School District of Springfield Township
Montgomery County, PA

PLANNED COURSE OF STUDY

Course Title	3rd Grade Science
Grade Level	3rd Grade
Content Area / Dept.	Science
Length of Course	One academic year
Author(s)	Deidre Wright

Course Description:
Third grade science consists of two modules, or units of study, *Water and Climate* and *Structures of Life*, using the FOSS science program. Lessons are designed to provide real and meaningful student experience with important scientific ideas. It will also nurture developmentally appropriate knowledge of the objects, organisms, systems, and principles governing the natural world.

Course Rationale:

The instructional design of the third-grade science curriculum provides opportunities for students to:

- communicate the disciplinary core ideas (content) of science
- engage in or exercise the science and engineering practices (inquiry methods) to develop knowledge of the disciplinary core ideas
- understand the themes that unite core ideas as they gain more and more knowledge of the natural world

Curriculum Map

Month	Typical # of Weeks	Topics Covered this Month
September	4 weeks	Water and climate begins - 2 weeks
October	4 weeks	Water and Climate
November	3 weeks	Water and Climate
December	3 weeks	Water and Climate
January	4 weeks	Water and Climate
February	4 weeks	Water and Climate ends- 2 weeks Structures of Life begins - 2 weeks
March	4 weeks	Structures of Life
April	(Remember PSSAs this month)	Structures of Life
May	4 weeks	Structures of Life
June	2 weeks	Water and Climate (the waterwheel lesson after a trip to The Fairmount Waterworks) - 1 day Structures of Life - 2 weeks

Unit Title	Water and Climate
Unit Description	The **Water and Climate Module** provides students with experiences to explore the properties of water, the water cycle and weather, interactions between water and other earth materials, and how humans use water as a natural resource. Students engage in science and engineering practices in the context of water, weather, and climate while exploring the crosscutting concepts of cause and effect, scale, proportion, quantity, systems, and system models.
Essential Questions & Enduring Understandings	**Water Observations** Essential Questions: What happens when water falls on different surfaces? How does water move on a slope? How much water can a dry sponge soak up? What happens outdoors when rain falls on natural materials? Key Understandings: ● Water forms beads on waterproof materials and soaks into absorbent materials. ● Water flows downhill. The angle of the slope and the amount of water affect flow. **Hot Water, Cold Water** Essential Questions: How can you measure temperature accurately? What happens to water when it gets hot? Cold? What happens when hot or cold water is put into room-temperature water? How does water change when it gets really cold? Where should an animal go to stay warm or to stay cool? Key Understandings: ● Temperature is a measure of how hot matter is. ● Water expands when heated and contracts when cooled. ● A material that floats in water is less dense than water; a material that sinks is more dense. ● Cold water is more dense than warm water; ice is less dense than liquid water. ● Water expands when it freezes ● Ice melts when heated; water freezes when cooled.

	Weather and Water Essential Questions: What does the weather forecast tell us? What happens to wet paper towels overnight? How does surface area effect evaporation? What else effects how fast water evaporates? What causes moisture to form on the side of a cup? Key Understandings: ● Weather is measured using observations and tools such as thermometers, wind vanes, and rain gauges. ● Evaporation is the process by which liquid water changes into water vapor (gas). ● High temperatures, greater surface area, and moving air (wind) increase the rate of evaporation. ● Condensation is the process by which gas (water vapor) changes into liquid water; it occurs on a cool surface. ● Evaporation and condensation are part of the movement of water through the water cycle. **Seasons and Climate** Essential Questions: What are typical weather conditions in our region? How do we describe different climates? How do people deal with natural hazard such as floods? Key Understandings: ● Typical weather in a region often varies with seasons. High and low temperatures and amount of precipitation are the main ways to describe seasonal weather changes. ● The sun's energy drives weather. ● Weather data in tables and graphs may show weather patterns over time. ● Climate is the average or typical weather that can be expected to occur in a region. ● Weather-related natural hazards include tornadoes, hailstorms, blizzards, lightning, floods, and drought. ● People often modify their homes and their way of life to deal with floods.

	● Wetland protection and restoration is one way to prevent floods. **Waterworks** <u>Essential Questions</u>: What happens when water is mixed with other earth materials? Do soils in the schoolyard drain water at the same rate? What is needed to make a waterwheel system function well? <u>Key Understandings</u>: ● Soil is rock particles mixed with organic material called humus. ● Soils retain more water than rock particles alone. ● Water drains more easily through some earth materials than through others. ● The energy of flowing water can be used to do work; waterwheels are machines powered by flowing water.

PA Core Standards	Assessment Anchors
3.2.3.A1 3.2.3.A3 3.2.3.A6 3.2.3.B2 3.2.3.B3 3.2.3.B7 3.3.3.A1 3.3.3.A4 3.3.3.A5 3.3.3.A7 3.3.3.B3 3.4.3.A2 3.4.3.C1 3.4.3.C2 3.4.3.D2 3.4.3.D3 3.4.3.E1 3.4.3.E3	S4.A.1.1 S4.A.1.3 S4.A.2.1 S4.A.2.2 S4.A.3.1 S4.A.3.2 S4.A.3.3 S4.B.3.3 S4.C.1.1 S4.C.2.1 S4.D.1.1 S4.D.1.2 S4.D.1.3 S4.D.2.1

Key Unit Vocabulary	**Water Observations:** *absorb* *bead* *bead up* *data* *direction* *dome* *earth material* *evidence* *gravity* *move* *natural material* *observation* *opinion* *relationship* *repel* *slope* *surface* *waterproof* **Hot Water, Cold Water:** *bulb* *cold* *contract* *degree Celsius (℃)* *expand* *float* *freeze* *hot* *less dense* *liquid* *mass* *melt* *more dense* *sink* *solid* *state* *temperature* *thermometer* *volume* **Weather and Water:** *compass* *condensation* *evaporation* *forecast* *gas* *meteorologist* *meteorology* *precipitation* *rain gauge* *surface area* *water cycle* *water vapor* *weather* *wind vane* **Seasons and Climate:** *blizzard* *climate* *climatologist* *drought* *embankment* *flood* *floodplain* *hailstorm* *hurricane* *lightning* *monsoon* *natural hazard* *season* *sluice gate* *tornado* *typical* *wetland*

	Waterworks: *blade* *constraint* *criteria* *criterion* *drainage* *energy* *gravel* *humus* *load* *natural resource* *nonrenewable resource* *renewable resource* *retain* *shaft* *soil* *system* *water retention* *waterwheel*

Learning Objectives – *The student will…*	Assessment Opportunities
- compare how water drops interact with four materials: paper towel, waxed paper, aluminum foil, and writing paper.	● embedded assessment (science notebook entry)
- observe that water soaks into absorbent materials and forms dome-shaped beads on waterproof materials.	● embedded assessment (science notebook entry) ● benchmark assessment
- use droppers to make water domes and observe the domes' behavior on a sloped surface.	● performance assessment ● embedded assessment (science notebook entry)
- observe that water domes always move downhill.	● performance assessment ● embedded assessment (science notebook entry) ● benchmark assessment
- observe that the angle of slope affects the speed at which domes move down a slope.	• performance assessment ● embedded assessment (science notebook entry) ● benchmark assessment

- measure how much water a dry sponge can soak up, by measuring mass, volume, or both (*Students develop their own procedures to answer this question*).	• performance assessment ● embedded assessment (science notebook entry) ● benchmark assessment
- go outdoors and collect small samples of natural materials, including living and dead plant material and earth materials, and put drops of water on the materials to simulate rain and observe what happens.	● embedded assessment (science notebook entry) ● benchmark assessment
- compare the temperature of three cups of water, using their fingers as gauges.	● embedded assessment (science notebook entry) ● benchmark assessment
- realize that a standard is needed, as well as a more accurate device to measure temperature.	● embedded assessment (science notebook entry)
- become familiar with the tool used for measuring temperature, the thermometer, by observing and discussing its features.	● embedded assessment (science notebook entry)
- build a bottle thermometer and observe what happens when the thermometer is placed in hot water and then cold water.	● embedded assessment (science notebook entry)
- observe that water expands when it is heated and contracts when it is cooled.	● embedded assessment (science notebook entry)
- observe that some objects sink in water and some float.	● embedded assessment (science notebook entry)
- become familiar with the operational definition: objects float if they are less dense than water; objects sink if they are more dense than water.	● performance assessment ● embedded assessment (science notebook entry)
- lower a vial of hot water and then a vial of cold water into a cup of room temperature water to observe that the less-dense hot water rises (floats), and the more-dense cold water sinks.	• embedded assessment (science notebook entry) ● use of scientific terminology ● benchmark assessment
- freeze water in vials to observe that water expands when it freezes.	● performance assessment ● embedded assessment (science

	notebook entry)
- freeze water in syringes to observe that a mass of ice has a greater volume than an equal mass of liquid.	Embedded assessments: ● science notebook entry ● response sheet
- predict and observe the behavior of ice in water, and explain the observation that ice floats in liquid water because ice is less dense than water.	
- place one ice cube in the sunshine, place a second ice cube in the shade, bury a third ice cube, and monitor them to determine, by extension, the best place for an animal to go to stay cool.	
- compare above-ground melting to underground-melting	● embedded assessment (science notebook entry) ● benchmark assessment
- observe and collect local weather data.	● embedded assessment (science notebook entry)
- review local weather, forecasts, and records set in previous years.	● performance assessment ● embedded assessment (science notebook entry)
- compare current local weather data to meteorologists' forecasts and historical data.	
- observe a demonstration in which two paper towels are soaked with equal amounts of water and then put in cups on a balance (one open to air, and the other closed).	
- observe, a day later, that the towel in the open cup is dry, and identify this drying process as evaporation.	● embedded assessment (science notebook entry)
- measure equal amounts of water into 4 containers with different surface areas, and after 4 days, measure the amount of water remaining in each container to discover that	● embedded assessment (science notebook entry) ● benchmark assessment

the greater the surface area exposed to air, the greater the amount of evaporation.	
- measure equal amounts of water into four cups, place the cups into four different locations, and monitor temperatures for 4 days. Then, measure the amount of water remaining in the cups to discover that warmer environments promote more evaporation.	● embedded assessment (science notebook entry) ● performance assessment
- set up cups of ice water and room-temperature water, and observe condensation on the ice-water cup to learn that water vapor in the air condenses into a liquid on cold surfaces.	● embedded assessment (response sheet)
- analyze local daily weather data for 4 months of the previous year and describe the weather during that period.	● embedded assessment (science notebook entry) ● benchmark assessment
- suggest schemes for describing world climate regions, view a video to gather information on climate and compare their climate-region scheme to those of climatologists.	● embedded assessment (science notebook entry)
- watch videos and read about ways people manage natural hazards associated with floods and discuss engineering methods to deal with floods and droughts.	
- pour equal amounts of water through masses of two earth materials (soil and gravel), measure the amount of water that drains through the earth materials, and compare the resulting masses of soil and gravel, using a balance.	● embedded assessment (science notebook entry) ● benchmark assessment
- test the soil in a number of locations in the schoolyard to find out how long it takes each soil to absorb equal amounts of water	● embedded assessment (response sheet)
- dig small holes in the ground, fill them with perforated filter cups, and time how long it	

takes for 100 mL of water to drain into the soil as they consider which soils are best for plant growth.	● embedded assessment (science notebook entry)
- design and construct simple waterwheels and determine how many syringes of water it takes to move an object a specified distance.	
	● performance assessment

Sequence of Teaching and Learning		
Number of Lessons / Blocks	Lesson Topic	Lesson Activities
		Investigation 1: Drops of Water
1 Session	Survey	**Benchmark Assessment:** *Pretest*
1 Session	**Drops of Water**	**Active Investigation:** Students conduct investigations to observe the properties of water by comparing how water drops react with four materials: paper towel, waxed paper, aluminum foil, and writing paper. They observe that water soaks into absorbent materials and forms dome-shaped beads on water proof materials. **Science Notebook Entry:** *Water on Surfaces*
1 Session		**Reading:** *Science Resources Book,* "A Report From the Blue Planet"
1 Session		**Reading:** *Science Resources Book,* "Surface Tension" **Videos:** *Aquatic Surface Dwellers* *Aquatic Insect Adaptations* **Online Activity:** "Surface Tension"
1 Session	**Water on a Slope**	**Active Investigation and embedded Performance Assessment:** Students use droppers to make water domes

		and observe the domes' behavior on a sloped surface. During a series of investigations, students observe that water domes always move downhill, and that size and angle of slope affect the speed at which domes move down a slope. **Science Notebook Entry:** *Water on a Slope*
1 Session		**Reading:** *Science Resources Book,* "Which Way Does it Go?"
1 Session	**Soaking Sponges**	**Active Investigation:** Students are challenged to measure how much water a dry sponge can soak up. This can be determined by measuring mass, volume, or both. Students develop their own procedures to answer this question. **Science Notebook Entry:** *Soaking Sponges* **Online Activities:** "Measuring Volume" "Measuring Mass" "Reading a Graduated Cylinder" "Measuring Volume and Mass" "Kilogram Hunt" "Metric Mystery"
1 Session		**Reading/Writing:** *Science Resources Book,* "Opinion and Evidence"
1 Session	**Water in Nature**	**Active Investigation, including NGSS Performance Expectation:** Students go outdoors to collect small samples of natural materials, including living and dead plant material and earth materials. They put drops of water on the materials to simulate rain and observe what happens. **Writing:** Answer the focus question (science notebook entry)
1 Session		**Reading:** *Science Resources Book*, "Water Everywhere"
1 Session		**Benchmark Assessment:** Investigation 1: I-Check
		Investigation 2: Hot Water, Cold Water
1 Session	**Measuring Temperature**	**Active Investigation:** Students compare the temperature of three cups of water, using their fingers as gauges. They realize that a standard is needed, as well as a more accurate device to measure temperature. Students are introduced to the tool used for measuring temperature, the thermometer. **Science Notebook Entry:** *Measuring Temperature - Number Line*

		Online Activities: "Measuring Temperature" "Reading a Thermometer"
1 Session		**Readings:** *Science Resources Book,* "Vacation Aggravation" and "Celsius and Fahrenheit"

1 session	**Build a Thermometer**	**Active Investigation:** Students build a bottle thermometer and conduct investigations to find out what happens when the thermometer is placed first in hot water and then in cold water. They learn that water expands when it is heated and contracts when it is cooled. **Science Notebook Entry:** *Bottle -and-Pipe System* **Online Activity:** "Bottle Thermometer"
	Sinking and Floating Water	**Active Investigation and embedded Performance Assessment, including NGSS Performance Expectation:** After observing that some objects sink in water and some float, students are given an operational definition: objects float if they are less dense than water; objects sink if they are more dense. Students lower a vial of hot water and then a vial of cold water into a cup of room temperature water. They observe that the less-dense warm water rises (floats) and the more-dense cold water sinks. **Science Notebook Entry:** *Sinking and Floating Water*
1 Session		**Reading:** *Science Resources Book,* "Water: Hot and Cold" **Online Activities:** "Density of Hot and Cold Water" "Hot and Cold Water Density"
3 Sessions	**Water as Ice**	**Active Investigation:** Students freeze water in vials and in syringes to observe that water expands when it freezes. They observe that a volume of liquid water has a greater mass than an equal volume of ice. They predict the behavior of ice in water, and explain the observation that ice floats in liquid water because ice is less dense than water. **Science Notebook Entry:** *Ice and Water* **Writing (Embedded Assessment):** Response Sheet **Online Activity:** "Expansion and Contraction of Water"
1 Session		**Reading:** *Science Resources Book,* "Ice is Everywhere"
1 Session	**Ice Outdoors**	**Active Investigation and Performance Assessment (NGSS):** Students place one ice cube in the sunshine, place a second ice cube in the shade, and bury a third ice cube. They monitor the ice cubes and, by extension, determine the best place for an animal to go stay warm and to stay cool. **Science Notebook Entry:** Answer the focus question

1 Session		**Benchmark Assessment** Investigation 2: I-Check
		Investigation 3: Weather and Water
2 Sessions	**Measuring Weather**	**Active Investigation and embedded Performance Assessment:** Students compare weather data that they observe and collect to meteorologists' forecasts and historical data. Students watch a short video about how meteorologists make their forecasts. They review local weather, forecasts, and records set in previous years. Students take turns collecting local weather data to compare to the local forecasts and records. **Science Notebook Entries:** *Weather Data - Forecast* *Weather Data - Observed* *"Studying Weather" Review Questions* **Video**: *All about Meteorology*
1 Session		**Reading**: *Science Resources Book,* "Studying Weather" **Online Activities:** "Weather Grapher" Weather Forecast Websites
2 Sessions	**Evaporation**	**Active Investigation:** Students observe a demonstration in which two paper towels are soaked with equal amounts of water and then put in cups on a balance. One cup is open to air and the other is closed. A day later, the towel in the open cup is dry. Students learn that things dry because of evaporation. **Science Notebook Entry:** Answer the focus question (embedded assessment)
1 Session		**Reading:** *Science Resources Book,* "Drying Up"
2 Sessions	**Surface Area**	**Active Investigation and embedded Performance Assessment, including NGSS Performance Expectations:** Students measure equal amounts of water into four containers with different surface areas. After four days, students measure the amount of water remaining in each container to discover that the greater the surface area exposed to air, the greater the amount of evaporation. **Science Notebook Entry:** *Surface-Area Table*

1 Session		**Reading:** *Science Resources Book,* "Surface-Area Experiment"
2 Sessions and daily monitoring over 5 days	**Evaporation Locations**	**Active investigation:** Students measure equal amounts of water into four cups, place them in four different locations, and monitor temperatures for 4 days. They measure the amount of water remaining in the cups to discover that warmer environments promote more evaporation. **Student Notebook Entry**: *Evaporation Data* **Online Activity:** "Evaporation Experiment" **Embedded Assessment:** Response Sheet
2 Sessions	Condensation	**Active Investigation, including NGSS Performance Expectation:** Students set up cups of ice water and room-temperature water and observe condensation on the ice-water cup. They learn that the water vapor in the air condenses into a liquid on cold surfaces. The water cycle is introduced. **Science Notebook Entry**, *Condensation Observations*
1 Session		**Readings:** *Science Resources Book* "Condensation" and "The Water Cycle" **Online Activity:** "Water Cycle" **Video:** *Water Cycle* (optional)
1 Session		**Assessment:** Investigation 3: I-Check
		Investigation 4 - Seasons and Climate
1-2 Sessions	**Seasonal Weather**	**Active Investigation:** The class analyzes local daily weather data for 4 months of the previous year. Each group works with a 2-week period in one of those 4 months to come up with a description for the weather during that period. Students grapple with what data to use and how to organize the data to extract meaning from them. **Science Notebook Entry:** *Weather Graph*
1 Session	**Describing Climate**	**Active Investigation:** Students are introduced to climate and suggest schemes for describing world climate regions, based on their understanding of weather. They view a video to gather information on climate and compare their climate-region scheme to those of climatologists. **Video:** *All about Climate and Seasons*

		Online Activity: "Climate Regions Map"
1 Session		**Reading:** *Science Resources Book*, "Climate Regions" **Online Activity:** "Climate Regions Map" (continued) **Science Notebook Entry:** Answer the focus question
1-2 Sessions	**Weather-Related Natural Hazards**	**Active Investigation, including NGSS Performance Expectations:** Through video and readings, students are introduced to ways that people manage the natural hazards associated with floods and discuss engineering methods to deal with floods and droughts. **Videos:** *Come a Tide* *Floods*
1 Session		**Reading:** *Science Resources Book* "Wetlands for Flood Control" "Conserving Water during Droughts"
1 Session		**Benchmark Assessment:** Investigation 4: I-Check
		Investigation 5 - Waterworks
1-2 Sessions	**Water in Earth Materials**	**Active investigation:** Students pour equal amounts of water through masses of two earth materials (soil and gravel), measure the amount of water that drains through the earth materials, and compare the resulting masses of soil and gravel, using a balance. **Science Notebook Entry:** Answer the focus question
1 Session		**Embedded Assessment:** Response Sheet **Readings:** *Science Resources Book* "Water: A Vital Resource" "Natural Resources"
1 Session	**Water in Soil**	**Active investigation:** Students test the soil in a number of locations in the schoolyard to find out how long it takes each soil to absorb equal amounts of water. Students dig small holes in the ground and fit them with perforated filter cups. They time how long it takes for 100 ml of water to drain into the soil. Students consider which soils are best for plan growth. **Science Notebook Entry:** Answer the focus question

1 Session		**Readings:** *Science Resources Book* "Ellen Swallow Richards: An Early Ecologist" "Making Drinking Water Safe"
2-3 Sessions	**Waterwheels**	**Active investigation and Performance Assessment, including NGSS Performance Expectations:** Students are presented with an engineering challenge to design and construct simple waterwheels. They use water to power their waterwheels to lift or pull objects. They consider which features are necessary to make the waterwheel work and what the function of each part of the system serves. **Science Notebook Entry:** Answer the focus question
1 Session		**Reading:** *Science Resources Book*, "Using the Energy of Water"
1 Session		**Benchmark Assessment:** *Post-test*

Unit Title	**Structures of Life**
Unit Description	The **Structures of Life Module** provides students with experiences to observe, compare, categorize, and care for a selection of organisms. Students engage in science and engineering practices to investigate structures and behaviors of the organisms and learn how some of the structures function in growth and survival. Students look at the interactions between organisms of the same kind, among organisms of different kinds, and between the environment and populations over time.
Essential Questions & Enduring Understandings	**Origin of Seeds** Essential Questions: How are seeds alike and different? What effect does water have on seeds? How much water does a seed soak up? How do seeds disperse away from the parent plant? Key Understandings: ● Seeds develop in the plant part called the fruit. ● Different kinds of fruits have different kinds and numbers of seeds: seeds have a variety of properties. ● A seed is an organism, a living thing. ● Seeds undergo changes in the presence of water. ● A seed contains the embryo plant and stores food. A seed grows into a new plant (reproduction). ● Seed-dispersal mechanisms (wind, water, and animals) move seeds away from parent plants. **Growing Further** Essential Questions: What structures does a seedling have to help it grow and survive? What is the sequence of the bean plant's life cycle? How do the roots of schoolyard plants compare to the roots of bean plants? Key Understandings: ● Germination is the onset of a seed's development. ● Plants need water, light, space, and nutrients to grow. ● The life cycle is a sequence of stages during which a

	seed grows into an adult (mature) plant and produces seeds, which in turn produce new plants of the same kind. ● The fruit of the plant develops from the flower. ● Roots function to take up water and nutrients so they can be transported to the other parts of the plant. They can also anchor the plant into the soil. Different kinds of plants have different root systems. **Meet the Crayfish** Essential Questions: What are the structures of a crayfish? How do crayfish structures and behaviors help crayfish survive? What kind of behavior do crayfish display in their habitat? How are the structures of crayfish and other organisms alike and different? What is needed to sustain a food chain? Key Understandings: ● Crayfish have observable structures and behaviors that serve various functions in growth, survival, and reproduction. ● Different organisms can live in different environments; organisms have adaptations that allow them to survive and reproduce in those environments. ● Organisms are related in feeding relationships called food chains. ● Differences in characteristics between individuals of the same species may provide an advantage in surviving. ● Some animals claim a territory that they defend against others of their same kind. Some organisms live in social groups that may help the individuals in the group survive. **Human Body** Essential Questions: What are the functions of the skeletal system? In what ways are the skeletons of a rodent and a human similar?

	What makes our skeletal system flexible? How are fingerprints alike and different? <u>Key Understandings</u>: ● A skeleton is a system of interacting bones. Humans have about 206 bones. Bones have three functions; support, protection, and movement. ● The number and kinds of bones in an organism are characteristics inherited from the parents of the organism. ● Muscles attach across joints to move bones. ● Fossils are important evidence about extinct organisms and past environments. ● Fingerprints can be sorted into three groups based on basic pattern: whorl, arch, and loop.

PA Core Standards	Assessment Anchors
3.1.3.A1 3.1.3.A2 3.1.3.A3 3.1.3.A5 3.1.3.A9 3.1.3.B1 3.1.3.B5 3.1.3.B6 3.1.3.C1 3.1.3.C2 3.1.3.C3 3.1.3.C4 3.2.3.A6 3.2.3.B7 3.3.3.A7 3.3.3.B3 3.4.3.A2	S4.A.1.1 S4.A.1.3 S4.A.2.1 S4.A.2.2 S4.A.3.1 S4.A.3.2 S4.A.3.3 S4.B.1.1 S4.B.2.1 S4.B.2.2 S4.B.3.1 S4.B.3.2 S4.B.3.3 S4.C.1.1 S4.D.1.2

Key Unit Vocabulary	**Origin of Seeds:** *compete* *cotyledon* *disperse* *dormant* *embryo* *engineer* *estimate* *fruit* *function* *living* *modify* *observe* *organism* *parent plant* *pattern* *physical model* *predict* *property* *protect* *reproduce* *seed* *seed coat* *structure* *survive* **Growing Further:** *adult* *fibrous root* *flower*	**Meet the Crayfish:** *adaptation* *antenna* *appendage* *behavior* *carapace* *carnivore* *crayfish* *crustacean* *elodea* *energy* *environment* *female* *food chain* *genus* *habitat* *herbivore* *male* *molt* *offspring* *omnivore* *pincer* *population* *predator* *prey* *protective coloration* *species* *stable system* *sustain* *sustainable* *swimmeret* *system* *territory* *trait* *variation* **Human Body:** *arch* *articulated* *ball-and-socket joint*

	germination *growth* *hydroponics* *inherit* *leaf* *life cycle* *nutrient* *root* *seedling* *shoot* *stem* *taproot*	*bone* *characteristic* *contract* *fingerprint* *fossil* *gliding joint* *hinge joint* *joint* *loop* *movement* *muscle* *opposable thumb* *pattern* *protection* *skeletal muscle* *skeletal system* *skeleton* *skull* *support* *tendon* *tissue* *torso* *whorl*

Learning Objectives: ***The students will…***	Assessment Opportunities
- conduct a seed hunt by opening fresh fruit and locating the seeds.	● embedded assessment (science notebook entry)
- describe and compare seed properties	Embedded assessments: ● science notebook entry ● response sheet
- examine and sort a selection of seeds - bean, pea, sunflower, and corn	● performance assessment ● embedded assessment (science notebook entry)
- investigate the effect water has on seeds by setting up seed sprouters and observing and recording changes over a week.	● performance assessment ● embedded assessment (science notebook entry) ● benchmark assessment

- systematically find out how much water lima beans soak up in a day.	● performance assessment ● embedded assessment (science notebook entry)
- examine germinated seeds to determine similarities and differences in the way the organisms grow.	● embedded assessment (science notebook entry)
- set up a hydroponic garden to observe the life cycle of a bean plant.	● embedded assessment (science notebook entry) ● benchmark assessment
- go outdoors to investigate the roots and shoots of various plants.	● performance assessment ● embedded assessment (science notebook entry)
- use tools to dig up plants and compare the structures above ground to those below ground.	
- use direct experience and readings to learn about plant structures and functions.	● embedded assessment (science notebook entry) ● benchmark assessment
- observe and record some of the structures of a crustacean, the crayfish, and compare it to other organisms.	● embedded assessment (science notebook entry)
- establish a feeding and maintenance schedule for the organisms.	● embedded assessment (science notebook entry)
- investigate crayfish behavior and map where the crayfish spend their time in their habitat.	● embedded assessment (science notebook entry)
- use readings, organism cards, and a video to learn about adaptations of organisms in different environments, including different kinds of group and social behaviors.	● embedded assessment (science notebook entry) ● benchmark assessment
- use a computer simulation to study variation of traits in species and explore how variation might affect survival of individuals.	● embedded assessment (science notebook entry)
- engage in an outdoor simulation activity to explore food chains.	● performance assessment
- observe the articulated human skeletal system in action, use posters and a sense of touch to estimate and refine a count of the	● embedded assessment (science notebook entry) ● performance assessment

206 human bones, and build skeletal puzzles from memory.	● benchmark assessment
- explore joints and their role in movement focusing on opposable thumbs.	● embedded assessment (science notebook entry)
- build operational models of muscle-bone systems to see how muscles move bones.	● performance assessment ● embedded assessment (science notebook entry)
- investigate their skin by making and analyzing fingerprint patterns.	● performance assessment ● embedded assessment (science notebook entry)

Sequence of Teaching and Learning		
Number of Lessons / Blocks	Lesson Topic	Lesson Activities
		Investigation 1: Origin of Seeds
1 Session	Survey	**Benchmark Assessment:** *Pretest*
1-2 Sessions	**Seed Search**	**Active Investigation:** Students embark on a seed hunt, delving into an assortment of fresh fruits. They open a fruit, locate the seeds, describe the seed properties, and count or estimate the number of seeds in the fruit. **Science Notebook Entry:** *Comparing Seeds*
1 Session		**Reading:** *Science Resources Book,* "The Reason for Fruit"
2 Sessions plus 6 days of monitoring	**The Sprouting Seed**	**Active Investigation:** Students use two kinds of sprouting devices to find out what effect water has on seeds. They water the seeds daily for a week and record their observations. **Science Notebook Entry:** *The Sprouting Seed*
1 Session		**Reading:** *Science Resources Book, "The Most Important Seed"*
1 Session		**Embedded Assessment:** Response Sheet

2 Sessions	**Seed Soak**	**Active investigation and embedded Performance Assessment:** Students compare the mass of seeds that have been soaked in water overnight to the mass of dry seeds. They determine how much water the seeds soaked up. **Science Notebook Entries:** *The Soaked Seed* *Seed Structures*
1 Session		**Reading:** *Science Resources Book,* "Barbara McClintock"
1 Session	**Seed Dispersal**	**Active Investigation, including NGSS Performance Expectation:** Students go to the school yard to design and apply modifications to seeds and fruits for dispersal by various natural forces. Students search for seeds in the schoolyard and consider how they are adapted for dispersal. **Video:** *How Seeds Get Here...and There* **Science Notebook Entry:** Answer the focus question
1 Session		**Reading:** *Science Resources Book,* "Nature Journal - How Seeds Travel"
1 Session		**Benchmark Assessment:** Investigation 1: I-Check
		Investigation 2: Growing Further
2 Sessions	**Germination and Growth**	**Active Investigation:** Students compare four seeds germinating in mini-sprouters. They identify and describe emerging plant structures, such as seed coats, cotyledons, stems, leaves, and roots. Students discuss germination strategies used by different plants and how those strategies enhance the plants' chances of survival. **Science Notebook Entry:** Answer the focus question **Embedded Assessment:** Response Sheet
1 Session		**Reading:** *Science Resources Book,* "Germination"
2 Sessions plus 6 weeks of monitoring	**Life Cycle of the Bean**	**Active Investigation:** Students grow seedlings hydroponically in nutrient solution and observe them throughout their life cycle. They observe and record the emergence of flowers, fruit, and new seeds. They sequence illustrations that depict different stages in the life cycle of a bean plant. Students read about the concept of life cycle in plants and animals and get additional information from a

		video on animal life cycles. Students compare life cycles and discuss inheritance of characteristics. **Science Notebook Entries:** *Bean-Plant Growth* *Bean-Life Cycle Pictures* *Bean-Life Cycle*
1 Session		**Reading:** *Science Resources Book*, "Life Cycles" **Videos:** *How Plants Get Food* *All About Animal Life Cycles*
1 session	**Roots and Shoots**	**Active Investigation, including NGSS Performance Expectation:** Students go to the schoolyard to investigate the roots and shoots of various plants. They use tools to dig up plants and compare the structures above ground to those below ground. They also compare root structures of different plants and discuss inheritance of characteristics. **Science Notebook Entry:** Answer the focus question
1 Session		**Benchmark Assessment:** Investigation 2: I-Check
		Investigation 3: Meet the Crayfish
1-2 Sessions	**Crayfish Structures**	**Active Investigation:** Students observe and record crayfish structures through direct interaction with live crayfish. They set up two crayfish habitats and learn to care for the crayfish in the classroom. **Science Notebook Entries:** *Crayfish Structures* *Crayfish-Structures Table* *Crayfish Diagrams* *Crayfish Log*
1 Session		**Readings:** *Science Resources Book,* "Crayfish"
5 Sessions	**Adaptation**	**Active Investigation:** Students study crayfish behavior and learn that it has survival value. They are introduced to the concept of adaptation - a structure or behavior that improves an organism's chance of survival. Students study environments and consider the particular adaptations that allow organisms to survive. Students use a computer simulation to study variation of traits in species and how variation might affect survival of individuals.

		Science Notebook Entries: *Crayfish Behavior* *All About Animal Adaptations* *Adaptations* *Walking Stick Survival: Bamboo Environment* *Five Generations of Walking Sticks in the Bamboo Environment* *Surviving Walking Sticks Graph* *Five Generations of Walking Sticks in Another Environment* **Video:** *All About Animal Adaptations* **Online Activity:** "Walking Stick Survival"
1 Session		**Reading:** *Science Resources Book*, "Adaptations"
2 Sessions plus 4 days of monitoring	**Crayfish Territory**	**Active Investigation and embedded Performance Assessment:** Students set up a long-term habitat and recording system for investigating territorial behavior in crayfish. The record and analyze the locations of individual crayfish. They consider territorial behavior as a possible adaptation that serves to improve the crayfish's chance for survival. **Science Notebook Entry:** *Crayfish Habitat*
1 Session		**Video:** *All About Animal Behavior and Communication* **Reading:** *Science Resources Book,* "Life on Earth"
1-2 Sessions	**Compare Crayfish to Other Animals**	**Active Investigation:** Students seek local schoolyard organisms for observation (snails are suggested). Using a Venn Diagram, students compare crayfish structures and functions to one other animal's structures and functions. **Science Notebook Entry:** *Comparing Structures*
1-2 Sessions		**Reading:** *Science Resources Book* "Inside a Snail's Shell" (optional) **Online Activities:** "Where Does it Live?" "What Doesn't Belong?" "Organism Match" "Habitat Gallery" "Crayfish vs. Snail vs. Mantis" "Life Cycles" **Reading:** *Science Resources Book* "A Change in the Environment"
1 Session	**Food Chains**	**Active Investigation, including NGSS Performance Expectation:** Students go outdoors to investigate food chains

		by assuming the roles of animals in a food chain. By changing the number in each population (grass, grasshoppers, frogs, and hawks), students try to achieve a sustainable food chain. **Science Notebook Entry:** Answer the focus question
1 Session		**Reading:** *Science Resources Book,* "Food Chains"
1 Session		**Benchmark Assessment:** Investigation 3: I-Check
		Investigation 4: Human Body
2-3 Sessions	**Counting Bones**	**Active Investigation:** Students start by observing the human body jumping rope. They count the number of bones in the skeleton, first without visual aids, then using photographs and posters to help make a more accurate count. Students assemble a model of a human skeleton from memory. They compare and discuss their models. They compare a picture of an accurate model to their own work. **Science Notebook Entry:** *Counting Bones*
1 Session		**Reading:** *Science Resources Book,* "The Human Skeleton" **Online Activity:** "Mr. Bones" **Embedded Assessment:** Response Sheet
2 Sessions	**Owl Pellets**	**Active Investigation and embedded Performance Assessment:** Students examine owl pellets, remove the rodent bones from them, and compare the structures of rodent bones to the structures of human bones. Students reconstruct the rodent skeleton, and read about researchers finding many 10,000-year-old preserved owl pellets. Through readings and media, students learn about fossils, how they are formed, and what evidence they provide about past environments. **Science Notebook Entry:** *Owl-Pellet Observations*
1-2 Sessions		**Reading:** *Science Resources Book* "Barn Owls" "Fossils" "Skeletons on the Outside" "Crayfish, Snails, and Humans" **Video:** *All About Fossils*
3-4 Sessions	**Joints and Muscles**	**Active Investigation:** Students investigate joints and discover the advantages of an articulated skeletal system. They modify their hands to simulate having no thumbs. They

		look for and feel their muscles when the muscles are working. Students work in pairs to build a model leg and foot that emulate the actions of a leg and foot during jumping. **Science Notebook Entries:** *Thumb Joints* *Muscle Action*
1-2 Sessions		**Reading:** *Science Resources Book* "Your Amazing Opposable Thumbs" "Joints and Muscles"
1 Session	**Fingerprints**	**Active Investigation, including NGSS Performance Expectation:** Students use pencil and tape to make carbon prints of their skin texture and fingerprints. They classify their fingerprints into the three basic patterns: whorl, arch, and loop. **Science Notebook Entries:** "Finger Patterns" Answer the focus question
1-2 Sessions		**Readings:** *Science Resources Book* "Fingerprints" "Super-twins"
1		**Benchmark Assessment:** *Post-test*