

## Wilson Area School District Planned Course Guide

**Title of Planned Course:** Life Science

**Subject Area:** Life Science

**Grade Level:** 8

**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 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 academic school year

**Curriculum Writing Committee:** Eric Yurvati

## Curriculum Map

**August:** Nature of science

**September:** Nature of science and Life, Cell Types and Organelles (prokaryotes vs. eukaryotes)  
(plants vs. animals)

**October:** Cell Types and Organelles (see above)

**November:** Cell Processes (cell transport)

**December:** Cell Processes (bioenergetics)

**January:** Cellular Reproduction (cell division - mitosis and meiosis)

**February:** Genetics and DNA

**March:** Genetics and DNA/Evolution

**April:** Evolution/Ecology

**May:** Ecology

**June:** Classification

## Wilson Area School District Planned Course Materials

**Course Title:** Life Science

**Textbook:** Biggs, A. (2020). *Inspire science: Life*. McGraw-Hill Education.

**Supplemental Books:** Biggs, A. (2020). *Inspire science: Life*. McGraw-Hill Education. Online: Student Version.

<https://www.mheducation.com/prek-12/program/inspire-science-life/MKTSP-QIF23M2.html>

*Ck-12: Life Science.*

<https://www.ck12.org/c/life-science/>

*Concepts and Concepts: Life Science.* Bernstein, Schacter, Winkler, Wolfe. 2009

### **Teacher Resources:**

*Amoeba Sisters*

<https://www.youtube.com/@AmoebaSisters>

Biggs, A. (2020). *Inspire science: Life*. McGraw-Hill Education. Teacher Edition

*Crash Course Biology*

<https://www.youtube.com/user/crashcourse>

Gizmos: Stem Simulations and Virtual Labs

<https://gizmos.explorellearning.com/>

## Curriculum Scope & Sequence

**Planned Course:** Life Science

**Unit:** Nature of Science

**Time frame:** 2 weeks

**State Standards. Anchor(s) or adopted anchor:** 3.5.6-8.B, 3.5.6-8DD, 3.5.6-8.Q

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

- Identify and formulate a scientific question and hypothesis
- Recall 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
- Explain the difference between quantitative and qualitative data
- 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
- Formulate scientific questions and hypotheses
- Identify 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 errors.
- Select and apply correct measurement techniques and instruments in an experiment
- Record observations accurately using tables, graphs and other methods
- Differentiate between inputs, outputs and feedback technological systems
- Use instruments to gather data on the performance of everyday products
- Apply a technology and engineering design thinking process

**Core Activities:** 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 identify variables in a scenario/lab; model correct lab techniques for safety and accurate measurement. Amoeba Sisters video on the scientific method to reinforce visually the steps of experimental design and variables.
- Guided Practice: Unit worksheets and classwork worksheets on writing scientific questions and hypotheses, identifying independent and dependent variables, identifying and explaining control

variables, identifying control groups, qualitative vs. quantitative data, making graphs from data, inferences vs. predictions, and writing conclusion practice.

- Independent Practice: Worksheets on writing scientific questions and hypotheses, identifying independent and dependent variables, identifying and explaining control variables, identifying control groups, qualitative vs. quantitative data, making graphs from data, inferences vs. predictions, and writing conclusion practice
- Labs: Thumb Lab or Penny Lab and Lab write-up
- Group Work: Ivory Billed Woodpecker Case Study, Germination Gizmo

**Extensions:** Create your own experiment independent lab

### **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
- Teacher-designed review sessions such as Kahoot or Blooket
- Study guides will be provided before assessments

### **Instructional Methods**

- Direct instruction
- Note-taking strategies
- Labs and Investigations
- C.E.R. (Claim/Evidence/Reasoning)
- Modeling
- Small-group collaborative activities
- Small and large-group discussion
- Guided practice
- Independent practice
- Practice with online programs (i.e. Online textbook, CK-12 Life Science)

### **Materials & Resources:**

- Nature of Science Google Slides presentation
- Scientific method worksheets:
  - Scientific Method- Controls and Variables Part 1 and 2 (Spongebob worksheets)
  - Scientific Method Beri Beri Case Study
  - Scientific Method - Design an Experiment
  - Graphing and Data Analysis worksheets
- Scientific Method Germination Gizmo
- Thumb Lab and associated materials indicated in Lab's handout
- Amoeba Sisters - Nature of Science

### **Assessments:**

- Formative Assessment: Do Nows, guided practice review, tickets out the door, Blooket and/or Kahoot sessions
- Summative: Nature of science quiz and test, Thumb Lab lab report

## Curriculum Scope & Sequence

**Planned Course:** Life Science

**Unit:** Life, Cell Types and Organelles

**Time frame:** 5 Weeks

**State Standards, Anchor(s) or adopted anchor:** 3.1.6-8.A, 3.1.6-8.B, 3.1.6-8.C, 3.1.6-8.H

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

- Identify the 6 characteristics of life
- Explain how organisms may exhibit the characteristics of life
- Classify and entity as either living or nonliving based on the characteristics of living organisms
- Identify the three parts of the cell theory and explain the evidence that supports the cell theory
- Use a microscope to observe 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
- Explain 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
- Compare and contrast structures that can be found in prokaryotic and eukaryotic cells as well as plant versus animal cells
- Develop and use a model to describe the function of a cell as a whole and the ways that parts of cells contribute to the function

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

- Direct Instruction: Guided Note Strategies and Classroom Discussion: discuss characteristics of life, 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, "Is it Alive?" class activity, cell part flashcards
- Independent Practice: worksheets on cell theory, cell part structure and function, plant vs. animal cells, cell diagrams, levels of organization and microscope parts. Cell Explorer internet game
- Labs: Microscope lab, Cell Baggie lab
- Group Work: cell diagrams, Cell Structure Gizmo, cell city analogy worksheet, Prokaryotic and Eukaryotic Cells POGIL, Eukaryotic Organelles POGIL
- Projects: Characteristics of Life Animal Infographic Project, Cell Travel Brochure 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
- Class-level Blooket or Kahoot review sessions prior to assessments

### **Instructional Methods**

- Direct instruction
- Note-taking strategies
- Labs and Investigations
- C.E.R. (Claim/Evidence/Reasoning)
- Modeling
- Small-group collaborative activities
- Small and large-group discussion
- Guided practice
- Independent practice
- Practice with online programs (i.e. Online textbook, CK-12 Life Science)

### **Materials & Resources:**

- *Inspire Science: Unit 2 - Module 1: Cells and Life*
- Characteristics of Life, Prokaryotic and Eukaryotic Cell and Eukaryotic Cell Organelles Google Slides presentation
- "Is it Alive?" worksheet
- Unlabeled plant and animal cell diagrams
- Cell City Analogy worksheet
- Prokaryotic and Eukaryotic Cells and, Eukaryotic Organelles POGIL
- Cell Structures Gizmo
- Elodea and Cheek Cell Microscope Lab
- Cell Baggie Lab
- Amoeba Sisters - Characteristics of Life and Prokaryotic and Eukaryotic Cells
- Cell Explorer website
- Cell Travel Brochure instructions, template and related materials
- Cell structures Blooket

### **Assessments:**

- Formative Assessment: Do Nows, guided practice review, tickets out the door, Blooket and/or Kahoot sessions
- Summative: Cell types and organelles quiz and test, Characteristics of Life Animal Infographic Project and Cell Travel Brochure

## Curriculum Scope & Sequence

**Planned Course:** Life Science

**Unit:** Cell Processes

**Time frame:** 5 Weeks

**State Standards, Anchor(s) or adopted anchor:** 3.1.6-8.A, 3.1.6-8.B, 3.1.6-8.F, 3.1.6-8.G, 3.1.6-8.N, 3.2.6-8.E

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

- Describe how cell organelles (parts) function together as parts during cell transport to move substance into or out of the cell
- Explain the difference between active and passive transport
- Explain concentration and how materials have the tendency to move from areas of high concentration to low concentration
- Use a percentage to describe the movement of substances into or out of the cell
- 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
- Explain how maintaining osmotic balance allows an organism to maintain homeostasis
- Describe how cell organelles (parts) function together during photosynthesis and cellular respiration to provide energy for the cell
- Identify the reactants and products of photosynthesis and cellular respiration equations
- Distinguish between system inputs and outputs of photosynthesis and cellular respiration
- Distinguish between the cell processes and feedback requirements of cellular transport, photosynthesis, and cell respiration
- 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
- Describe the cell structures involved in photosynthesis and cellular respiration that provide energy for the cell
- 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
- Describe how cell organelles (parts) function together during photosynthesis and cellular respiration to provide energy for the cell and the organism as a whole

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

- Direct Instruction: Guided Note Strategies and Classroom Discussion: cellular transport, photosynthesis, and cellular respiration
- Guided Practice: Unit Packets with guided notes, photosynthesis/cellular respiration foldable, and osmosis problems
- Independent Practice: worksheets on cellular transport, photosynthesis, and cellular respiration, Labs: Osmosis Egg Lab

- Group Work: photosynthesis/cellular respiration equation cards, Diffusion Gizmo, Osmosis Gizmo, Photosynthesis versus Respiration Gizmo

### **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

### **Instructional Methods**

- Direct instruction
- Note-taking strategies
- Labs and Investigations
- C.E.R. (Claim/Evidence/Reasoning)
- Modeling
- Small-group collaborative activities
- Small and large-group discussion
- Guided practice
- Independent practice
- Practice with online programs (i.e. Online textbook, CK-12 Life Science)

### **Materials & Resources:**

- *Inspire Science: Unit 1 - Module 1 Matter and Energy in Ecosystems*
- *Inspire Science: Unit 2 - Module 1 Cells and Life*
- Cell transport notes, photosynthesis and respirations notes
- Osmosis problems worksheets
- Photosynthesis and cellular respiration foldable
- Gizmos - diffusion, osmosis, photosynthesis versus cellular respiration
- Egg lab and related materials
- Amoeba sister videos on cell transport, photosynthesis and respiration
- Cell transport, photosynthesis and respiration Blookets

### **Assessments:**

- Formative Assessment: Do Nows, guided practice review, tickets out the door, Blooket and/or Kahoot sessions
- Summative: Cellular processes quiz and test, Osmosis egg lab

# Curriculum Scope & Sequence

**Planned Course:** Life Science

**Unit:** Cellular Reproduction

**Time frame:** 4

**State Standards, Anchor(s) or adopted anchor:** 3.1.6-8.A, 3.1.6-8.B, 3.1.6-8.C, 3.1.6-8.E, 3.1.6-8.M, 3.1.6-8.N

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

- Describe how cell organelles (parts) function together during mitosis and meiosis, which allows the organism to grow and repair damaged cells
- Explain why cells undergo cell division (both mitosis and meiosis)
- Identify the stages of the cell cycle
- Describe the cell structures involved in meiosis and mitosis for cellular reproduction
- Describe how cell organelles (parts) function together during mitosis and meiosis in order to reproduce
- Compare and contrast the processes of mitosis and meiosis in terms of the phases, cells involved and the overall function of each process

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

- Direct Instruction: Guided Note Strategies and Classroom Discussion: cellular respiration (mitosis, meiosis and errors of the cell cycle)
- Guided Practice: Unit Packets with guided notes, Mitosis and meiosis illustrative diagrams and Venn diagrams
- Independent Practice: worksheets on cellular reproduction, cell cycle cut and paste, Mitosis Mover, “Snurfle” meiosis, Labs: Onion root tip lab, karyotype lab
- Group Work: photosynthesis/cellular respiration equation cards, mitosis flashcards, Diffusion Gizmo, Osmosis Gizmo, Photosynthesis versus Respiration Gizmo, Mitosis Gizmo, Meiosis Gizmo

**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

**Instructional Methods**

- Direct instruction
- Note-taking strategies
- Labs and Investigations
- C.E.R. (Claim/Evidence/Reasoning)
- Modeling
- Small-group collaborative activities

- Small and large-group discussion
- Guided practice
- Independent practice
- Practice with online programs (i.e. Online textbook, CK-12 Life Science)

**Materials & Resources:**

- *Inspire Science: Unit 3 - Module 1 Reproduction of Organisms*
- Cellular reproduction notes (mitosis, meiosis and errors of the cell cycle notes)
- Unlabeled mitosis and meiosis diagrams
- Cell cycle cut-and-paste
- Gizmos - mitosis and meiosis
- Mitosis mover website
- “Snurfle” meiosis website
- Onion root tip lab and associated materials
- Karyotype lab and associated materials
- Amoeba sister videos mitosis and meiosis
- Mitosis and meiosis Blookets

**Assessments:**

- Formative Assessment: Do Nows, guided practice review, tickets out the door, Blooket and/or Kahoot sessions
- Summative: Cellular reproduction quiz and test, Onion root tip lab

## Curriculum Scope & Sequence

**Planned Course:** Life Science

**Unit:** Genetics and DNA

**Time frame:** 5 weeks

**State Standards. Anchor(s) or adopted anchor:** 3.1.6-8.B, 3.1.6-8.E, 3.1.6-8.M

**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 onto 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
- Explain how traits are inherited
- Explain the difference between phenotypes and genotypes and be able to explain why an organism may have a phenotype ratio that differs from its genotype ratio

**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, DNA foldable
- 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, "Snurfle genetics" online activity, mouse genetics Gizmo, DNA Structure Gizmo
- Labs: "Reebop Lab," DNA Model lab
- Group Work: Punnett Square practice, inherited traits activity
- Projects: monster genetics 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

### **Instructional Methods**

- Direct instruction
- Note-taking strategies
- Labs and Investigations
- C.E.R. (Claim/Evidence/Reasoning)
- Modeling
- Small-group collaborative activities
- Small and large-group discussion
- Guided practice
- Independent practice
- Practice with online programs (i.e. Online textbook, CK-12 Life Science)

### **Materials & Resources:**

- *Inspire Science*: Unit 3 - Reproduction of organisms
- Mendelian genetics and Punnett square notes, DNA structure notes, Mutation notes
- Punnett square practice worksheets
- Mouse genetics Gizmo, DNA Structure Gizmo
- Monster genetics project instructions and rubric
- “Reebop” lab handout and materials
- DNA model lab handout and kits
- DNA foldable PowerPoint
- Amoeba sisters video on genetics and DNA
- Genetics and DNA Blookets

### **Assessments:**

- Formative Assessment: Do Nows, guided practice review, tickets out the door, Blooket and/or Kahoot sessions
- Summative: Genetics and DNA quiz and test, “Reebop” lab

## Curriculum Scope & Sequence

**Planned Course:** Life Science

**Unit:** Evolution

**Time frame:** 5 Weeks

**State Standards. Anchor(s) or adopted anchor:** 3.1.6-8.D, 3.1.6-8.J, 3.1.6-8.O, 3.1.6-8.P, 3.1.6-8.Q, 3.1.6-8.R, 3.1.6-8.S, 3.1.6-8.T, 3.1.6-8.U

**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 worksheets such as "Darwin Problems"
- Independent Practice: worksheets on evolution as a theory, evidence for evolution, fossils, natural selection, environmental influences on evolution, and human evolution, peppered moth Gizmo, Evolution: natural and artificial selection Gizmo
- Labs: Natural selection lab, rock pocket mouse lab, molecular evidence for evolution lab
- Group Work: Adaptation activity, Peppered Moth activity
- Projects: "Build-a-Beast" evolution 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

**Instructional Methods**

- Direct instruction
- Note-taking strategies
- Labs and Investigations
- C.E.R. (Claim/Evidence/Reasoning)
- Modeling
- Small-group collaborative activities
- Small and large-group discussion
- Guided practice
- Independent practice
- Practice with online programs (i.e. Online textbook, CK-12 Life Science)

**Materials & Resources:**

- *Inspire Science - Unit 4: Module 1 - Natural Selection and Adaptations*
- *Inspire Science - Unit 4: Module 2 - Evidence of Evolution*
- Darwin and natural selection notes, evidence for evolution notes
- Natural selection and evolution worksheets
- “Evolutionary Arms Race” video and accompanying worksheet
- Peppered moth Gizmo, evolution: natural and artificial selection Gizmo
- Rock pocket mouse lab handout, materials and video clip
- Molecular evidence lab handouts
- “Build-a-Beast” project instructions and rubric

**Assessments:**

- Formative Assessment: Do Nows, guided practice review, tickets out the door, Blooket and/or Kahoot sessions
- Summative: Evolution quiz and test, “Build-a-Beast” project

## Curriculum Scope & Sequence

**Planned Course:** Life Science

**Unit:** Ecology

**Time frame:** 8 Weeks

**State Standards. Anchor(s) or adopted anchor:** 3.1.6-8.F, 3.1.6-8. G, 3.1.6-8.I, 3.1.6-8.J, 3.1.6-8.K, 3.1.6-8.L, 3.1.6-8.U, 3.4.6-8.A, 3.4.6-8.B, 3.4.6-8.C, 3.4.6-8.D,3.4.6-8.E, 3.4.6-8.F, 3.4.6-8.G, 3.4.6-8.H, 3.4.6-8. I

**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
- 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 longterm 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

**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

- 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, balance in an ecosystem Group Work: Symbiotic relationship cut and paste activity, food chain activity, “Exploring Biomes” activity
- Projects: Biome project, Symbiosis “Wanted Ad” project, food web 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

### **Instructional Methods**

- Direct instruction
- Note-taking strategies
- Labs and Investigations
- C.E.R. (Claim/Evidence/Reasoning)
- Modeling
- Small-group collaborative activities
- Small and large-group discussion
- Guided practice
- Independent practice
- Practice with online programs (i.e. Online textbook, CK-12 Life Science)

### **Materials & Resources:**

- *Inspire Science - Module 1: Matter and Energy in Ecosystems*
- *Inspire science - Module 2: Dynamic Ecosystems*
- *Inspire science - Module 3: Biodiversity in Ecosystems*
- Amoeba sister videos on ecology
- Wanted Ad instructions, topics and rubric
- Symbiosis cut and paste activity
- Ecological relationships POGIL
- Ecological succession POGIL
- Food web lab handout

### **Assessments:**

- Formative Assessment: Do Nows, guided practice review, tickets out the door, Blooket and/or Kahoot sessions
- Summative: Ecology quiz and test, “Wanted Ad” project, food web project

## Curriculum Scope & Sequence

**Planned Course:** Life Science

**Unit:** Classification

**Time frame:** 3 Weeks

**State Standards. Anchor(s) or adopted anchor:** 3.1.6-8.A, 3.5.6-8.L, 3.5.6-8.N

**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:** 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: "Fun with Classification" Lab
- Group Work: Kingdom Chart, Invertebrate Chart, Vertebrate Chart
- Projects: Kingdoms of Life trading card 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

**Instructional Methods**

- Direct instruction
- Note-taking strategies
- Labs and Investigations
- C.E.R. (Claim/Evidence/Reasoning)
- Modeling
- Small-group collaborative activities
- Small and large-group discussion
- Guided practice
- Independent practice
- Practice with online programs (i.e. Online textbook, CK-12 Life Science)

**Materials & Resources:**

- Classification and the Kingdoms of Life notes
- “Fun with Classification” handout and kits
- Blank kingdoms of life charts
- Classification unit worksheets
- Kingdoms of Life trading card project instructions and rubric

**Assessments:**

- Formative Assessment: Do Nows, guided practice review, tickets out the door, Blooket and/or Kahoot sessions
- Summative: This unit’s content will be incorporated into the final exam, “Wanted Ad” project, “Fun with Classification” lab