# Unit #3: Life Science 6- Diversity of Life

Content Area:	Science
Course(s):	Science 6
Time Period:	Fourth Marking Period
Length:	Mid-March through June
Status:	Published

#### **Unit Overview**

Life has existed on Earth for a very, very long time, more than 3.5 billion years, in fact. Over the millennia, an amazing variety of life has evolved. From humble single-celled beginnings in water to incredibly complex and large multicellular organisms that exist in the widest range of habitats imaginable, the diversity of life that currently exists boggles the mind.

Middle school students are ready to consider what it means to be a living organism. What are the characteristics that scientists use to define life? Are those characteristics hard and fast or are they flexible? Does something as outlandish as an archaeon that lives in boiling hot springs or a virus that depends upon other life-forms to reproduce fit into the definition students create? Students consider these questions as they encounter life throughout the course.

As these students' will inherit Earth, their understanding of life may lead to a more robust and informed response to the rapid loss of diversity.

### **STAGE 1- DESIRED RESULTS**

### 2020 New Jersey Student Learning Standards- Science

#### **Life Science**

SCI.MS-LS1-1	Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
SCI.MS-LS1-7	Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
SCI.MS-LS1-5	Construct a scientific explanation based on evidence for how environmental and genetic

	factors influence the growth of organisms.
SCI.MS-LS1-2	Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
SCI.MS-LS1-6	Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
SCI.MS-LS1-4	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
SCI.MS-LS3-2	Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
SCI.MS-LS1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

## **Science and Engineering Practices**

- Analyzing and Interpreting Data
- Asking Questions and Defining Problems
- Constructing Explanations and Designing Solutions
- Developing and Using Models
- Engaging in Argument from Evidence
- Obtaining, Evaluating, and Communicating Information
- Planning and Carrying Out Information
- Using Mathematics and Computational Thinking

## **Cross Cutting Concepts**

- Cause and Effect
- Energy and Matter
- Influence of Engineering, Technology, and Science on Society and the Natural World
- Interdependence of Science, Engineering, and Technology
- Patterns
- Scale, Proportion, and Quantity
- Stability and Change
- Structure and Functions
- Systems and System Models

## **Disciplinary Core Ideas**

#### **Physical Sciences**

• PS3D: Energy in Chemical Processes and Everyday Life

#### **Life Sciences**

- LS1A: Structure and Functions
- LS1B: Growth and Development of Organisms
- LS1C: Organization for Matter and Energy Flow in Organisms
- LS2C: Ecosystems Dynamics, Functioning, and Resilience
- LS3B: Variation of traits
- LS4D: Biodiversity and Humans

### **Engineering. Technology. and Applications of Science**

- ETS1A: Defining and Delimiting an Engineering Problem
- ETS1B: Developing Possible Solutioins
- ETS1C: Optimizing the Design Solution

#### **Essential Questions**

## Investigation 1: What is Life?

Part 1: How do you know if something is living?

Part 2: How do you know if something is living?

#### **Investigation 2:** The Microscope

- Part 1: How do objects appear when they are viewed through a microscope?
- **Part 2:** How can we estimate the size of an object by looking at it through the microscope?
- Part 3: What evidence can we find that brine shrimp are living organisms?

#### **Investigation 3: The Cell**

- Part 1: What microscope structures make up organisms such as elodea?
- Part 2: How are elodea and the paramecium alike, and how are they different?

Part 3: Is there life in the mini-habitats? If so, where did it come from?

Part 4: What microscopic structures make up organisms such as humans (you)?

#### **Investigation 4: Domains**

Part 1: What are the building blocks of cell structures?

**Part 2:** What evidence is there that bacteria are living organisms?

Part 3: What evidence is there that fungi are living organisms?

Part 4: What are the characteristics of archae?

#### **Investigation 5: Plants: The Vascular System**

**Part 1:** What happened to the water?

**Part 2:** How is water transported through a plant?

**Part 3:** How do plants use water?

#### **Investigation 6: Plant Reproduction and Growth**

Part 1: How do the structural adaptations of seeds help them survive?

- Part 2: How do environmental factors affect the germination and early growth of different food crops?
- **Part 3:** What is the purpose of a flower?

Part 4: What adaptations do flowering plants have to accomplish pollination?

#### **Investigation 7: Insects**

- **Part 1:** How do the structures and behaviors of the Madagascar hissing cockroach enable life's functions?
- **Part 2:** How is the insect transport system like plant and human transport systems and how is it different?

#### **Investigation 8: Diversity of Life**

- **Part 1:** What kind of plant and animal life exists in our schoolyard (neighborhood)?
- Part 2: How do you know if something is living?

### **Enduring Understanding**

The Diversity of Life Course emphasizes the use of knowledge and evidence to describe life in all its diversity. All organisms are made up of cells and carry out the characteristics of life.

#### Students will know... VOCABULARY

### **Investigation 1: What Is Life?**

dead, dormant, evidence, habitat, living, nonliving, organism

### **Investigation 2: The Microscope**

compound microscope, field of view, magnification, magnify, power scale

### **Investigation 3: The Cell**

asexual reproduction cell, cell membrane, cell structure, cell wall, chlorophyll chloroplast, cytoplasm, dormancy, elodea, mitochondrion, multicellular, organism, nucleus, organelle, paramecium, protest, single-celled organism

### **Investigation 4: Domains**

Archaea, atom, bacteria, classification, colony, control, culture, decomposer, domain, e. coli, eukaryote, fungus, microorganism, molecule, plasmid, prokaryote, spore

### **Investigation 5: Plants: The Vascular System**

aerobic, cellular respiration, guard cells, organ, organ system, phloem, photosynthesis, stomata, tissue, transpiration, vascular system, vein, xylem

### **Investigation 6: Plant Reproduction and Growth**

adaptation, coevolve, egg, environmental factor, fertilize, flower, genetic factor, germination, pollination, pollination, syndrome, pollinator, salinity, salt tolerant, seed, sexual reproduction sperm,

### **Investigation 7: Insects**

behavior, function, structure

### **Investigation 8: Diversity of Life**

### **Misconceptions About Diversity of life**

- Movement automatically indicates life, whereas students should know there are other characteristics such as exchanging of gases and reproduction to show evidence of life.
- Students assume the movement of the stage of a microscope appears in the same direction, however it's the opposite.
- All cells have a nuclei and a cell wall, fact not all cells have both.
- Organisms grow bigger when the cells grows bigger, fact it grows due to cell division.
- Some students confuse cells with molecules.
- Bigger organisms have bigger cell, fact bigger organism have more cells.
- Plants get their food from their roots, rather than the plant undergoing Photosynthesis.
- Seeds aren't alive however they are dormant until given the proper environment.

Students believe all insects are bugs, classification of Taxonomy.

#### Students will be able to...

### **Investigation 1: What Is Life?**

- Collect, analyze, and interpret data about five materials for evidence of life.
- Construct explanations and arguments related to the concepts of living, nonliving, dead, and dormant.

### **Investigation 2: The Microscope**

- Demonstrate proper use of the microscope.
- Draw scale representations of images seen through a microscope.
- Use computations thinking to estimate size of objects based on field of view.

### **Investigation 3: The Cell**

- Use a microscope to discover and observe, and compare structures of cells in multicellular and single-celled organisms.
- Describe differences between living cells that are organisms and living cells that are part of multicellular organisms.
- Refine the working definiton of life to include the cell.

### **Investigation 4: Domains**

- Observe the growth of bacteria on nutrient agar and bread mold on bread.
- Calculate the reproductive potential of bacteria.

• Determine that advances in technology have influenced the progress of science.

## Investigation 5: Plants: The Vascular System

- Plan and carry out an investigation to answer a question.
- Analyze and interpret data.
- Use mathematics and computational thinking to determine the amount of water unaccounted for in a vial with celery.

## **Investigation 6: Plant Reproduction and Growth**

- Dissect dry and wet lima bean seeds to discover the embroyo; dissect and mount the structures of a simple flower.
- Plan and carry out an investigation to determine how salinity affects the rate of germination of different food crops.
- Sequence the steps of pollination and fertilization.
- Examine a flower to discover its pollination syndrome.

## **Investigation 7: Insects**

- Observe and explain how hissing cockroaches' structural and behavioral adaptations help them survive.
- Compare the transport systems of insects, plants, and humans.

## Investigaiotn 8: Diversity of Life

- Use different collection techniques to gather organisms.
- Compare predicted species diversity to observed species diversity in a local study site.

Argue using evidence about whether virsues are living.

## Students will be able to...

- Observe some properties of matter.
- Find the mass of a known volume of water.
- Measure the mass and volume of some regular and irregular objects.
- Predict whether an object will float or sink on the basis of how it feels.
- Use density to predict whether a substance will float or sink in water.
- Determine the density of different liquids. Build a density column.
- Use density to predict how solids will behave when they are placed in a density column.
- Find out whether air has volume.
- Design an experiment that can be used to find out the mass of a sample of air.
- Try to measure the mass of a sample of air.
- Build a working thermometer and use it to measure temperature.
- Discuss how your thermometer works and relate this to changes in the volume and density of matter.
- Observe and record the effects of heating on different substances.
- Measure the temperature of ice water as it is heated.

- Observe what happens to ice as it is heated.
- Discuss what happens to the mass of substances when they change state.
- Use your knowledge and skills to solve problems related to the characteristic properties of matter.
- Describe the appearance of several elements.
- Perform tests and make observations to determine some physical properties of elements.
- Collect information on elements and organize it into a table.
- Use the information collected to classify elements into groups.
- Compare your classification system with one used by chemists.
- · Identify these groups on the periodic table.
- Discuss the differences between reactants and products.
- Conduct an inquiry to compare how different metals react with acid.
- Discuss how differences in the chemical properties of metals affect how they are extracted from their ores and used.
- Design and conduct an experiment to compare how different metals corrode.
- Explain results in terms of the chemical reaction involved in the rusting process.
- Conduct an inquiry to compare the mass of the reactants and the mass of the products in the chemical reaction that takes place when an effervescent tablet is added to water in both open and closed containers.
- Determine whether the Law of Conservation of Mass can be applied to chemical reactions.

#### **STAGE 2- EVIDENCE OF LEARNING**

#### **Formative Assessment**

- 3- Minute Pause
- A-B-C Summaries
- Analogy Prompt
- Choral Response
- Debriefing
- Exit Card / Ticket
- Hand Signals
- Idea Spinner
- Index Card Summaries
- Inside-Outside Circle Discussion (Fishbowl)
- Journal Entry
- Misconception Check
- Observation
- One Minute Essay
- One Word Summary

- Portfolio Check
- Questions & Answers
- Quiz
- Self-Assessment
- Student Conference
- Think-Pair-Share
- Web or Concept Map

#### **Authentic Assessments**

- follow lab procedures
- complete assignments
- develop and utilize models
- cooperate in groups and with partners
- complete a written science journal
- maintain class notes and vocabulary in MacBook Airs
- complete data tables
- complete and interpret graphs
- teacher observations
- quick writes

#### **Benchmark Assessments**

- Final module exam
- End of investigation assessments
- I-Checks
- Focus questions

#### **STAGE 3- LEARNING PLAN**

#### **Instructional Map**

Investigation 1: What is Life? Investigation 2: The Microscope Investigation 3: The Cell Investigation 4: Domains Investigation 5: Plants: The Vascular System Investigation 6: Plant Reproduction and Growth Investigation 7: Insects Investigation 8: Diversity of Life

## **INVESTIGATION 1: WHAT IS LIFE?**

#### INV 1: Part 1- Living or Nonliving (3 Sessions)

Students observe the antics of a mysterious material when it is placed on water and record their observations. They work in groups to sort pictures of objects into living and nonliving categories, defining the characteristics that qualify objects as living. The pictures are displayed in class so that students can reevaluate their decisions as the course progresses. Students set up minihabitats for future study, using organic materials collected locally.

#### **Content:**

• Any free-living thing is an organism.

• All organisms exhibit common characteristics and have certain requirements: they grow, need energy (food) and water, exchange gases, respond to the environment, reproduce, eliminate waste, and need a suitable environment in which to live.

• Something can be dead only if it was once living.

#### INV 1: Part 2- Is Anything Alive in Here? (3 Sessions)

Students place five unidentified materials (sand, yeast, polyacrylate beads, radish seeds, and brine shrimp eggs) in different environments and observe what happens over several days. They determine if each material is living and record the evidence that supports their determinations. Students are introduced to the distinction between living, nonliving, dormant, and dead.

#### **Content:**

• Some organisms can become dormant to survive an unsuitable environment.

### **INVESTIGATION 2: THE MICROSCOPE**

#### INV 2: Part 1- Meet the Microscope (2 Sessions)

Students learn to handle and operate a microscope. They learn the parts of the microscope and the tools in the microscope kit. They observe print and simple objects to learn about image orientation. Students engage with a virtual microscope to reinforce care and use.

#### **Content:**

• A compound optical microscope is composed of a two-lens system (eyepiece and objective lens), a stage on which to mount the material being observed, a light source (lamp or reflected), and a focusing system.

• A microscope may reverse and invert images.

### INV 2: Part 2- Field of View (2 Sessions)

Students are introduced to the concept of scale. They use small, transparent millimeter rulers to discover the diameter of the field of view at various magnifications. They use this information to estimate the size of two organisms at different magnifications. Practice with digital resources reinforces the skills learned.

## **Content:**

• The field of view (FOV) is the diameter of the circle of light seen through the microscope. As the power increases, the FOV decreases.

• A microscope's optical power is the product of the magnification of the eyepiece and the objective lens.

## INV 2: Part 3- Microscopic Life (2 Sessions)

Students use their microscopes to observe brine shrimp to confirm that they are living organisms. They estimate the size of the brine shrimp. This is the first opportunity for students to use the microscope to make scientific observations.

### **Content:**

• The field of view (FOV) is the diameter of the circle of light seen through the microscope. As the power increases, the FOV decreases.

• A microscope's optical power is the product of the magnification of the eyepiece and the objective lens.

## **INVESTIGATION 3: THE CELL**

### INV 3: Part 1- Discovering Cells (2 Sessions)

Students look at elodea and discover cells. They may also find something else in the water that they will identify as living, based on their definition.

### **Content:**

• The cell is the basic unit of life. All living things are made up of one or more cells.

• Every cell has structures that enable it to carry out life's functions.

### INV 3: Part 2- Paramecia (2 Sessions)

Students start a detailed investigation into paramecium structures and behaviors. Students recognize paramecia as single-celled organisms.

## **Content:**

- The cell is the basic unit of life. All living things are made up of one or more cells.
- Every cell has structures that enable it carry out life's functions.
- Both single-celled and multicellular organisms exhibit all the characteristics of life.

• Asexual reproduction is a method of reproduction that results in offspring with identical genetic information.

## INV 3: Part 3- Microworlds (1 Session)

Students explore the minihabitats they created to appreciate the diversity in aquatic microorganisms. Students consider where life in the minihabitats came from and recognize that the organisms they observed were always present, only dormant.

## **Content:**

- Both single-celled and multicellular organisms exhibit all the characteristics of life.
- Some organisms can become dormant to survive in an unsuitable environment.

### INV 3: Part 4- Human Cheek Tissue (3 Sessions)

Students rub the interior surfaces of their cheeks, prepare wet mounts, and view the cheek tissue with microscopes. They see cells and discuss the relationship between cells and human beings.

### **Content:**

- The cell is the basic unit of life. All living things are made up of one or more cells.
- Every cell has structures that enable it to carry out life's functions.
- Both single-celled and multicellular organisms exhibit all the characteristics of life.

### **INVESTIGATION 4: DOMAINS**

### INV 4: Part 1- Comparing Living Things (2 Sessions)

Students consider if they are most like bacteria, fungi, or archaea. They set up cultures of mold and bacteria to help explore that question. They prepare a spore print from a mushroom cap to observe in Part 3. Students determine that while cells are made of cell structures, those structures are made of even simpler components, molecules and atoms.

### **Content:**

• Cells are made of cell structures, which are, in turn, made of molecules, which are made of atoms.

#### INV 4: Part 2- Bacteria (3 Sessions)

Over the course of several days, students make observations of the cultures they started in Part 1. They look for evidence that bacteria are living organisms and find out more about the role bacteria play on Earth. Students sample various foods that bacteria had a part in creating. The structures and functions of bacterial cells are introduced as a way to help students consider how like bacteria they are.

#### **Content:**

• Bacteria, fungi, and archaea demonstrate all the characteristics of life.

### INV 4: Part 3- Fungi (2 Sessions)

Students examine the bread mold cultures they prepared, eat samples of fungi or foods that were prepared using fungi, and learn more about fungal cell structures and functions.

#### **Content:**

• Bacteria, fungi, and archaea demonstrate all the characteristics of life.

### INV 4: Part 4- Archaea: The Three Domains (3 Sessions)

The final contender for "most like humans" is introduced. Classification is used as a vehicle to understand why archaea are considered to be a unique group. Finally, students are prepared to choose which organism is most like humans.

#### **Content:**

• Bacteria, fungi, and archaea demonstrate all the characteristics of life.

• Life is classified into three different domains (Archaea, Bacteria, Eukaryota), depending upon cellular and molecular characteristics.

### **INVESTIGATION 5: PLANTS: THE VASCULAR SYSTEM**

#### INV 5: Part 1- What Happened to the Water? (2 Sessions)

Students help design an investigation to find out what happens to the water when a stalk of celery sits in a vial of water overnight. They observe the results and consider where the water might have gone.

#### **Content:**

• Transpiration is the process by which water is carried through vascular plants from the roots to stomata, ensuring that all the cells have access to water.

## INV 5: Part 2- Looking at Plant Structures (2 Sessions)

Students observe that red food coloring flows through the vascular system of a celery stalk, turning the leaves and veins red. This suggests that water moves to the leaves and escapes. Students remove the xylem in celery and observe stomata in plant leaves. Students then set up a plastic bag to capture water as it exits a plant growing in the schoolyard.

## **Content:**

• The vascular system of plants consists of xylem and phloem.

• Transpiration is the process by which water is carried through vascular plants from the roots to stomata, ensuring that all the cells have access to water.

## INV 5: Part 3- Transpiration and Photosynthesis (4 Sessions)

Students collect the water captured in their plastic bag. This provides evidence that water, in the form of vapor, is escaping from the plant, most likely through the stomata. Students learn about the process of transpiration and turn their attention to how water is used in a plant to make food during photosynthesis. They are introduced to the levels of complexity in a multicellular organism

### **Content:**

• Transpiration is the process by which water is carried through vascular plants from the roots to stomata, ensuring that all the cells have access to water.

- The vascular system of plants consists of xylem and phloem.
- Plants use photosynthesis and aerobic cellular respiration to make usable energy from the Sun's energy.

• Cells are the building blocks of tissues, which are the building blocks of organs, which are the building blocks of organ systems, which are the building blocks of multicellular organisms.

## **INVESTIGATION 6: PLANT REPRODUCTION AND GROWTH**

### Investigation 6: Part 1- Lima Bean Dissection (1 Session)

Students soak a lima bean seed in warm water for a few minutes and then explore the structural adaptations of the seed to gather information about how a seed and newly germinated plant survive. Students add to their understanding that a dormant seed is alive.

### **Content:**

• Flowering plants reproduce sexually, producing seeds, which contain dormant new plants.

### **Investigation 6: Part 2- Environmental and Genetic Factors (2 Sessions)**

Students investigate how increasing salinity affects the germination and growth of food crops. They compare four grains (corn, wheat, barley, and oats) to determine that the different grains have varying levels of salt tolerance. This leads to a discussion on genetic factors.

• Environmental and genetic factors affect the germination and growth of plants.

## Investigation 6: Part 3- Flowering- Plant Reproduction (2 Sessions)

Students dissect flowers to learn about flower structures and sexual reproduction. They sequence the steps of pollination and fertilization. Students consider methods of reproduction that non-flowering plants use.

## **Content:**

• Flowering plants reproduce sexually, producing seeds, which contain dormant new plants.

## Investigation 6: Part 4- Flowers and Pollinators (3 Sessions)

Students review flowers, pollination, and seed formation. They examine pollinator-attracting characteristics of a flower to determine possible pollinators.

## **Content:**

• Flowering plants have characteristics that

attract pollinators to ensure successful pollination and reproduction and pollinators are attracted to flowers that meet their needs.

## **INVESTIGATION 7: INSECTS**

## Investigation 7: Part 1- Structure, Function, and Behavior (3 Sessions)

Students observe Madagascar hissing cockroaches. After making initial observations of cockroach structures and behaviors, students focus on specific structure/function and behavior/function relationships.

## **Content:**

• The structures and behaviors of an organism have functions that enhance the organism's chances to survive and reproduce in its habitat.

## Investigation 7: Part 2- Insect Systems (1 Session)

Students review the levels of complexity. They use online activities to compare the insect circulatory system to the plant vascular system and the human cardiovascular (circulatory) system.

## **Content:**

• Cells are the building blocks of tissues, which are the building blocks of organs, which are the building blocks of organ systems, which are the building blocks of multicellular organisms.

• Insects have open circulatory systems that transport substances to and away from their cells.

## **INVESTIGATION 8: DIVERSITY OF LIFE**

## **Investigation 8: Part 1- Bioblitz (4 Sessions)**

Students watch Secret Garden, a video that takes an amusing look at the life that exists "behind the scenes" in

a British yard. Students explore their own locale to collect plants and animals and discover the unexpected diversity of life that exists.

## **Content:**

• Biodiversity is the variety of life that exists in a particular habitat or ecosystem.

• Measuring biodiversity includes measuring both the variety of organisms and the number of organisms in a habitat or ecosystem.

## Investigation 8: Part 2- What is Life? (4 Sessions)

Students examine their Living/Nonliving class cards and find that there is one card that they have not been able to consider, the rhinovirus. They think about their own prior knowledge and then explore viruses in order to determine whether viruses are living organisms.

## **Content:**

- Scientific debate regarding whether viruses are living is ongoing.
- All life on Earth is related.

## **Modification/Differentiation of Instruction**

Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content
- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials

- Strategy and flexible groups based on formative assessment
- Differentiated checklists and rubrics, if available and appropriate

## Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products
- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas

### Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary

- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

#### Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

#### 504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

## **Modification Strategies**

- Cooperative Grouping
- Extended Time
- Frequent Breaks
- Highlighted Text
- Interactive Notebook
- Modified Test
- Oral Directions
- Peer Tutoring
- Preferential Seating
- Re-direct
- Repeated Drill and Practice
- Shortened Assisgnment
- Teacher Notes
- Tutorials
- Use of Additional Reference Materials
- Use of Audio Resources

### **Differentiation Strategies**

## **High Preparation**

- Alternative Assessments
- Choice Boards
- Games and Tournaments
- Group Investigations
- Guided Reading
- Independent Research / Project
- Interest Groups
- Learning Contracts
- Leveled Rubrics
- Literature Circles
- Multiple Intelligence Options
- Multiple Texts
- Personal Agendas
- Project Based Learning (PBL)
- Stations / Centers
- Think-Tac-Toe
- Tiered Activities / Assignments
- Varying Graphic Organizers

#### **Low Preparation**

- Choice of Book / Activity
- Cubing Activities
- Exploration by Interest (using interest inventories)
- Flexible Grouping
- Goal Setting With Student
- Homework Options
- Jigsaw
- Mini Workshops to Re-teach or Extend Skills
- Open-ended Activities
- Think-Pair-Share by Readiness, Interest, or Learning Style
- Use of Collaboration
- Use of Reading Buddies
- Varied Journal Prompts

- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

#### Horizontal Intergration- Interdisciplinary Connections New Jersey Student Learning Standards for Mathematics

#### Grades 6

6.RP.A. Understand ratio concepts and use ratio reasoning to solve problems.

- 6.NS.B. Compute fluently with mulit-digit numbers and find common factors and multiples.
- 6.NS.C. Represent and analyze quantitative relationships between dependent and independent variables.
- 6.G. A. Solve real world and mathematical problems.
- 6.EE.A. Apply and extend previous understanding of arithmetic to algebraic expressions.
- 6.SP.B. Summarize and describe distributions.

### **Reading Science and Technical Subjects**

RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6-8 texts and topics*.

RST.6-8.5. Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

RST.6-8.6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

RST.6-8.7.Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

RST.6-8.8.Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

RST.6-8.9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.

## Writing History, Science and Technical Subjects

WHST.6-8.1. Write arguments focused on *discipline-specific content*.

A. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

B. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

C. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

D. Establish and maintain a formal/academic style, approach, and form.

E. Provide a concluding statement or section that follows from and supports the argument presented.

WHST.6-8.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

A. Introduce a topic and organize ideas, concepts, and information using text structures (e.g. definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g. headings, graphics, and multimedia) when useful to aiding comprehension.

B. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

C. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

D. Use precise language and domain-specific vocabulary to inform about or explain the topic.

E. Establish and maintain a formal/academic style, approach, and form.

F. Provide a concluding statement or section that follows from and supports the information or explanation presented

WHST.6-8.3(See note; not applicable as a separate requirement)

WHST.6-8.4. Produce clear and coherent writing in which the development, organization, voice, and style are appropriate to task, purpose, and audience.

WHST.6-8.5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

WHST.6-8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

WHST.6-8.7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

WHST.6-8.8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

WHST.6-8.9. Draw evidence from informational texts to support analysis, reflection, and research. WHST.6-8.10. Write routinely over extended time frames (time for research, reflection, metacognition/selfcorrection, and revision) and shorter time frames (a single sitting or a day or two) for a range of disciplinespecific tasks, purposes, and audiences.

## 2020 New Jersey Student Learning Standards- Computer Science and Design Thinking

#### **Computer Science and Design Thinking Practices**

CSDT.K-12.CSDTP1	Fostering an Inclusive Computing and Design Culture
CSDT.K-12.CSDTP2	Collaborating Around Computing and Design
CSDT.K-12.CSDTP3	Recognizing and Defining Computational Problems
CSDT.K-12.CSDTP4	Developing and Using Abstractions
CSDT.K-12.CSDTP5	Creating Computational Artifacts
CSDT.K-12.CSDTP6	Testing and Refining Computational Artifacts
CSDT.K-12.CSDTP7	Communicating About Computing and Design

### 8.2 Design Thinking

8.2.8.ED.1: Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.

8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem.

8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).

8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-

step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team.

8.2.8.ED.5: Explain the need for optimization in a design process.

8.2.8.ED.6: Analyze how trade-offs can impact the design of a product.

8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches).

8.2.8.ITH.1: Explain how the development and use of technology influences economic, political, social, and cultural issues.

8.2.8.ITH.2: Compare how technologies have influenced society over time.

8.2.8.ITH.3: Evaluate the impact of sustainability on the development of a designed product or system.

8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact.

8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another.

8.2.8.NT.1: Examine a malfunctioning tool, product, or system and propose solutions to the problem.

8.2.8.NT.2: Analyze an existing technological product that has been repurposed for a different function.

8.2.8.NT.3: Examine a system, consider how each part relates to other parts, and redesign it for another purpose.

8.2.8.NT.4: Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product.

8.2.8.ETW.1: Illustrate how a product is upcycled into a new product and analyze the shortand long-term benefits and costs.

8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital).

8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact.

8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best.

8.2.8.EC.1: Explain ethical issues that may arise from the use of new technologies. 8.2.8.EC.2: Examine the effects of ethical and unethical practices in product design and development.

# 2020 New Jersey Student Learning Standards- Career Readiness, Life Literacies, and Key Skills Career Readiness, Life Literacies, and Key Skills Practices

CRP.K-12.CRP1	Act as responsible and contributing community members and employee.
CRP.K-12.CRP2	Attend to financial well-being.
CRP.K-12.CRP3	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP4	Demonstrate creativity and innovation.
CRP.K-12.CRP5	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP6	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP7	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP8	Use technology to enhance productivity, increase collaboration and communicate effectively.
CRP.K-12.CRP9	Work productively in teams while using cultural/global competence.

### 9.2 Career Awareness and Planning

9.2.8.CAP.1: Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest.

9.2.8.CAP.2: Develop a plan that includes information about career areas of interest.

9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.

9.2.8.CAP.4: Explain how an individual's online behavior (e.g., social networking, photo exchanges, video postings) may impact opportunities for employment or advancement.

9.2.8.CAP.11: Analyze potential career opportunities by considering different types of resources, including occupation databases, and state and national labor market statistics.

9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.

#### 9.4 Life Literacies and Key Skills

9.4.8.Cl.1: Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).

9.4.8.Cl.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3).

9.4.8.Cl.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).

9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries.

9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (MS-ETS1-2).

9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).

9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.

9.4.8.DC.1: Analyze the resource citations in online materials for proper use.

9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8).

9.4.8.DC.3: Describe tradeoffs between allowing information to be public (e.g., within online games) versus keeping information private and secure.

9.4.8.DC.4: Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences.

9.4.8.DC.5: Manage digital identity and practice positive online behavior to avoid inappropriate forms of selfdisclosure.

9.4.8.DC.6: Analyze online information to distinguish whether it is helpful or harmful to reputation.

9.4.8.DC.7: Collaborate within a digital community to create a digital artifact using strategies such as crowdsourcing or digital surveys.

9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities).

9.4.8.GCA.1: Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).

9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.

9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information.

9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.

9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).

9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.

9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data.

9.4.8.IML.6: Identify subtle and overt messages based on the method of communication.

9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8).

9.4.8.IML.8: Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b).

9.4.8.IML.9: Distinguish between ethical and unethical uses of information and media (e.g., 1.5.8.CR3b, 8.2.8.EC.2).

9.4.8.IML.10: Examine the consequences of the uses of media (e.g., RI.8.7).

9.4.8.IML.11: Predict the personal and community impact of online and social media activities.

9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience.

9.4.8.IML.13: Identify the impact of the creator on the content, production, and delivery of information (e.g., 8.2.8.ED.1).

9.4.8.IML.14: Analyze the role of media in delivering cultural, political, and other societal messages.

9.4.8.IML.15: Explain ways that individuals may experience the same media message differently.

9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate databased decision-making.

9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).

9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

9.4.8.TL.4: Synthesize and publish information about a local or global issue or event (e.g., MS-LS4-5, 6.1.8.CivicsPI.3).

9.4.8.TL.5: Compare the process and effectiveness of synchronous collaboration and asynchronous collaboration.

9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.

## Vertical Integration- Discipline Mapping

Kindergarten-Grade 5 Kindergarten: Animals Two By Two Grade 1: Plants and Animals Grade 2: Insects and Plants Grade 3: Structures of Life Grade 4: Environments Grade 5: Living Systems

Preparation for high school science courses

## **Additional Materials**

**Discovery Education** 

Visit FOSSWEB.com for list of websites, and additional readings

Search YouTube for related videos.