Board Approved
October 2016

Wilson Area School District
Planned Course Guide

Title of planned course: Life Science

Subject Area: Science

Grade Level: 8th

Course Description: This course is designed to serve as an introductory course into biology or the study of living things. Life science is a branch of science that allows students to view and understand the nature of life, how it began, and how it adapts and changes over time. The subjects that students will be covering include nature of science, chemistry, cell types, cellular processes, genetics, classification, evolution, ecology, and organic molecules. Students will be expected to read, analyze, and synthesize in order to demonstrate understanding of the content. Students will use these skills to investigate and scientifically question the concepts of life science.

Time/Credit for this Course: One full school year

Curriculum Writing Committee: Karl Hontz and Rachel Fuehrer

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Curriculum Map

August: Introduction and Nature of Science

September: Nature of Science and Atoms

October: Atoms and Classification

November: Classification

December: Classification

January: Cell Types and Cell Processes

February: Cell Processes

March: Genetics and Evolution

April: Evolution and Ecology

May: Ecology and DNA

June: DNA

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Wilson Area School District
Planned Course Materials

Course Title: Life Science

Textbook: *Concepts and Challenges: Life Science*
Bernstein, Schachter, Winkler, Wolfe
2009

Supplemental Books/Resources:

Concepts and Challenges: Life Science
Pearson Online: Student Version
2009
www.conceptsandchallenges.com

Reading Essentials: Life Science
Glencoe, McGraw Hill Education

Buckle Down Grade 8
Buckle Down Publishing
2007
www.buckledown.com

Biology Middle/High School
DiStasio 1995

How to Get Better Test Scores: Science Grade 8
Ebling and Lathrop
2007

Science Fusion
Houghton Mifflin Harcourt

Science Based-Investigation: Interactive Science
Pearson Education

Spectrum Science Test Practice: Grade 8
Frank Schaffer Publication

PSSA Coach Science Grade 8
Triumph Learning, 2008

Teacher Resources:

Concepts and Challenges: Life Science
Pearson Online: Teacher Version
2009
www.conceptsandchallenges.com

Crash Course Biology
https://www.youtube.com/user/crashcourse

Discovery Education
www.discoveryeducation.com

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Curriculum Scope & Sequence

Planned Course: Life Science

Unit: Nature of Science

Time frame: 4 Weeks

State Standards, Anchor(s), and Eligible Content: S8.A.1.1, S8.A.1.1.2, S8.A.1.1.3, S8.A.1.1.4, S8.A.1.3, S8.A.1.3.1, S8.1.3.2, S8.A.1.3.3, S8.A.1.3.4, S8.A.2.1, S8.A.2.1.1, S8.A.2.1.2, S8.A.2.1.3, S8.A.2.1.4, S8.A.2.1.5, S8.A.2.1.6, S8.A.2.2, S8.A.2.2.1, S8.A.2.2.2, S8.A.2.2.3

Essential content/objectives: At end of the unit, students will be able to:

- Identify and formulate a scientific question and hypothesis
- Recite the steps of the scientific method
- Demonstrate understanding of scientific method during labs
- Analyze data from graphs, tables, and other evidence to make inferences and predictions
- Analyze data from graphs, tables, and other evidence from results to make inferences, predictions, and written conclusions
- Use quantitative and qualitative measurements to create ratios and inferences that describe how lab results may change over time
- Identify independent, dependent, and control variables
- Predict how changes in variables will affect the results of an experiment
- Make inferences describing how changing variables in an experiment will affect the results
- Use data and results to write a conclusion
- Create operational definitions
- Formulate scientific questions and hypotheses
- Indentify or describe a control group in an experiment
- Design an experiment using independent, dependent and controlled variables correctly
- Interpret data in order design graphs and use those graphs to make predictions and inferences
- Use data to support conclusions for science-based scenarios and labs
- Identify sources of error in an experiment and/or technological equipment and explain ways to correct such error.
- Select and apply correct measurement techniques and instruments in an experiment
- Record observations accurately using tables, graphs and other methods

Core Activities and Instructional Methods: Students will complete/participate in the following:

- Direct Instruction: Guided Note Strategies and Classroom Discussion; discuss and demonstrate how to correctly write a scientific question, hypothesis, inferences, predictions, and conclusions; discuss how to correctly indentify variables in a scenario/lab; model correct lab techniques for safety and accurate measurement
- Guided Practice: Unit Packets with guided notes and classwork
- Independent Practice: worksheets on writing scientific questions and hypotheses, indentifying independent and dependent variables, indentifying and explaining control variables, indentifying control groups, qualitative vs. quantitative data, making graphs from data, inferences vs. predictions, and writing conclusion practice
- Labs: Penny Lab and Lab write-up, Create your own experiment
- Group Work: Science Scenarios

Extensions:

- Independent readings
- Online videos (Crash Course)
- Current research articles

Remediation:

- Small group work to review material
- Reading level appropriate materials for differentiated instruction
- Additional practice worksheets given to students on an as-needed basis
- Study guides will be provided before assessment

Materials & Resources:

- PSSA Prep Books (Buckle Down and PSSA Coach)
- *Science Based-Investigation: Interactive Science*
- PowerPoint Notes
- Scientific Method Unit Packets
- Online Videos from Discovery Education and Youtube

Assessments:

- Diagnostic: Scientific Method Pre-Test, Bell-Ringers, Homework review
- Formative: Homework, leveled questioning, groupwork, essential question discussion, exit tickets, think-pair-share
- Summative: Objective Quizzes, Final Unit Test, Lab Write-Up

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Curriculum Scope & Sequence

Planned Course: Life Science

Unit: Chemistry

Time frame: 5 Weeks

State Standards, Anchors and Eligible Content: S8.A.1.1, S8.A.1.1.1, S8.A.3.1, S8.A.3.1.2, S8.A.3.1.4, S8.A.3.2, S8.A.3.2.1, S8.A.3.3, S8.A.3.3.2, S8.C.1.1, S8.C.1.1.1, S8.C.1.1.3, S8.C.2.1.3

Essential content/objectives: At end of the unit, students will be able to:

- Compare Aristotle's atomic theory to Dalton's atomic theory and discuss how Dalton's theory is supported by evidence
- Describe a chemical reaction as a system and indentify the reactants as inputs and products as outputs of that system
- Explain how a chemical reaction is like an open loop and a closed loop system during a lab
- Explain why scientists need to use models and the periodic table to represent atoms and elements
- Describe and explain how the periodic table is arranged periodically and indentify patterns throughout the periodic table
- Identify and describe examples of elements, compounds, and mixtures while describing how each one is different from the other
- Identify and describe the reactants and products of a chemical reaction
- Explain how chemical reactions obey the Law of Conservation of Mass
- Define convection, conduction, and radiation and explain how energy moves using these processes
- Explain that energy can never be created or destroyed, it can only change form according to the Law of Conservation of Energy

Core Activities/Instructional Methods: Students will complete/participate in the following:

- Direct Instruction: Guided Note Strategies and Classroom Discussion; discuss matter and energy transformations, atomic theory, atomic structures, chemical vs. physical reactions, Law of Conservation of Mass, the differences between elements, compounds, and mixtures, types of bonding to make compounds, periodic table trends and patterns. Demonstrate how to calculate the number of neutrons, protons, and electrons, how to count the number of atoms in a compound and read a molecular formula
- Guided Practice: Unit Packets with guided notes and classwork
- Independent Practice: worksheets on matter and energy transformations, atomic theory, atomic structures, chemical vs. physical reactions, Law of Conservation of Mass, the differences between elements, compounds, and mixtures, types of bonding to make compounds, periodic table trends and patterns. Demonstrate how to calculate the number of neutrons, protons, and electrons, how to count the number of atoms in a compound and read a molecular formula

- Labs: Open vs. Closed System for Chemical Reaction Lab and Lab write-up
- Group Work: Build Atom Model, Molecule Model, Counting Atoms
- Projects: Element Project, Coloring the Periodic Table

Extensions:

- Independent readings
- Online videos (Crash Course)
- Current research articles

Remediation:

- Small group work to review material
- reading level appropriate materials for differentiated instruction
- Additional practice worksheets given to students on an as-needed basis
- Study guides will be provided before assessment

Materials & Resources:

- *Concepts and Challenges: Physical Science* Textbook
- *Concepts and Challenges: Physical Science* Online
- *Buckle Down PSSA*
- *PSSA Coach*
- *Getting Better Test Scores*
- PowerPoint Notes
- Chemistry Unit Packets
- Online Videos from Discovery Education and Youtube

Assessments:

- Diagnostic: Matter Probe, Bell-Ringers, Homework review
- Formative: Homework, leveled questioning, groupwork, essential question discussion, exit tickets, whiteboard reviews
- Summative: Objective Quizzes, Final Unit Test, Lab Write-Up

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Curriculum Scope & Sequence

Planned Course: Life Science

Unit: Classification

Time frame: 7 Weeks

State Standards, Anchors, and Eligible Content: S8.A.1.2, S8.A.1.2.3, S8.A.1.3, S8.A.1.3.4, S8.A.3.3, S8.A.3.3.2, S8.B.1.1, S8.B.1.1.1, S8.B.1.1.2, S8.B.1.1.3

Essential content/objectives: At end of the unit, students will be able to:

- Describe taxonomy as one of the fundamental concepts of biology, and explain how it is used to classify newly discovered species or fossil remains so they can be added to the phylogenetic tree
- Use a dichotomous key to name new organisms
- Explain how the 6 kingdoms came into being as the environment on Earth changed over time
- Explain how plants evolved due to changes in their environment over time
- Explain how animals (invertebrates and vertebrates) evolved due to changes in their environment over time
- Describe structural patterns throughout the 6 kingdoms
- Describe how the structural characteristics of organisms within each of the 6 kingdoms help them function effectively in their environment
- Describe how the structural characteristics of various groups of plants enable them to function effectively in their environment
- Describe how the structural characteristics of various groups of animals enable them to function effectively in their environment
- Compare and contrast internal and external structures of the 6 kingdoms
- Compare and contrast internal and external structures of various groups of plants
- Compare and contrast internal and external structures of invertebrates and vertebrates
- Determine if something is living or non-living based on the characteristics of life
- Categorize living things based on key characteristics from each of the 6 kingdoms
- Discuss how organisms become more complex as they progress through the phylogenetic tree

Core Activities/Instructional Methods: Students will complete/participate in the following:

- Direct Instruction: Guided Note Strategies and Classroom Discussion; discuss characteristics of life, characteristics of the 6 kingdoms, vascular vs. non-vascular plants, invertebrates, and vertebrates, how adaptations for each kingdom help organisms survive in their environment, viruses, and levels of taxonomy. Demonstrate how to use a phylogenetic tree and dichotomous key

- Guided Practice: Unit Packets with guided notes, characteristics of life class-lab
- Independent Practice: worksheets on characteristics of life, characteristics of the 6 kingdoms, vascular vs. non-vascular plants, invertebrates, and vertebrates, viruses, and levels of taxonomy, phylogenetic tree, and dichotomous key
- Labs: “Is It Alive?” Lab
- Group Work: Kingdom Chart, Invertebrate Chart, Vertebrate Chart
- Projects: Prokaryote Project, Virus Project, Build an Invertebrate Project

Extensions:

- Independent readings
- Online videos (Crash Course)
- Current research articles

Remediation:

- Small group work to review material
- reading level appropriate materials for differentiated instruction
- Additional practice worksheets given to students on an as-needed basis
- Study guides will be provided before assessment

Materials & Resources:

- *Concepts and Challenges: Life Science* Textbook
- *Concepts and Challenges: Life Science* Online
- PSSA Prep Books
- PowerPoint Notes
- Classification, Plant, Invertebrate and Vertebrate Packets
- Online Videos from Discovery Education and Youtube

Assessments:

- Diagnostic: Characteristics of Life Lab, Bell-Ringers, Homework review
- Formative: Homework, leveled questioning, groupwork, essential question discussion, exit tickets, think-pair-share, whiteboard review
- Summative: Objective Quizzes, Classification Test, Plant Quest, Invertebrate Test, and Vertebrate Test.

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Curriculum Scope & Sequence

Planned Course: Life Science

Unit: Cell Types

Time frame: 3 Weeks

State Standards, Anchors, and Eligible Content: S8.A.1.1, S8. A.1.1.1, S8.A.2.2, S8.A.2.2.3, S8.A.3.1, S8.A.3.1.1, S8.A.3.1.2, S8.A.3.1.4, S8.B.1.1, S8.B.1.1.1, S8.1.1.4

Essential content/objectives: At end of the unit, students will be able to:

- Recite the three parts of the cell theory and explain the evidence that supports the cell theory
- Use a microscope to look at plant and animal cells, diagram observations, and compare and contrast cell structures
- Describe cells as a system of cell parts that work together in order to keep the cell alive
- Explain how simple structures can form complex structures (i.e. how cells come together to form tissue, tissues come together to form organs, organs come together to form organ systems, organ systems come together to form organisms)
- Explain how a cell functions as an open loop system allowing matter and energy in and out
- Describe the how the different structures in plant and animal cells allow them to survive in their environments
- Describe how the different structures in eukaryotic and prokaryotic cells allow them to survive in their environments
- Identify the levels of organization in order: cell, tissue, organ, organ system, and organism
- Describe how cell parts work together in order to keep the cell functioning as a whole

Core Activities: Students will complete/participate in the following:

- Direct Instruction: Guided Note Strategies and Classroom Discussion: discuss cell theory and discovery, cell part structure and function, comparing and contrasting plant and animal cells, levels of organization, and microscope parts and use
- Guided Practice: Unit Packets with guided notes, cell part flash cards
- Independent Practice: worksheets on cell theory, cell part structure and function, plant vs. animal cells, cell diagrams, levels of organization and microscope parts
- Labs: Microscope lab
- Group Work: cell diagrams, cell part tournament
- Projects: Cell analogy project

Extensions:

- Independent readings
- Online videos (Crash Course)
- Current research articles

Remediation:

- Small group work to review material, reading level appropriate materials for differentiated instruction
- Additional practice worksheets given to students on an as-needed basis
- Study guides will be provided before assessment

Materials & Resources:

- *Concepts and Challenges: Life Science* Textbook
- *Concepts and Challenges: Life Science* Online
- PSSA Prep Books
- PowerPoint Notes
- Cell Types and Microscopes Packets
- Online Videos from Discovery Education and Youtube
- Classroom microscope
- Teacher microscope
- Microscope slides and samples

Assessments:

- Diagnostic: Cell Pre-Test, Bell-Ringers, Homework review
- Formative: Homework, leveled questioning, groupwork, essential question discussion, exit tickets, think-pair-share, quick writing, cell flashcards, whiteboard review
- Summative: Objective Quizzes, Cell Structure and Function Test, Microscope quiz, Microscope Lab, Cell Analogy Project

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Curriculum Scope & Sequence

Planned Course: Life Science

Unit: Cell Processes

Time frame: 3 Weeks

State Standards, Anchors, and Eligible Content: S8.A.1.3, S8.A.1.3.1, S8.A.3.1, S8.A.3.1.1, S8.A.3.1.3, S8.A.3.1.4, S8.A.3.1.5, S8.A.3.2, S8.A.3.2.3, S8.B.1.1, S8.B.1.1.1, S8.B.1.1.4, S8.C.1.1, S8.C.1.1.3, S8.C.2.1, S8.C.2.1.1, S8.C.2.1.2, S8.C.2.1.3, S8.C.2.2, S8.C.2.2.1

Essential content/objectives: At end of the unit, students will be able to:

- Use a percentage to describe the movement of substances into or out of the cell
- Describe how cell organelles (parts) function together as parts during cell transport to move substance into or out of the cell
- Describe how cell organelles (parts) function together during photosynthesis and cellular respiration to provide energy for the cell
- Describe how cell organelles (parts) function together during mitosis and meiosis in order to reproduce
- Distinguish between system inputs and outputs of photosynthesis and cellular respiration
- Distinguish between the cell processes and feedback requirements of cellular transport, photosynthesis, cell respiration, and cellular reproduction
- Describe cell processes as open systems allowing energy and matter in and out
- Explain how cell processes play roles in larger systems such as organ systems and ecosystems
- Show the cause and effect relationship within photosynthesis and predict the results of photosynthesis given a model
- Show how the volume of a cell will change via diffusion given a model
- Describe the cell structures involved in cellular transport that helps bring substances into and out of the cell
- Describe the cell structures involved in photosynthesis and cellular respiration that provide energy for the cell
- Describe the cell structures involved in meiosis and mitosis for cellular reproduction
- Describe how cell organelles (parts) function together as parts during cell transport to move substance into or out of the cell that allows the organism to survive
- Describe how cell organelles (parts) function together during photosynthesis and cellular respiration to provide energy for the cell and the organism as a whole
- Describe how cell organelles (parts) function together during mitosis and meiosis, which allows the organism to grow and repair damaged cells

- Identify the reactants and products of photosynthesis and cellular respiration equations
- Distinguish between forms of energy that are involved in photosynthesis and cellular respiration (solar, chemical, and electrical)
- Explain how heat energy is absorbed from the sun into plant cells via radiation
- Describe how energy changes forms during photosynthesis and cellular respiration
- Describe the sun as the major source of energy for all living things either directly or indirectly

Core Activities: Students will complete/participate in the following:

- Direct Instruction: Guided Note Strategies and Classroom Discussion: cellular transport, photosynthesis, cellular respiration, and cellular reproduction
- Guided Practice: Unit Packets with guided notes, photosynthesis/cellular respiration foldable
- Independent Practice: worksheets on cellular transport, photosynthesis, cellular respiration, and cellular reproduction
- Labs: Diffusion lab, fermentation lab
- Group Work: photosynthesis/cellular respiration equation cards, mitosis flashcards
- Projects: Tour of Photosynthesis project

Extensions:

- Independent readings
- Online videos (Crash Course)
- Current research articles

Remediation:

- Small group work to review material
- Reading level appropriate materials for differentiated instruction
- Additional practice worksheets given to students on an as-needed basis
- Study guides will be provided before assessment

Materials & Resources:

- *Concepts and Challenges: Life Science* Textbook
- *Concepts and Challenges: Life Science* Online
- PSSA Prep Books
- PowerPoint Notes
- Cellular Transport Packet, Energy Processes Packet, and Cellular Reproduction Packet
- Online Videos from Discovery Education and Youtube
- Classroom microscope
- Teacher microscope

Assessments:

- Diagnostic: Bell-Ringers, Homework review
- Formative: Homework, leveled questioning, groupwork, essential question discussion, exit tickets, think-pair-share, quick writing, whiteboard review, photosynthesis/cellular respiration foldable, mitosis flashcards
- Summative: Objective Quizzes, Cell Process Test, Diffusion Lab, Projects: Tour of Photosynthesis Project

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Curriculum Scope & Sequence

Planned Course: Life Science

Unit: Genetics

Time frame: 4 weeks

State Standards, Anchors, and Eligible Content: S8.A.1.2, S8.A.1.2.1, S8.A.1.2.3, S8.A.1.2.4, S8.B.2.1, S8.B.2.1.1, S8.B.2.1.3, S8.B.2.1.4, S8.B.2.2, S8.B.2.2.1, S8.B.2.2.2

Essential content/objectives: At end of the unit, students will be able to:

- Describe the positive and negative effects of genetic engineering
- Use the basic concepts of Mendelian genetics to solve Punnett Squares and predict possible genetic outcomes of offspring
- Explain how genetic engineering has improved crops in terms of increased agricultural yield, increased size pesticide resistance, and drought resistance
- Explain how inherited structures or behaviors help organisms survive
- Explain that mutations lead to genetic variation by altering genes that can then be passed on to offspring
- Describe how genetic engineering such as selective breeding and biotechnology can change the genetic makeup of various living things from bacteria to humans
- Identify and give examples of inherited and acquired traits
- Describe the differences between inherited and acquired traits
- Identify and recognize that the gene is the basic unit of inheritance
- Recognize that there are dominant and recessive traits and distinguish between dominant and recessive traits given an example
- Recognize and describe how traits are inherited

Core Activities: Students will complete/participate in the following:

- Direct Instruction: Guided Note Strategies and Classroom Discussion: genes, chromosome structure, meiosis vs. mitosis, Mendel's experiments, inherited vs. acquired traits, genotype vs. phenotype, dominant vs. recessive genes, Punnett Squares, inherited diseases, mutations, benefits of biotechnology and genetic engineering
- Guided Practice: Unit Packets with guided notes, Punnett squares practice
- Independent Practice: worksheets on genes, chromosome structure, meiosis vs. mitosis, Mendel's experiments, inherited vs. acquired traits, genotype vs. phenotype, dominant vs. recessive genes, Punnett Squares, inherited diseases, mutations, benefits of biotechnology and genetic engineering
- Labs: Traiting Places Lab (combined with Evolution unit)
- Group Work: Punnett Square practice, inherited traits activity
- Projects: Inherited Disease Project

Extensions:

- Independent readings
- Online videos (Crash Course)
- Current research articles

Remediation:

- Small group work to review material
- Reading level appropriate materials for differentiated instruction
- Additional practice worksheets given to students on an as-needed basis
- Study guides will be provided before assessment

Materials & Resources:

- *Concepts and Challenges: Life Science* Textbook
- *Concepts and Challenges: Life Science* Online
- PSSA Prep Books
- PowerPoint Notes
- Genetics Packet
- Online Videos from Discovery Education and Youtube

Assessments:

- Diagnostic: Bell-Ringers, Homework review, brainstorming activities
- Formative: Homework, leveled questioning, groupwork, essential question discussion, exit tickets, think-pair-share, quick writing, whiteboard review
- Summative: Objective Quizzes, Genetics Test, Traiting Places Lab

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Curriculum Scope & Sequence

Planned Course: Life Science

Unit: Evolution

Time frame: 3 weeks

State Standards, Anchors, and Eligible Content: S8.A.1.1, S8.A.1.1.1, S8.A.1.1.3, S8.A.1.3, S8.A.1.3.2, S8.A.1.3.3, S8.A.1.3.4, S8.B.2.1, S8.B.2.1.1, S8.B.2.1.2, S8.B.2.1.3, S8.B.2.1.5, S8.D.1.1, S8.D.1.1.4

Essential content/objectives: At end of the unit, students will be able to:

- Describe evolution as a theory
- Explain the evidence that supports the theory of evolution
- Explain how new scientific discoveries can change the theory of evolution
- Use various sources of evidence to support the theory of evolution and explain how species change gradually over time
- Use fossil evidence to explain how ecosystems and species have changed over time
- Examine and explain how the Earth's ecosystems and living things have changed over time via evolution and natural selection
- Infer why Earth's ecosystems and species have changed over time
- Explain how animals need to evolve or adapt to changing environments in order to survive in different scenarios
- Explain how certain organisms are genetically predisposed to living and reproducing in certain environments, but not in other environments
- Explain how certain species are adapted to living in certain environments through natural selection
- Explain "survival of the fittest" in which the organisms that are best adapted to their environment will be the most likely to survive and reproduce
- Identify a mutation as any change in a gene
- Explain that mutations can lead to genetic variation and the creation of new species
- Explain that evolution is a gradual process that occurs over long periods of time
- Explain that adaptations are genetic and will be passed on from one generation to the next
- Observe fossils from Pennsylvania and explain how they provide evidence for species that lived in that area a long time ago
- Explain how the plant and animal life in Pennsylvania has changed from past to present using fossil evidence

Core Activities: Students will complete/participate in the following:

- Direct Instruction: Guided Note Strategies and Classroom Discussion: evolution as a theory, evidence for evolution, fossil evidence, adaptations to the environment, natural selection, survival of the fittest, environmental influences on evolution, and human evolution
- Guided Practice: Unit Packets with guided notes
- Independent Practice: worksheets on evolution as a theory, evidence for evolution, fossils, natural selection, environmental influences on evolution, Peppered Moth evolution, and human evolution
- Labs: Traiting Places Lab continued, natural selection lab
- Group Work: Adaptation activity, Peppered Moth activity
- Projects: Human Evolution Timeline

Extensions:

- Independent readings
- Online videos (Crash Course)
- Current research articles

Remediation:

- Small group work to review material, reading level appropriate materials for differentiated instruction. Additional practice worksheets given to students on an as-needed basis. Study guides will be provided before assessment

Materials & Resources:

- *Concepts and Challenges: Life Science* Textbook
- *Concepts and Challenges: Life Science* Online
- PSSA Prep Books
- PowerPoint Notes
- Evolution Packet
- Online Videos from Discovery Education and Youtube

Assessments:

- Diagnostic: Bell-Ringers, Homework review, brainstorming activities
- Formative: Homework, leveled questioning, groupwork, essential question discussion, exit tickets, think-pair-share, quick writing, whiteboard review
- Summative: Objective Quizzes, Evolution Unit Test

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Curriculum Scope & Sequence

Planned Course: Life Science

Unit: Ecology

Time frame: 6 weeks

State Standards, Anchors, and Eligible Content: S8.A.1.2, S8.A.1.2.2, S8.A.1.2.4, S8.A.1.3, S8.A.1.3.2, S8.A.1.3.3, S8.A.1.3.4, S8.A.3.1, S8.A.3.1.1, S8.A.3.1.2, S8.A.3.1.3, S8.A.3.1.4, S8.A.3.1.5, S8.A.3.2, S8.A.3.2.1, S8.A.3.2.2, S8.A.3.2.3, S8.B.3.1, S8.B.3.1.1, S8.B.3.1.2, S8.B.3.1.3, S8.B.3.2, S8.B.3.2.1, S8.B.3.2.2, S8.B.3.2.3, S8.B.3.3, S8.B.3.3.1, S8.B.3.3.2, S8.B.3.3.3, S8.B.3.3.4, S8.C.2.2, S8.C.2.2.1, S8.C.2.2.2, S8.C.2.2.3, S8.D.1.1, S8.D.1.1.3, S8.D.1.2, S8.D.1.2.1, S8.D.1.2.2, S8.D.1.3, S8.D.1.3.1, S8.D.1.3.2, S8.D.1.3.3, S8.D.1.3.4

Essential content/objectives: At end of the unit, students will be able to:

- Identify various environmental issues such as pollution and pest control
- Explain how various forms of pollution and pest control measures can affect health long term
- Explain how the needs of humans and modern technology affect agriculture and the environment
- Use a graph to predict the carrying capacity of a species in an ecosystem
- Use a diagram to describe the stages of ecological succession of a hardwood forest and a freshwater pond
- Discuss how an ecosystem is changing
- Identify variables that will cause changes in an ecosystem
- Infer how variables affect changes in the ecosystem
- Explain how the environment is constantly changing and those changes lead to life being able to continue given various scenarios
- Describe an ecosystem as a natural system of related parts with various roles that work together to provide the necessities of life
- Describe a watershed as a system with various parts that work together with specific roles to keep the system functioning
- Explain how there are trophic levels within an ecosystem and that each trophic level depends on the one below
- Distinguish between the inputs and outputs of an ecosystem
- Distinguish between and describe the various processes that occur in an ecosystem and how feedback in an ecosystem will affect these processes, inputs, and outputs
- Describe energy flow within a food web and food chain as an open loop system in which energy and matter can flow in and out
- Describe the carbon and nitrogen cycles as closed loop systems in which only matter flows in and out
- Explain how certain components of an ecosystem can play various roles in various environments
- Identify and describe the models that scientists use to explore ecosystems and river systems
- Describe how scientists use these models to explore natural systems

- Describe how engineers will use models of ecosystems in order to develop new or improved technology to solve problems
- Use a model of the water cycle to describe the cause and effect relationship within the stages of that cycle
- Explain how energy moves through a food web
- Explain how energy is lost from trophic level to trophic level (energy pyramid)
- Create a food chain and food web and describe how energy moves through it
- Differentiate between abiotic and biotic factors
- Identify and describe the 7 major biomes in terms of their abiotic and biotic factors including climate, soil type, sunlight, and native living organisms
- Explain the relationship between producers, consumers, and decomposers
- Explain symbiotic relationships: commensalism, parasitism, and mutualism
- Describe the relationship between predators and prey
- Describe the relationship between primary, secondary, and tertiary consumers
- Explain how organisms will compete for resources including food, shelter, and mates
- Explain how deforestation can change populations in an ecosystems
- Explain how limiting factors will influence the population of a species in an ecosystem
- Use evidence to explain how disease, human land use, natural disaster, and invasive species can affect and change populations in an ecosystem
- Explain, using evidence, how biodiversity is beneficial in an ecosystem
- Describe how organisms will respond to changes in climate and how these changes will affect survival
- Describe how certain organisms will migrate or hibernate in response to the changes in different seasons
- Describe how certain organisms will change colors in response to changes in their environment
- Explain how human activities such as farming, mining, deforestation, and pollution affect local, regional, and global environments
- Explain the difference between renewable and nonrenewable resources and give examples of each
- Explain how renewable and nonrenewable resources are used for human needs such as food, energy, water, clothing, and shelter
- Describe how recycling can help conserve natural resources and prevent pollution
- Explain how composting can help minimize the amount of waste that is deposited in a landfill
- Explain how landfills can negatively affect the environment
- Explain how incineration can lead to increased pollutants in the air
- Explain how sewage treatment plants can lead to pollution within water systems
- Explain how herbicides, natural predators, and biogenetics can have long-term effects on the environment

- Describe the sun as the primary source of energy in an ecosystem
- Compare fossil fuels and alternative fuels in terms of renewable resources
- Describe how over-using renewable resources can produce waste and have negative impacts on the environment
- Describe how renewable resources can be conserved in order to prevent waste
- Explain that once nonrenewable resources are used up, they will be gone from the environment forever
- Describe how using nonrenewable resources such as fossil fuels can produce waste and lead to climate change
- Describe various ways to conserve nonrenewable resources to help protect the environment
- Identify and describe the various soil types found in Pennsylvania and explain how they were formed
- Identify and describe the various soil types found in different biomes and explain how they were formed
- Describe a products transformation process*:* prospecting, propagating, growing, maintaining, adapting, treating, converting, distributing, and disposing
- Explain how transforming products can have various impacts on Earth's resources
- Describe how human-made processes such as mining and agriculture affect both living and nonliving things
- Describe the stages of the water cycle: precipitation, condensation, run-off, evaporation, infiltration and transpiration
- Describe the phase changes for each stage of the water cycle
- Describe the energy inputs for the water cycle
- Compare and contrast characteristics of freshwater and saltwater based on density, conductivity, and composition
- Compare and contrast the use of freshwater and saltwater systems in their use as natural resources
- Distinguish between wetland systems, ocean systems, river systems, and watersheds
- Describe the relationship between various water systems and landforms
- Identify the physical characteristics of a stream: biodiversity, water quality, flow rate, tributaries, surrounding watershed
- Explain how the physical characteristics of a stream will determine what types of organisms are found in an aquatic environment

Core Activities: Students will complete/participate in the following:

- Direct Instruction: Guided Note Strategies and Classroom Discussion: abiotic vs. biotic factors, characteristics of an ecosystem, habitats and niches, limiting factors, major biomes, ecological succession, renewable and nonrenewable resources, deforestation, producers, consumer, decomposers, predators and prey, food chains and food webs, energy pyramids, symbiotic relationships, parasitism, commensalism, mutualism, adaptations, water cycle, nitrogen cycle, carbon cycle, balance in an ecosystem
- Guided Practice: Unit Packets with guided notes
- Independent Practice: worksheets on abiotic vs. biotic factors, characteristics of an ecosystem, habitats and niches, limiting factors, major biomes, ecological succession, renewable and nonrenewable resources, deforestation, producers, consumer, decomposers, predators and prey, food chains and food webs, energy pyramids, symbiotic relationships, parasitism, commensalism, mutualism, adaptations, water cycle, nitrogen cycle, carbon cycle, balance in an ecosystem
- Group Work: Symbiotic relationship activity, food chain activity
- Projects: Biome project, food web project, cycle song project

Extensions:

- Independent readings
- Online videos (Crash Course)
- Current research articles

Remediation:

- Small group work to review material
- Reading level appropriate materials for differentiated instruction
- Additional practice worksheets given to students on an as-needed basis
- Study guides will be provided before assessment

Materials & Resources:

- *Concepts and Challenges: Life Science* Textbook
- *Concepts and Challenges: Life Science* Online
- PSSA Prep Books
- PowerPoint Notes
- Chapter 11 and Chapter 12 Packets
- Online Videos from Discovery Education and Youtube

Assessments:

- Diagnostic: Ecology Pre-Test, Bell-Ringers, Homework review, brainstorming activities
- Formative: Homework, leveled questioning, group work, essential question discussion, exit tickets, think-pair-share, quick writing, whiteboard review
- Summative: Objective Quizzes, Chapter 11 Test, Chapter 12 Test, Food Web Project, Biome Project

Board Approved
October 2016

Curriculum Scope & Sequence

Planned Course: Life Science

Unit: DNA

Time frame: 4 weeks

State Standards, Anchor(s): (Keystone Standards) BIO.A.2.2, BIO.A.2.2.3, BIO.B.1.2, BIO.B.1.2.1, BIO.B.1.2.2, BIO.B.2.2, BIO.B.2.2.1, BIO.B.2.2.2, BIO.B.2.3, BIO.B.2.3.1, BIO.B.2.4, BIO.B.2.4.1

Essential content/objectives: At end of the unit, students will be able to:

- Describe the overall structure of DNA
- Explain how the bases pair in DNA: A pairs with T and C pairs with G
- Describe the basic unit of structure of DNA as nucleotides
- Describe how the structure of DNA determines the function of DNA
- Describe the overall structure of proteins and that amino acids are the basic unit of structure of proteins
- Describe how the structure of protein dictates its function
- Describe the steps of DNA replication
- Describe DNA replication as a semiconservative process in which information is copied from an old strand to a new strand using a template
- Describe how information is transmitted and conserved during DNA replication
- Explain that chromosomes are made of segments of DNA called genes that code for a specific trait
- Explain that various versions of a gene are called alleles
- Describe the steps of transcription and translation
- Describe how transcription and translation are similar in all organisms
- Explain how the nucleus, ribosomes, Golgi apparatus, and endoplasmic reticulum work together to produce and transport proteins
- Explain how the various types of mutations affect the DNA sequence: silent, missense, nonsense, frameshift, insertion, deletion
- Explain that mutations can be harmful, beneficial, or neutral to an organisms' phenotype
- Explain how genetic engineering has benefitted human beings in the fields of medicine, forensics, and agriculture
- Explain how genetic engineering has led to cloning, gene splicing, gene therapy, genetically modified organisms, and selective breeding

Core Activities: Students will complete/participate in the following:

- Direct Instruction: Guided Note Strategies and Classroom Discussion: DNA discovery, DNA structure, base pairings, DNA vs. RNA, DNA replication, transcription, translation, amino acids, proteins, genetic engineering, cloning, and mutations
- Guided Practice: Unit Packets with guided notes
- Independent Practice: DNA discovery, DNA structure, base pairings, DNA vs. RNA, DNA replication, transcription, translation, amino acids, proteins, genetic engineering, cloning, mutations
- Group Work: Building a DNA ladder and DNA sequencing games
- Labs: Strawberry Lab

Extensions:

- Independent readings
- Online videos (Crash Course)
- Current research articles

Remediation:

- Small group work to review material
- Reading level appropriate materials for differentiated instruction
- Additional practice worksheets given to students on an as-needed basis
- Study guides will be provided before assessment

Materials & Resources:

- *Concepts and Challenges: Life Science* Textbook
- *Concepts and Challenges: Life Science* Online
- PowerPoint Notes
- DNA packet
- Online Videos from Discovery Education and Youtube

Assessments:

- Diagnostic: DNA Pre-Test, Bell-Ringers, Homework review, brainstorming activities
- Formative: Homework, leveled questioning, groupwork, essential question discussion, exit tickets, think-pair-share, quick writing, whiteboard review
- Summative: Objective Quizzes, DNA Test, DNA ladder