Science / 3rd Grade

Structures of Life

Subject	Grade	Unit	Suggested Timeline
Science	3	Structures of Life	9 Weeks

Grade Level Summary
The 3rd grade science curriculum focuses on giving students a broad understanding of science concepts. The focus is on physical science, earth science, life/biological science, technology and engineering education, and crosscutting concepts. Students will experience an inquiry based learning approach using observation and the scientific method that encourages collaboration, critical thinking, creativity, and communication.

Grade Level Units
Structures of Life
Water and Climate
Motion and Matter

Unit Title
Structures of Life

Unit Summary
The Structures of Life Module consists of four investigations dealing with big ideas in life science—plants and animals are organisms and exhibit a variety of strategies for life, organisms are complex and have a variety of observable structures and behaviors, organisms have varied but predictable life cycles and reproduce their own kind, and individual organisms have variations in their traits that may provide an advantage in surviving in the environment. Students 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.

Unit Essential Questions

1. How do organisms live, grow, respond to their environment, and reproduce?
2. How and why do organisms interact with their environment and what are the effects of these interactions?
3. How are the characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics?
4. How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms?

Key Understandings

1. Organisms are made of unique structures, grow, change, reproduce and respond to their environments.
2. Organisms interact with and have an effect on their environment.
3. Living organisms follow predictable life cycles and have similar characteristics as their parents.
4. The structures and behaviors of organisms help them to survive.
5. The skeletal system supports our body and joints allow for flexibility and movement.
6. There are shared characteristics between the structures of different organisms.

Focus Standards Addressed in the Unit	
3.1.3.A1	Describe the characteristics of living things that help to identify and classify them.
3.1.3.A2	Describe the basic needs of living things and their dependence on light, food, air, water and shelter.
3.1.3.A3	Illustrate how plants and animals go through predictable life cycles that include birth, growth, development, reproduction and death.
3.1.3.A5	Identify the structures in plants that are responsible for food production, support, water transport, reproduction, growth, and protection.
3.1.3.B2	Identify the characteristics that appear in both parents and offspring.
4.1.3.A	Differentiate between living and nonliving components in an environment.

Important Standards Addressed in the Unit	
4.1.3.A	Differentiate between living and nonliving components in an environment.
CC.1.2.3.E	Use text features and search tools to locate and interpret information.
CC.1.4.3.A	Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
4.1.3.D	Identify organisms that are dependent on one another in a given ecosystem.
CC.2.4.3.A.4	Represent and interpret data using tally charts, tables, pictographs, line plots, and bar graphs.
CC.2.4.3.A.1	Solve problems involving measurement and estimation of temperature, liquid volume, mass or length.

Misconceptions	Proper Conceptions
● Trees are their own type of organisms and not plants, students understanding of plant is not comprehensive enough to embrace all phases of the plant life cycle. ● Seeds are an inedible nuisance in foods. Vegetables are not fruits. ● We do not eat seeds. ● Something is only alive if it moves. ● Confusion between life cycle and life span.	● Plant have a life cycle starting as seeds and can grow into full size plants including trees if conditions are right. ● The fruit of the plant holds the seeds necessary for new plants. Foods we call vegetables can be the fruit of the plan- ie cucumbers, peppers, and peas. ● Nuts and grains are staples in our diets. ● Not all living things can move. All living things grow, resperate, reproduce, are made of cells, use energy, and respond to their environment. ● Life span is beginning of life to end of life. Life cycles are cyclical and the pattern repeats.

Concepts	Competencies	Vocabulary
Investigation 1: Origin of Seeds <u>Growth and development of organisms</u> -Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. ●Seeds develop in the plant part called a 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 <u>Inheritance of traits</u> -Many characteristics of organisms are inherited from their parents. ●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.	**Students will be able to...** 1. Identify, compare and contrast the properties of seeds. 2. Observe and describe the effect of water on dormant seeds. 3. Build a model to demonstrate a method in which a seed could disperse from the parent plant.	**Investigation 1: 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
Investigations 2: Growing Farther <u>Structure and function</u> -All organisms have external parts. Plants have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (Extended from grade 1) ● Roots function to take up water and nutrients so they can be transported	**Students will be able to...** 1. Identify and describe the structures of a plant. 2. Describe how plants are able to grow without soil (hydroponic setup). 3. Describe the life cycles of organisms.	**Investigation 2: Growing Further** adult fibrous root flower germination growth hydroponics inherit leaf

to other parts of the plant. Different kinds of plants have different root systems. Growth and development of organisms -Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. ●Germination is the onset of a seed's development. ●Plants need water, light, space, and nutrients to grow. ● The life cycle is the 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. Inheritance of traits -Many characteristics of organisms are inherited from their parents. -Other characteristics result from individuals' interactions with the environment. Many characteristics involve both inheritance and environment.	4. Compare and contrast the structures of different kinds of plants. 5. Explain that characteristics of organisms come from both inheritance and environment.	life cycle nutrient root seedling shoot stem taproot
Investigation 3: Meet the Crayfish Ecosystem dynamics, functioning, and resilience -When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. •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. Social interactions and group behavior -Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size. •Some animals claim a territory that they defend against others of their kind. Some organisms live in social groups that many help the individuals in the group survive.	**Students will be able to...** 1. Label the structures of a crayfish. 2. Observe and describe crayfish behaviors within their habitat. 3. Compare and contrast the structures of crayfish to those of other organisms. 4. Simulate a food chain.	**Investigation 3: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

Inheritance of traits -Many characteristics of organisms are inherited from their parents. -Other characteristics result from individuals' interactions with the environment. Many characteristics involve both inheritance and environment. •Crayfish have observable structures and behaviors that serve various functions in growth, survival, and reproduction. Variation of traits -Different organisms vary in how they look and function because they have different inherited information. -The environment also affects the traits that an organism develops. Natural selection -Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. •Difference in characteristics between individuals of the same species may provide an advantage in surviving. Adaptation -For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. Biodiversity and humans -Populations live in a variety of habitats, and changes in those habitats affect the organisms living there.		sustain sustainable swimmeret system territory trait variation
Investigations 4: Human Body Structure and function -All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air. •A skeleton is a system of interacting bones. Humans have about 206 bones. Bones have several functions: support, protection, and movement. •Muscles attach across joints to move bones. •Fingerprints can be sorted into three groups based on basic pattern: whorl, arch, and loop.	**Students will be able to...** 1. Explain the functions of the skeletal system. 2. Compare the skeletal system of a rodent to a human. 3. Explain the role of joints in movement. 4. Compare and contrast human fingerprints.	**Investigation 4:Human Body** arch articulated ball-and-socket joint bone characteristic contract fingerprint fossil gliding joint hinge joint joint loop movement muscle opposable thumb pattern protection

Inheritance of traits -Many characteristics of organisms are inherited from their parents. •The number and kinds of bones in an organism are characteristics inherited from the parents of the organism. Evidence of common ancestry and diversity -Some kinds of plants and animals that once lived on Earth are no longer found anywhere. -Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. •Fossils are important evidence about extinct organisms and past environments.		skeletal muscle skeletal system skeleton skull support tendon tissue torso whorl

Assessments:

-Survey/Pre-assessment
-Lab investigation response sheets
-Performance assessments
-Science notebooks
-I-Checks
-Posttest
-Centers
-Conferences
-Teacher observations

Grade 3 NGSS Performance Expectations	Foss Module	
	Embedded Assessment	**Benchmark Assessment**
3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.	• Inv 1, Part 1: notebook entry • Inv 1, Part 2: response sheet • Inv 1, Part 3: performance assessment • Inv 2, Part 1: response sheet • Inv 2, Part 2: notebook entry	• Investigation 1 I-Check • Investigation 2 I-Check • Survey/Posttest
3-LS2-1. Construct an argument that some animals form groups that help members survive.	• Inv 3, Part 3: research social behavior	
3-LS3-1. Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.	• Inv 3, Part 3: performance assessment • Inv 3, Part 4: response sheet	• Investigation 1 I-Check • Investigation 3 I-Check • Survey/Posttest
3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment.	• Inv 3, Part 3: performance assessment	• Investigation 2 I-Check • Investigation 3 I-Check • Survey/Posttest

3-LS4-1. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.	• Inv 4, Part 2: performance assessment	
3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.	• Inv 3, Part 1: notebook entry • Inv 3, Part 2: notebook entry • Inv 3, Part 3: performance assessment	• Investigation 1 I-Check • Investigation 3 I-Check • Survey/Posttest
3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.	• Inv 3, Part 4: response sheet	• Investigation 3 I-Check • Survey/Posttest
3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.	• Inv 3, Part 4: response sheet	• Investigation 3 I-Check • Survey/Posttest

Suggested Strategies to Support Design of Coherent Instruction
Charlotte Danielson's Framework for Teaching: Domain 3 Instruction

- (Transfer Goals)
- Apply Knowledge of science and technology in public discussion on relevant issues in a changing world
- Conduct investigations individually and collaboratively to answer questions
- Validate scientific claims for validity
- Think Systemically

Differentiation:

- Scaffolded notes
- Orally dictated note-taking
- Multiple instructional methods geared towards visual, auditory and kinesthetic learners
- Modified assessments
- Graphic organizers
- Extension research opportunities

Interdisciplinary Connections:

- See FOSS and Common Core ELA-Grade 3 Guide
- See FOSS and Common Core Math-Grade 3 Guide

Additional Resources:

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- Recommended Websites list
- Recommended Books list

Created By:
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Science / 3rd Grade
Water and Climate

Subject	Grade	Unit	Suggested Timeline
Science	3	Structures of Life	9 Weeks

Grade Level Summary
The 3rd grade science curriculum focuses on giving students a broad understanding of science concepts. The focus is on physical science, earth science, life/biological science, technology and engineering education, and crosscutting concepts. Students will experience an inquiry based learning approach using observation and the scientific method that encourages collaboration, critical thinking, creativity, and communication.

Grade Level Units
Structures of Life
Water and Climate
Motion and Matter

Unit Title
Water and Climate

Unit Summary
Water is the most important substance on Earth. Water dominates the surface of our planet, changes the face of the land, and defines life. Weather is driven by the sun and involves the movement of water over the earth through evaporation, condensation, precipitation, and runoff—the water cycle. Climate is determined in part by the amount of precipitation in a region and by temperature fluctuations. Human societies depend on water, and new technologies are being engineered to conserve and protect this natural resource, to provide for the needs of people around the world.

These powerful pervasive ideas are introduced to grade 3 students in the **Water and Climate Module**. It 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 and explore the crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; and systems and system models. They are introduced to the nature of science, how science affects everyday life, and the influence of engineering, technology, and science on society and the natural world.

Unit Essential Questions

1. What happens when water falls on different surfaces?
2. How does water move on different surfaces?
3. How does water change as it changes temperature?
4. How is density visible in the changing temperature of water?
5. How do we collect, understand, compare and use weather forecast data?
6. What affects the rate of evaporation?
7. How does surface area affect the rate of evaporation?
8. What are the qualities of water at different temperatures?

Key Understandings

1. Water will either absorb or bead up on a surface depending on how porous it is.
2. Water will always move down a slope joining with other water drops if possible. The angle of the slope and amount of water will affect the flow.
3. Water molecules will expand when they are heated and contract when they are cooled; until the temperature reaches -4℃ where water will freeze into ice which is less dense than liquid water.
4. Less dense materials will float in water while more dense materials will sink. Cold water is more dense than warm water. Ice is less dense than liquid water.

9. What is condensation and how does it affect the water cycle? 10. How are weather and climate different? 11. How do humans cope with weather conditions and hazards? 12. What happens when water mixes with other earth materials? 13. Do all soils drain at the same rate? 14. What is needed to make a waterwheel system function well?	5. Weather is the current condition of the atmosphere and climate is the typical weather of a region. 6. Access to air, air temperature, surface area and temperature all impact evaporation. 7. Weather-related natural hazards include tornadoes, hailstorms, blizzards, lightning, floods, and drought. 8. People often modify their homes and their way of life to deal with flood and wetland protection/restoration can prevent floods. 9. 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. 10. Evaporation is the process by which liquid (water) changes into gas (water vapor). 11. Condensation is the process by which gas (water vapor) changes into liquid water; it occurs on a cool surface. 12. Evaporation and condensation contribute to the movement of water through the water cycle. 13. Soil is rock particles mixed with organic material called humus. 14. Soils retain more water than rock particles alone. 15. Water drains more easily through some earth materials than through others. 16. The energy of flowing water can be used to do work; waterwheels are machines powered by flowing water.

Focus Standards Addressed in the Unit	
3.2.3.A3	Demonstrate how heating and cooling may cause changes in the properties of materials including phase changes.
3.2.4.A5	Use models to demonstrate the physical change as water goes from liquid to ice and from liquid to vapor.
3.3.4.A2	Identify basic properties and uses of Earth's materials including rocks, soils, water and gases of the atmosphere.
3.3.3.A4	Connect the various forms of precipitation to the weather in a particular place and time.
3.3.3.A5	Explain how air temperature, moisture, wind speed and direction, and precipitation make up the weather in a particular place and time.
4.1.4.B	Identify how matter cycles through an ecosystem.

Important Standards Addressed in the Unit	
4.1.3.E	Identify changes in the environment over time.
3.4.3.B2	Explain how materials are re-used or recycled.
CC.1.2.3.E	Use text features and search tools to locate and interpret information.
CC.1.4.3.A	Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
CC.2.4.3.A.4	Represent and interpret data using tally charts, tables, pictographs, line plots, and bar graphs.

CC.2.4.3.A.1	Solve problems involving measurement and estimation of temperature, liquid volume, mass or length.

Misconceptions	Proper Conceptions
● Placing their thermometer in hot water causes the water inside to go up because heat rises. ● Ice sinks in room temperature water just like cold water. ● Water that contracts in the thermometer is evaporating. ● Wet paper towels in a close container and open container will weigh the same amount the next day. ● Weather and climate are the same thing.	● Water expands when it gets hot. ● Ice floats because it is less dense than room temperature water and cold water sinks because it is more dense than room temperature water. ● Water contracts as it cools to take up less space. ● Water will evaporate from the paper towel in the open container and this container will weigh less the next day. ● Weather is the current condition of the atmosphere and climate is the typical weather of a region.

Concepts

Investigation 1: Water Observations

Core Content

-Water forms beads on waterproof materials and soaks into absorbent materials.

-Water moves downhill. The angle of the slope and the amount of water affect flow.

Science and Engineering Practices

-Developing and using models.

-Planning and carrying out investigations.

-Analyzing and interpreting data.

-Constructing explanations and designing solutions.

-Engaging in argument from evidence.

-Obtaining, evaluating, and communicating information.

The Roles of Water in Earth's Surface Processes

-Water is found in the ocean, rivers, lakes, and ponds.

-Water exists as solid ice and in liquid form. (Extended from grade 2)

-Nearly all of Earth's available water is in the ocean.

Human Impacts on Earth Systems

- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space.

Competencies

Students will be able to...

1. Compare and contrast water droplets on varied surface.
2. Build and model to demonstrate how water moves down a slope.
3. Explain that water behaves differently on different surfaces, i.e. is absorbed by or beads up.
4. Describe what happens when rain falls on natural materials.

Investigation 1: Water Observations

absorb
bead
bead up
data
direction
dome
earth material
evidence
gravity
move
natural material
observation
opinion
relationship
repel
slope
surface
waterproof
cloud
conserve
drought
evidence
fresh water
gas
gravity
ice
liquid
liter
mass
matter
melt
natural resource
opinion
rain
recycle

But individuals and communities are doing things to help protect Earth's resources and environments.		salt water soak soil solid surface tension volume water water vapor weigh
Investigations 2: Hot Water, Cold Water <u>Core Content</u> -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 the water; a material that sinks is more dense. -Cold water is more dense than warm water. -Water expands when it freezes; ice is less dense than liquid water. -Ice melts when heated; water freezes when cooled. <u>Science and Engineering Practices</u> - Asking questions and defining problems - Developing and using models - Planning and carrying out investigations - Analyzing and interpreting data - Constructing explanations and designing solutions - Engaging in argument from evidence - Obtaining, evaluating, and communicating information <u>The Roles of Water in Earth's Surface Processes</u> -Water is found in the ocean, rivers, lakes, and ponds. -Water exists as solid ice and in liquid form. (Extended from grade 2) -Nearly all of Earth's available water is in the ocean. <u>Weather and Climate</u> -Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years	**Students will be able to...** 1. Measure temperature accurately. 2. Describe the properties of water as it is heated and cooled. 3. Compare the density of water at different temperatures in room temperature water. 4. Compare melting ice in different conditions.	**Investigation 2: Hot Water, Cold Water** bulb cold contract degree Celsius (ºC) expand float freeze hot less dense liquid mass melt more dense sink solid state temperature thermometer volume

Structures and Properties of Matter -Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. -Matter can be described and classified by its observable properties. (Extended from grade 2)		
Investigation 3: Weather and Water Core Content -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 gas (water vapor). -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 contribute to the movement of water through the water cycle. Science and Engineering Practices -Asking questions and defining problems -Developing and using models -Planning and carrying out investigations -Analyzing and interpreting data -Using mathematics and computational thinking -Constructing explanations and designing solutions -Engaging in argument from evidence -Obtaining, evaluating, and communicating information Weather and Climate - Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. Structures and Properties of Matter -Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. -Matter can be described and classified by its observable properties. (Extended from grade 2)	**Students will be able to...** 1. Describe tools used to observe and measure weather. 2. Define and describe the steps involved in the water cycle using content specific vocabulary including evaporation and condensation. 3. Compare and contrast the rate of evaporations and the contributing causes. 4. Explain the process of condensation.	**Investigation 3: Weather and Water** compass condensation evaporation forecast gas meteorologist meteorology precipitation rain gauge surface area water cycle water vapor weather wind vane

Investigations 4: Seasons and Climate	**Students will be able to...**	**Investigation 4: Seasons and Climate**
Core Content -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 in graphic displays, may show patterns over time. -Climate is the average or typical weather that can be expected to occur in a region, based on long- term observation and data analysis. -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. Science and Engineering Practices -Analyzing and interpreting data -Constructing explanations and designing solutions -Obtaining, evaluating, and communicating information Weather and Climate -Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. -Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. Natural Hazards -A variety of natural hazards result from natural processes. -Humans cannot eliminate natural hazards but can take steps to reduce their impacts.	1. Organize and analyze local weather data for the past 4 months. 2. Differentiate between weather and climate. 3. Explain how humans adapt to severe weather conditions.	blizzard climate climatologist drought embankment flood floodplain hailstorm hurricane lightning monsoon natural hazard season sluice gate tornado typical wetland
Investigations 5: Waterworks	**Students will be able to…**	**Investigation 5: Waterworks**
Core Content -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.	1. Compare what happens when water is poured through different earth materials. 2. Determine whether or not soils in the schoolyard evaporate at the same rate.	blade constraint criteria criterion drainage energy gravel

-The energy of flowing water can be used to do work; waterwheels are machines powered by flowing water Science and Engineering Practices -Asking questions and defining problems -Planning and carrying out investigations -Analyzing and interpreting data -Constructing explanations and designing solutions -Engaging in argument from evidence -Obtaining, evaluating, and communicating information Natural Resources -Living things need water, air, and resources from the land, and they live in places that have the things they need. -Humans use natural resources for everything they do. (Extended from kindergarten) Natural Hazards -A variety of natural hazards result from natural processes. -Humans cannot eliminate natural hazards but can take steps to reduce their impacts. Defining and Delimiting Engineering Problems -Possible solutions are limited by available materials and resources (constraints). -The success of a designed solution is determined by considering the desired features of a solution (criteria). -Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. Developing Possible Solutions - At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. Optimizing the Design Solution - Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.	3. Construct a working waterwheel.	humus load natural resource nonrenewable resource renewable resource retain shaft soil system water retention waterwheel

Assessments:

-Survey/Pre-assessment
-Lab investigation response sheets
-Performance assessments
-Science notebooks
-I-Checks
-Posttest
-Centers
-Conferences
-Teacher observations

Grade 3 NGSS Performance Expectations	Foss Module	
	Embedded Assessment	**Benchmark Assessment**
3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.	• Inv 3, Part 1: performance assessment • Inv 4, Part 1: notebook entry	• Investigation 2 I-Check • Investigation 4 I-Check • Survey/Posttest
3-ESS2-2. Obtain and combine information to describe climates in different regions of the world.	• Inv 4, Part 2: notebook entry	• Investigation 4 I-Check
3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.	• Inv 4, Part 3: notebook entry	• Investigation 1 I-Check • Investigation 4 I-Check

Suggested Strategies to Support Design of Coherent Instruction
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- Conduct investigations individually and collaboratively to answer questions
- Validate scientific claims for validity
- Think Systemically

Differentiation:

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- Multiple instructional methods geared towards visual, auditory and kinesthetic learners
- Modified assessments
- Graphic organizers
- Extension research opportunities

Interdisciplinary Connections:

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Motion and Matter

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Water and Climate
Motion and Matter

Unit Title
Motion and Matter

Unit Summary
Motion and Matter provides grade 3 students with physical science core ideas dealing with forces and interactions, matter and its interactions, and with engineering design. Magnetism and gravity are the forces students explore as they look for patterns of motion to predict future motion. Students work with magnets and paper clips, wheel and- axle systems, paper air twirlers, and rotating tops. Students use their knowledge of science to enter the engineering design process and through the process refine their science understanding.

Students build on the science concepts of matter and its interactions developed in grade 2 using new tools to quantify observations.

Students use metric tools to refine observations by measuring mass and volume, they make mixtures and solutions to develop a foundational understanding of conservation of mass, and they observe a simple chemical reaction to extend their understanding of conservation. These new experiences with matter will prepare students for the disciplinary core ideas introduced in grade 5.

Throughout the Motion and Matter Module, students engage in science and engineering practices to collect data to answer questions and to define problems in order to develop solutions. Students reflect on their own use of these practices and find out about how others use these practices in science and engineering careers.

Unit Essential Questions	Key Understandings
1. How do magnets interact with other magnets and other objects? 2. How is a magnetic field affected when more magnets are added? 3. What causes changes in motion? 4. How can we predict, control and modify the motion of wheels down a ramp? 5. What is the best design for a top?	1. Gravity and magnetism are forces that can push or pull even when not in direct contact with another object. 2. Data can be used to predict how far a magnetic field extends. 3. The interaction between magnets depends on their orientation (attract or repel). 4. Unbalanced forces result in a change of motion.

6. What factors impact cart and twirly bird movement? 7. How can you improve upon your cart design? 8. What happens when you mix two substances? 9. Why is accurate measurement important?	5. The strength of the magnetic force between objects depends on the properties of those objects and their distance apart. 6. The pattern of an object's motion in various situations can be observed and measured. 7. When past motion exhibits a particular pattern, future motion can be predicted from it. 8. Wheel size impacts cart movement. The system will curve toward the smaller wheel. 9. Tops exhibit rotational motion when torque is applied to the axial shift. 10. Top and twirly bird performance is affected by variables. 11. One needs to consider desired features (criteria), available resources, and past research/data when designing and modifying the design of a cart. 12. A mixture is two or more materials distributed evenly throughout one another. 13. A solution results when a solid materials dissolves completely in a liquid. 14. Materials change into new materials when a chemical reaction occurs. 15. Mass is neither created nor destroyed during chemical and physical reactions.

Focus Standards Addressed in the Unit	
3.2.3.A4	Use basic reactions to demonstrate observable changes in properties of matter.
3.2.2.B1	Explain how movement can be described in many ways.
3.2.3.B2	Explore energy's ability to cause motion or create change. Explore how energy can be found in moving objects, light, sound and heat.
3.4.3.C2	Explain why the design process requires creativity and consideration of all ideas.
3.4.3.C3	Recognize that all products and systems are subject to failure; many products and systems can be fixed.
3.4.4.D1	Investigate how things are made and how they can be improved.

Important Standards Addressed in the Unit	
CC.1.2.3.E	Use text features and search tools to locate and interpret information.
CC.2.4.3.A.1	Solve problems involving measurement and estimation of temperature, liquid volume, mass or length.
CC.1.4.3.A	Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
CC.1.5.3.A	Engage effectively in a range of collaborative discussions on grade level topics and texts, building on others' ideas and expressing their own clearly.

3.4.4.A3	Understand that systems have parts and components that work together.
3.4.3.D2	Observe, analyze and document how simple systems work.

Misconceptions	**Proper Conceptions**
● Matter is lost during a chemical reaction. ● Magnets only attract other magnets. ● Magnets attract all metal objects. ● Motion cannot be predicted. ● Carts with different sized wheels can roll straight. ● Gases don't have mass. ● If a book is on a table, the table is blocking gravity.	● Matter is neither created nor destroyed. ● Magnets have a north and south pole and can attract or repel based on orientation. ● Magnets only attract certain metal objects. ● Observing how an object moves can help to predict future movement. ● The system will curve toward the smaller wheel. ● Gases have mass. ● The table pushes up with the same amount of force as gravity pulls down. The forces are balanced.

Concepts	**Competencies**	**Vocabulary**
Investigation 1: Forces Content: • Magnetic forces between objects do not require that the objects be in contact. • The strength of the magnetic force between objects depends on the properties of the objects and their distance apart. • The interaction between magnets depends on their orientation (sometimes they attract and sometimes they repel). • Unbalanced forces (pushes or pulls) result in a change of motion. • Gravity is the force that pulls masses toward the center of the Earth. Force and Motion •The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. Type of Interactions •Objects in contact exert forces on each other. •Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.	**Students will be able to...** 1. Observe and describe the effects of the forces of magnetism and gravity to push and/or pull an object. 2. Identify that forces can make items move without direct contact. 3. Refine their investigations and their abilities to use science practices and collect data regarding their observations of the interaction between paper clips and magnets. 4. Use data to make predictions about the distance of a magnetic field. 5. Use their experience with magnetic forces to explore other pushes and pulls, considering strength and direction.	**Investigation 1: Forces** Investigation Guide: attract balanced change of motion data direction evidence force gravity magnet magnetic field magnetic force magnetism model motion observe pattern practice predict prediction pull push repel science practices strength unbalanced Additional Science Resources: distance equal experiment natural history observation

		pattern pole shaft system
Investigations 2: Patterns of Motion Content • The patterns of an object's motion in various situations can be observed and measured. • When past motion exhibits a regular pattern, future motion can be predicted from it • A wheel-and-axle system with two sizes of wheels describes a curved path when rolled down a slope. The system curves toward the smaller wheel. • A twirly bird is a simple winged system that spins when it interacts with air. Twirler performance is affected by variables. • Tops exhibit rotational motion (spinning) when torque is applied to the axial shaft. Top performance is affected by variables. Force and Motion • The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it.	**Students will be able to...** 1. Use a variety of systems to explore and measure patterns of motion. 2. Design wheel-and-axle systems and roll the systems down ramps to observe the pattern of motion. 3. Make predictions about using a big and little wheel system on a predictable curved rolling path. 4. Apply previously discovered exhibited patterns of motion to make predictions about future motions in a system. 5. Apply previous testing data to make adjustments to a wheel and axle system to meet certain challenges. 6. Explain the variables involved in the interaction between twirling systems, gravity, and air. 7. Design tops and explore the variables that results in the best spinning top.	**Investigation 2: Patterns of Motion** Investigation Guide: axis axle friction outcome pattern of motion ramp rotate shaft slope standard system top twirly bird variable wheel Additional Science Resources: curve energy mass predict rotation rotational force spin stable symmetrical uneven wheel-and-axle system
Investigation 3: Engineering Content • Possible solutions to a problem are limited by available materials and resources (constraints). • The success of a designed solution is determined by considering the desired features of a solution (criteria). • Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. • The pattern of an object's or a system's motion in various situations can be observed and measured. • When past motion exhibits a pattern, it can be used to predict future motion. Force and Motion •The patterns of an object's motion in various situations can be observed and	**Students will be able to...** 1. Apply previously discovered exhibited patterns of motion to make predictions about future motions in a system. 2. Design a cart that can roll "from here to there," and then improve their designs to meet a specific distance challenge. 3. Observe and describe how start position on a ramp affects the distance the cart travels. 4. Observe and measure the pattern of an object or system's motion. 5. Design a cart system to meet challenges using knowledge of magnetism.	**Investigation 3: Engineering** Investigation Guide: bearing centimeter (cm) constraint criterion engineer meter (m) metric system solution standard unit start position Additional Science Resources: criteria friction gram (g) liter (L) magnetic closure mixture prototype

measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. Defining and Delimiting Engineering Problems •Possible solutions are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. Developing Possible Solutions •At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. Optimizing the Design Solution •Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.		technology volume
Investigations 4: Mixtures Content •A mixture is two or more materials distributed evenly throughout one another. • A special class of mixture, a solution, results when a solid material dissolves (disappears) in a liquid. • Starting materials change into new materials during chemical reactions. • Mass is neither created nor destroyed during physical and chemical interactions Matter is conserved. Structures and Properties of Matter •The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. •Measurements of a variety of properties can be used to identify materials. Chemical Reactions •When two or more different substances are mixed, a new substance with different properties may be formed.	**Students will be able to...** 1. Determine the mass of the materials prior to mixing and after mixing. 2. Observe and describe the results of making various mixtures with 2 materials. 3. Make inferences about why the weight of 2 materials before mixing them can be different than their combined mass. 4. Explain that gases have mass. 5. Design and conduct a metric field day to apply their understanding of standards of measurement.	**Investigation 4: Mixtures** Investigation Guide: baking soda calcium carbonate carbon dioxide chalk chemical reaction cloudy conservation of mass dissolve mixture salt solution suspend transparent vinegar Additional Science Resources: conserve float gas liquid property screen separate sink

•No matter what reaction or change in properties occurs, the total weight of the substances does not change.		solid

Assessments:

-Survey/Pre-assessment
-Lab investigation response sheets
-Performance assessments
-Science notebooks
-I-Checks
-Posttest
-Centers
-Conferences
-Teacher observations

Grade 3 NGSS Performance Expectations	Foss Module	
	Embedded Assessment	Benchmark Assessment
3-PS2-1. Plan and conduct an investigatic to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.	• Inv 1, Part 1: notebook entry • Inv 1, Parts 2–3: response sheet • Inv 2, Part 3: performance assessment	• Investigation 1 I-Check • Investigation 2 I-Check • Survey/Posttest
3-PS2-2. Make observations and/or measurements of an object's motion to provide evidence that a pattern can be use to predict future motion.	• Inv 1, Part 2: performance assessment • Inv 2, Part 1: notebook entry • Inv 2, Part 2: response sheet	• Investigation 2 I-Check • Survey/Postest
3-PS2-3. Ask questions to determine cause-and-effect relationships of electric magnetic interactions between two object not in contact with each other.	• Inv 1, Part 2: performance assessment	• Investigation 1 I-Check • Survey/Postest
3-PS2-4. Define a simple design problem that can be solved by applying scientific ideas about magnets.	• Inv 3, Part 4: Focus question answer	• Investigation 3 I-Check
3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.	• Inv 3, Part 1: notebook entry • Inv 3, Part 2: notebook entry	• Investigation 3 I-Check
3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem	• Inv 3, Part 1: notebook entry • Inv 3, Part 2: notebook entry	• Investigation 3 I-Check
3-5-ETS1-3. Plan and carry out fair tests which variables are controlled and failure points are considered to identify aspects c a model or prototype that can be improve	• Inv 3, Part 3: performance assessment	• Investigation 3 I-Check

Suggested Strategies to Support Design of Coherent Instruction
Charlotte Danielson's Framework for Teaching: Domain 3 Instruction

- (Transfer Goals)
- Apply Knowledge of science and technology in public discussion on relevant issues in a changing world
- Conduct investigations individually and collaboratively to answer questions
- Validate scientific claims for validity
- Think Systemically

Differentiation:

- Scaffolded notes
- Orally dictated note-taking
- Multiple instructional methods geared towards visual, auditory and kinesthetic learners
- Modified assessments
- Graphic organizers
- Extension research opportunities

Interdisciplinary Connections:

- See FOSS and Common Core ELA-Grade 3 Guide
- See FOSS and Common Core Math-Grade 3 Guide

Additional Resources:

Digital only resources available at www.fossweb.com

- Recommended Websites list
- Recommended Books list

Created By:
3rd Grade Science Committee