  - Major Projects

Extensions:

- Students will be able to label a DNA model.
- Students will label the cell cycle using PMAT.
- Students will be able to correctly order the phases of the cell cycle using descriptions and visual representations.
- Students will compare and contrast using a venn diagram the concepts of meiosis and mitosis.
- Students will be able to correctly order and identify the phases of meiosis using descriptions and visual representations.
- Optional recommended Inquiry Labs and Digital Path interactive multimedia practices.
- Lesson Review and end of Lesson in text.
- Alternative Assessments provided by the text.

Correctives:

- Students will be asked to create flash cards, quizlet, and concept maps if necessary.
- Re-teach concepts using online lessons provided by the text.

Materials and Resources:

Primary Textbook: Science Fusion
SAS Website
Various websites and online resources
Supplemental teacher resources

Major Concept #7: Genetics and Heredity **Marking Period:** 3

Standard(s):
PA Academic Standards
PACS Reading and Writing for Science and Technology

Standards Addressed:
3.1.6.A4, 3.1.7.A4, 3.1.6.B6, 3.1.7.B1, 3.1.7.B4, 3.1.7.B5, 3.1.8.C1, CC.3.5.6-8.C, CC.3.5.6-8.D, CC.3.5.6-8.F, CC.3.5.6-8.G, CC.3.5.6-8.H, CC.3.5.6-8.I, CC.3.5.6-8.J
https://www.pdesas.org/Standard/View#

Anchor(s):
S8.A.1, S8.A.2, S8.A.3, S8.B.1, S8.B.2
http://static.pdesas.org/content/documents/CF-Science_MS_LifeScience.pdf

Overview: This major concept is designed to give students a deeper understanding of how traits of an organism are coded for by DNA. During this major concept students will be introduced to a basic understanding of how Mendelian and non-Mendelian genetics play a role in contributing to traits. Students will be able to complete simple punnett squares and pedigree charts.

Big Idea # 1: DNA is the code that is passed from parents to offspring that gives a living thing all of its characteristics and traits.

Essential Questions:
- How does a living thing acquire its traits?
- How can we determine the probability of the outcome of a cross between two living things?
- What is the history of the study of Genetics?
- How can genetic trait variance and mutations cause changes in an entire species of organism?

Concepts:
- Gregor Mendel is the father of Genetics and discovered traditional patterns of inheritance.
- DNA is a large molecule that has codes for traits on it that are called genes.
- Through the process of sexual reproduction, parents pass one copy of each gene for every trait on to their offspring.
- Every living thing has two copies of each gene for every trait.
- Depending on what two gene forms a living thing inherits, an organism can show different traits.
- Some forms of a gene are dominant to others.
- There are some patterns of inheritance that do not follow the traditional rules that Gregor Mendel discovered.

- There are two tools that Geneticists use to predict outcomes of genetic crosses and to show many generations of trait inheritance.

Competencies:

- Understand how organisms inherit their genetic traits.
- Understand the history of the traditional rules and patterns of inheritance came from.
- Understand and identify the traditional rule and patterns of inheritance.
- Analyze a simple pedigree.
- Identify some of the genetic patterns of inheritance that break the rules (Post-Mendelian Genetics).
- Analyze genetic crosses using Punnett Squares

Goals:

- 7th graders will understand how organisms inherit their genetic traits.
- 7th graders will understand the history of the traditional rules and patterns of inheritance came from.
- 7th graders will understand and identify the traditional rule and patterns of inheritance.
- 7th graders will be able to analyze a simple pedigree.
- 7th graders will be able to identify some of the genetic patterns of inheritance that break the rules.
- 7th graders will analyze genetic crosses using Punnett Squares.

Objectives:

1. Identify the history of the study of genetics (DOK Level 1)
2. Identify the tools used by geneticists to predict the outcome of genetic crosses (DOK Level 1)
3. Identify the basic patterns of genetic inheritance (DOK Level 1)
4. Identify some nontraditional types of modern patterns of inheritance (DOK Level 1)
5. Compare and contrast a pedigree to a Punnett Square (DOK Level 2)
6. Draw meaningful inferences and conclusions from lab work involving exploration of genetic crosses (DOK Level 3)
7. Differentiate between dominant and recessive alleles (DOK Level 3)
8. Differentiate between phenotypes and genotypes (DOK Level 3)
9. Analyze a genetic cross for multiple generations (DOK Level 4)

Core Activities and Corresponding Instructional Methods:

1. Present the concept of genetics using video clips and powerpoint visuals.
2. Present the concepts of mendelian genetics with punnett squares.
3. Present the concepts of non-mendelian genetics using examples.

Assessments:

- **Diagnostic:**
  - Pretests
  - Class Discussion

- **Formative:**
  - Teacher Observation
  - Class Discussion
  - Quizzes
  - Assignments
  - Homework Assignments
  - Practice Tests
  - Laboratory Exploration

- **Summative:**
  - Major Concept Test
  - Major Projects

Extensions:

- Students will be able to differentiate between dominant and recessive traits given alleles using various examples presented by the teacher.
- Students will be able to apply concepts of mendelian genetics through the use of punnett squares as provided.
- Students will use pedigrees to determine the type of inheritance.
- Optional recommended Inquiry Labs and Digital Path interactive multimedia practices.
- Lesson Review and end of Lesson in text.
- Alternative Assessments provided by the text.

Correctives:

- Students will be asked to create flash cards, quizlet, and concept maps if necessary.
- Re-teach concepts using online lessons provided by the text.

Materials and Resources:

Primary Textbook: Science Fusion
SAS Website
Various websites and online resources
Supplemental teacher resources

Major Concept #8: Ecology- Interactions of Life, Biomes and Ecosystems **Marking Period:** 4

Standard(s):
PA Academic Standards
PACS Reading and Writing for Science and Technology

Standards Addressed:
3.1.6.A1, 3.1.6.A2, 3.1.6.A5, 3.1.6.A6, 3.1.7.A1, 3.1.7.A2, 3.1.7.A3, 3.1.7.A8, 3.1.8.A8, 3.1.7.B5, 3.1.6.C1, 3.1.6.C4, 3.1.7.C1, 3.1.7.C2, 3.3.6.A2, 3.3.7.A2, 3.3.7.A4, CC.3.5.6-8.C, CC.3.5.6-8.D, CC.3.5.6-8.F, CC.3.5.6-8.G, CC.3.5.6-8.H, CC.3.5.6-8.I, CC.3.5.6-8.J
https://www.pdesas.org/Standard/View#

Anchor(s):
S8.A.1, S8.A.2, S8.A.3, S8.B.1, S8.B.3
http://static.pdesas.org/content/documents/CF-Science_MS_LifeScience.pdf

Overview:
This unit is designed to give students a deeper understanding of the organization of the world around them and how both living and nonliving things interact in that world.

Big Idea # 1: All living things in the biosphere are connected in direct and indirect ways.

Essential Questions:
- How is the biosphere organized?
- How are the living and nonliving things in nature organized?
- How do living things get their energy for life?
- What are some things that can limit a population's growth?
- How and why do organisms interact with their environment and what are the effects of these interactions?
- What are land biomes?
- What are aquatic ecosystems?
- What happens if nature is able to “run its course” without disruption?

Concepts:
- The biosphere is made up of all the parts of Earth that support life.
- Different species interact in many different ways.
- Living things can fulfill their energy requirements by either eating other organisms or making their own food molecules in their cells.
- Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem.
- Transfers of matter into and out of the physical environment occur at every level. Some food sources offer more energy than others.

- Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.
- There are many different kinds of living things in any area, and they exist in different places on land and in water.
- Biodiversity describes the variety of species found in Earth's terrestrial and aquatic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.
- The patterns of interactions of organisms with their environments, both living and nonliving, are shared. Predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival.
- Succession occurs when nature gradually replaces the living things in an area.

Competencies:

- Give students a diagram that shows the divisions of the Biosphere.
- Give students a diagram showing the relationships between organisms, populations, communities and ecosystems.
- Design and/or construct a model to describe the cycling of matter and flow of energy and within the biotic and abiotic parts of an ecosystem.
- Have students explain the transfer of energy in a food chain and an energy pyramid (essay, diagram, PowerPoint) .
- Analyze data to provide evidence for the impact of resource availability on organisms and populations in an ecosystem.
- Develop an explanation that describes patterns of interactions among organisms across multiple ecosystems.
- Show students examples and videos explaining various types of the symbiotic relationships.
- Observe and compare the different kinds of living things that are found in different habitats, in both land and aquatic ecosystems.
- Lead class discussions about real world examples of primary and secondary succession.
- Present all unit vocabulary to students in a format that they can study for retention and application of knowledge. See appendix for the MANDATORY list of vocabulary words.

Goals:

- 7th graders will know that the biosphere is made up of all the parts of Earth that support life.
- 7th graders will understand that different species interact in many different ways.

- 7th graders will understand that living things can fulfill their energy requirements by either eating other organisms or making their own food molecules in their cells.
- 7th graders will understand that some food sources offer more energy than others.
- 7th graders will be able to identify various types of land biomes, what makes one biome different from another and how climate determines the organisms that live in those biomes.
- 7th graders will know the major types of aquatic ecosystems, what their characteristics are and how abiotic factors affect these aquatic ecosystems.
- 7th graders will understand that succession occurs when nature gradually replaces the living things in an area.

Objectives:

1. Identify the three parts of the biosphere (DOK Level 1)
2. Differentiate between an organism, a population, a community and an ecosystem (DOK Level 3)
3. Draw meaningful inferences and conclusions from lab work involving exploration of limiting factors (DOK Level 3)
4. Differentiate between the different levels of consumers (DOK Level 3)
5. Analyze a food web including all its components (DOK Level 4)
6. Identify the three symbiotic relationships (DOK Level 1)
7. Describe the six major land biomes (DOK Level 1)
8. Categorize the types of freshwater and saltwater ecosystems (DOK Level 2)
9. Compare and contrast primary and secondary succession (DOK Level 2)

Core Activities and Corresponding Instructional Methods:

1. Present ecological organization in a logical manner.
2. Present organism interactions for students to understand the connection between levels of ecological organization.
3. Present the concepts of population dynamics.
4. Present the concepts of land vs. aquatic ecosystems.
5. Present the concept of change in a community over time (i.e. succession).

Assessments:

- **Diagnostic:**
    - Pretests

- Class Discussion

- **Formative:**
  - Teacher Observation
  - Class Discussion
  - Quizzes
  - Assignments
  - Homework Assignments
  - Practice Tests
  - Laboratory Exploration

- **Summative:**
  - Major Concept Test
  - Major Projects

Extensions:

- Students will be able to create and label a food chain using terminology associated with trophic levels.
- Students will be able to identify the type of organism interactions presented either verbally or through illustration.
- Students will be able to differentiate the type of succession taking place given parameters.
- Students will be able to differentiate between fresh and saltwater ecosystems as well as various land biomes.
- Optional recommended Inquiry Labs and Digital Path interactive multimedia practices.
- Lesson Review and end of Lesson in text.
- Alternative Assessments provided by the text.

Correctives:

- Students will be asked to create flash cards, quizlet, and concept maps if necessary.
- Re-teach concepts using online lessons provided by the text.

Materials and Resources:

Primary Textbook: Science Fusion

SAS Website
Various websites and online resources
Supplemental teacher resources

Major Concept #9: Diversity of Living Things **Marking Period:** 4

Standard(s):
PA Academic Standards
PACS Reading and Writing for Science and Technology

Standards Addressed:
3.1.6.A4, 3.1.6.A5, 3.1.6.A8, 3.1.7.A1, 3.1.7.A2, 3.1.7.A5, 3.1.7.A6, 3.1.7.A8, 3.2.7.A1, CC.3.5.6-8.C, CC.3.5.6-8.D, CC.3.5.6-8.F, CC.3.5.6-8.G, CC.3.5.6-8.H, CC.3.5.6-8.I, CC.3.5.6-8.J
https://www.pdesas.org/Standard/View#

Anchor(s):
S8.A.1, S8.A.2, S8.A.3, S8.B.1, S8.C.1
http://static.pdesas.org/content/documents/CF-Science_MS_LifeScience.pdf

Overview:
This major concept is designed to give students a better understanding of the concept of evolution and the driving force behind evolution, which is natural selection. Students will gain a better understanding of evolutionary processes by studying the classification of organisms and the relationships between them.

Big Idea # 1: Biological evolution explains both the unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.

Essential Questions:
- What is evolution?
- What causes change in living things?
- How long does evolution take?
- Is evolution permanent?
- How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms?

Concepts:
- Members of a species can and do change over time.
- Evolutionary traits are caused by random mutations and that the conditions of the environment at that time dictate which traits are beneficial for the survival of the organism.
- Adaptations allow organisms to survive in their environment. Natural selection leads to the predominance of certain traits in a population, and the suppression of others.
- Adaptation by natural selection acting over generations is a process by which species change over time in response to changes in environmental conditions. Traits that support survival and reproduction in the new environment become more common; those that do not, become less common.

- Anatomical similarities and differences among various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent.
- Explain how to use a dichotomous key to identify organisms.

Competencies:

1. Identify the meaning of evolution within a species.
2. Identify the meaning of natural selection.
3. Identify an example of a real life result of the process of natural selection.
4. Construct and utilize dichotomous keys to identify organisms
5. Differentiate between evolution within a species and the theory of evolution from one species.

Goals:

- 7th graders will recognize that members of a species can and do change over time.
- 7th grader will understand that evolutionary traits are caused by random mutations and that the conditions of the environment at that time dictate which traits are beneficial for the survival of the organism.
- 7th graders will understand that the more beneficial traits make those individuals more attractive to mates and therefore are the first to be passed to future generations.
- 7th graders will understand that human vestigial organs are evidence to support the evolution of the human species.

Objectives:

1. Identify the meaning of evolution within a species (DOK Level 1)
2. Identify the meaning of natural selection (DOK Level 1)
3. Identify an example of a real life result of the process of natural selection (DOK Level 1)
4. Draw meaningful inferences and conclusions from lab work involving exploration of evolutionary theory, natural selection and investigation of systems (DOK Level 3)
5. Differentiate between evolution within a species and the theory of evolution from one species (DOK Level 3)

Core Activities and Corresponding Instructional Methods:

1. Present the concept of evolution through the process of natural selection.

2. Present the concept of Survival of the Fittest in order to help students understand adaptations and change in a species over time.
3. Help students identify the evidence for evolution.
4. Present the concept of classification in such that students understand the relation between closely related species.
5. Present the use of dichotomous keys and levels of classification.

Assessments:

- **Diagnostic:**
  - Pretests
  - Class Discussion

- **Formative:**
  - Teacher Observation
  - Class Discussion
  - Quizzes
  - Assignments
  - Homework Assignments
  - Practice Tests
  - Laboratory Exploration

- **Summative:**
  - Major Concept Test
  - Major Projects

Extensions:

- Students will be able to identify vestigial organs and transitional fossils that show evidence for evolution.
- Students will be able to use an online simulation to demonstrate the process of natural selection as it relates to evolution.
- Students will be able to use a dichotomous key to identify common organisms they interact with in their daily lives.
- Students will be able to classify living things using the 3 domains.
- Optional recommended Inquiry Labs and Digital Path interactive multimedia practices.
- Lesson Review and end of Lesson in text.
- Alternative Assessments provided by the text.

Correctives:

- Students will be asked to create flash cards, quizlet, and concept maps if necessary.
- Re-teach concepts using online lessons provided by the text.

Materials and Resources:

Primary Textbook: Science Fusion
SAS Website
Various websites and online resources
Supplemental teacher resources

Primary Textbook(s) Used for this Course of Instruction

Name of Textbook:

Science Fusion Series

Science Fusion: Cells and Heredity
ISBN #: 978-0-544-77842-9

Science Fusion: Ecology and the Environment
ISBN#: 978-0-544-77845-0

Science Fusion: The Diversity of Living Things
ISBN#: 978-0-544-77843-6

Textbook Publisher & Year of Publication: Houghton Mifflin Harcourt 2017

Curriculum Textbook is utilized in (title of course): Grade 7 Honors Life Science

Appendix A - Vocabulary

Marking Period 1-

Major Concept #1: Nature of Science

Theory
Law
Scientific method
Hypothesis
Variable
Independent variable
Dependent variable
Controlled variable
Objective
Analyze
Research
Experiment
Qualitative data
Quantitative data
Evidence
Inference
Conclusion

Microscope
Slide
Base
Objective lenses
Ocular lens
Eyepiece
Stage
Stage clips
Base
Arm
Fine focus
Coarse focus
Diaphragm
Light Source

Major Concept #2: Living Things and Basic Cellular Biology

Homeostasis
Stimulus
Response
Chemical reaction
Movement
Reproduce
Development
Cell theory
Spontaneous generation
Biogenesis

Cell
Organism
Cell Membrane
Cytoplasm
Organelle
Nucleus
Prokaryotic
Eukaryotic
Plant cell
Animal cell
Bacterial cell
Viral cell

Major Concept #3: Cell Organelles and Their Functions

- Cell membrane
- Cytoplasm
- Nucleus
- Mitochondria
- Golgi bodies
- Endoplasmic reticulum
- Lysosome
- Vacuole
- Chloroplast
- Cell wall
- Cytoskeleton
- Ribosome
- Nucleolus

Marking Period 2 -

Major Concept #4: Cellular Organization and Systems

- Structure
- Function
- Cell
- Tissue
- Organ
- Organ system
- Organism
- Homeostasis
- Feedback Loops (Positive/Negative)
- Passive transport
- Active transport
- Diffusion
- Osmosis
- Facilitated diffusion
- Protein pumps
- Endocytosis
- Exocytosis
- Equilibrium
- Concentration gradient
- Fluid mosaic model
- Molecule
- Hypertonic
- Isotonic
- Hypotonic
- Selectively permeable
- Pores

Major Concept #5: Photosynthesis and Cellular Respiration

- Photosynthesis
- Cellular respiration
- Chemosynthesis
- Glucose
- ATP
- Metabolism
- Chemical energy
- Light energy
- Products
- Fermentation
- Enzyme
- Yields
- Carbon dioxide
- Producer
- Consumer
- Autotroph

Chlorophyll
Reactants
Heterotroph

Marking Period 3 -
Major Concept #6: DNA and Cell Cycle

DNA
RNA
Nucleotide
Nitrogen bases
Adenine
Cytosine
Guanine
Thymine
Uracil
Deoxyribose sugar
Phosphate
Gene
Mutation
Rosalind Franklin
James Watson
Francis Crick
Double Helix
Chromosome
Gene
Cell Cycle
Interphase
Mitosis
Prophase
Metaphase
Anaphase
Telophase
Cytokinesis
Spindle fibers
Centrioles
Centromere
Budding
Regeneration
Gamete fission
Karyotype
Gamete
Somatic Cell
Sperm
Egg
Asexual Reproduction
Sexual Reproduction
Fertilization
Homologous Chromosomes
Meiosis

Major Concept #7: Genetics and Heredity

Trait
Genetics
Heredity
Gregor Mendel
Punnett Square
Pedigree
Generation
Dominant
Recessive
Probability
Genetic engineering
Inherited
Acquired
Codominance

Genotype
Phenotype
Homozygous
Heterozygous
Allele
Incomplete dominance
Biotechnology
Artificial Selection
Genetic Engineering
Genetic Modification

Marking Period 4 –

Major Concept #8: Ecology- Interactions of Life, Biomes and Ecosystems

Binomial nomenclature
Species
Ecology
Food web
Food chain
Herbivore
Omnivore
Carnivore
Producer
Consumer
Energy pyramid
Symbiosis
Mutualism
Commensalism
Parasitism
Predator
Prey
Population
Community
Ecosystem
Biome (tundra, taiga, desert, grassland, deciduous forest, coniferous forest)
Biosphere
Habitat
Niche
Growth limits
Limiting factors
Carrying capacity
Migration
Competition
Camouflage
Abiotic
Biotic
Atmosphere
Soil
Primary
Secondary
Tertiary
Primary succession
Secondary succession
Pioneer species
Fresh Water
Salt Water
Wetland
Estuary
Biodiversity

Major Concept #9: Diversity of Living Things

Genus
Species
Evolution
Natural selection
Vestigial structure
Fossil
Dichotomous Key
Eukarya

Artificial Selection	Protista
Extinction	Archaea
Mutation	Bacteria
Variation	Fungi
Adaptation	Plantae
Fitness	Animalia
Survival of Fittest	Domain

Appendix B - Supplemental Resources

Movies and video clips to reinforce content including but not limited to Jurassic Park, Mythbusters, NOVA, Bill Nye, as well as various YouTube videos and episodes.