Title: Motion and Matter **Grade: 3**

Length: 25 days

Enduring Understandings:

<u>Investigation 1: Forces</u>

- Magnetic force between objects does not require that the objects be in contact; the strength of the magnetic force depends on the objects' properties and their distance apart.
- How magnets interact depends on their orientation (sometimes they attract and sometimes they repel).
- Each force acting on an object has a strength and a direction. Unbalanced forces (pushes and pulls) cause change of motion.
- Gravity is the force that pulls things toward the center of Earth

<u>Investigation 2: Patterns of Motion</u>

- 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.

Standards to be addressed: NGSS, CCSS ELA, CCSS Math

<u>NGSS:</u>

Physical Sciences- PS2- Motion and Stability: Forces and Interactions- How can one explain and predict interactions between objects and within systems of objects?
3-PS2-1: Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
3-PS2-2: Make observations and/ or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
3-PS2-3: Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
3-PS2-4: Define a simple design problem that can be solved by applying scientific ideas about magnets.
Engineering, Technology, and the Application of Science- ETS1: Engineering Design- How do engineers solve problems?
3-5-ETS1-1: Design a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or costs.
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 a problem.
3-5-ETS1-3: Plan and carry out fair tests in which variables are controlled and failure points are

	considered to identify aspects of a model or prototype that can be improved. **<u>CCSS ELA:</u>** **<u>Investigation 1: Forces</u>** RI 2: Determine the main idea of text. RI 3: Describe the relationship of scientific ideas or concepts. RI 5: Use text features to locate information. RI 6: Distinguish their own point of view from that of the author of the text. RI 7: Use information gained from illustrations to demonstrate understanding of text. SL 1: Engage in collaborative discussions. L 5: Demonstrate understanding of word relationships. L 6: Acquire and use domain-specific words. **<u>Investigation 2</u>: Patterns of Motion** RI 1: Ask and answer questions. RI 5: Use text features to locate information. RI 7: Use information gained from illustrations to demonstrate understanding of text. SL 1: Engage in collaborative discussions. SL 3: Ask and answer questions about information from a speaker. SL 5: Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace. L 4: Determine or clarify the meaning of new or unknown words. L 5: Demonstrate understanding of word relationships. **<u>CCSS Math:</u>** **MP.2.** Reason abstractly and quantitatively. **MP.4.** Model with mathematics. **MP.5.** Use appropriate tools strategically.

Essential Questions:

What provocative questions will foster inquiry, understanding, and transfer learning? What questions can you use to connect this unit to Cross-Cutting Concepts?

Investigation 1: Forces

- How can one explain and predict interactions between objects and within systems of objects?

  Focus Questions
  - What happens when magnets interact with other magnets and with paper clips?
  - How is the magnetic field affected when more magnets are added?
  - What causes change in motion?

Investigation 2: Patterns of Motion

- How can one explain and predict interactions between objects and within systems of objects?

  Focus Questions
  - How can we change the motion of wheels rolling down ramps?
  - What rules help predict where a rolling cup will end up?
  - Student-created questions, e.g., What happens to the motion of a twirly bird when the wing length changes?
  - What is the best design for a top?

Disciplinary Core Ideas:	**Scientific & Engineering Practices:**	**Crosscutting Concepts:**
Investigation 1: Forces **PS2.B:** Types 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.	**Investigation 1: Forces** ● Asking questions and defining problems ● Developing and using models ● Planning and carrying out investigations ● Analyzing and interpreting data ● Using	**Investigation 1: Forces** ● Patterns ● Cause and effect

● 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. **<u>Investigation 2: Patterns of Motion</u>** **PS2.A:** Forces and motion: ● The patterns of an object's motion in various situations can be observed and measured; when the past motion exhibits a regular pattern, future motion can be predicted from it.	mathematics and computational thinking ● Constructing explanations and designing solutions ● Obtaining, evaluating, and communicating information **<u>Investigation 2: Patterns of Motion</u>** ● Asking questions and defining problems ● Planning and carrying out investigations ● Analyzing and interpreting data ● Constructing explanations and designing solutions ● Obtaining, evaluating, and communicating information	**<u>Investigation 2: Patterns of Motion</u>** ● Patterns ● Cause and effect ● Systems and system models

Big Ideas-I want students to understand:

What scientific explanations and/or models are critical for student understanding of the content?
So what? Who cares?
What is the most important for students to understand about this topic?

<u>Investigation 1: Forces</u>

- Magnetic force between objects does not require that the objects be in contact; the strength of the magnetic force depends on the objects' properties and their distance apart.
- How magnets interact depends on their orientation (sometimes they attract and sometimes they repel).
- Each force acting on an object has a strength and a direction. Unbalanced forces (pushes and pulls) cause change of motion.
- Gravity is the force that pulls things toward the center of Earth

<u>Investigation 2: Patterns of Motion</u>

- 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. Variables affect twirler performance.
- Tops exhibit rotational motion (spinning) when torque is applied to the axial shaft. Variables affect top performance.

Do-I want students to be able to:

What scientific practices will we explicitly focus on in this unit?
What key knowledge and skills will students develop as a result of this unit?
(Use verb phrases)

<u>Investigation 1: Forces</u>

- Ask questions while observing the interaction of magnets.
- Develop a model to explain the attraction between magnets and paper clips.
- Analyze and interpret data in order to make a prediction about the boundary of the magnetic field

Investigation 2:

- Ask questions about how changes of system variables affect the system's motion.
- Make observations to produce data to test a design.
- Communicate observations and comparisons of motion, using precise vocabulary.

Know-What are the basics?:

What vocabulary formations or other facts do students need to know in order to understand the big ideas?

Investigation 1: Forces

Vocabulary: attract, balanced, change of motion, evidence, force, gravity, magnet, magnetic field, magnetic force, magnetism, model, motion, observe, predict, prediction, pull, push, repel, unbalanced

Investigation 2: Patterns of Motion

Vocabulary: axis, axle, friction, outcome, pattern of motion, ramp, rotate, shaft, slope, standard, system, top, twirly bird,variable, wheel

How do I reinforce or build literacy or mathematics skills?

Literacy:

Reading skills supported through reading science resources book: reading fluency, reading comprehension, determining main ideas, integrating information from multiple texts, making connections, drawing evidence and conclusions from informational texts, distinguishing between evidence (fact) and opinion, determining meaning of domain specific vocabulary

Writing skills supported through writing in interactive science notebooks: take notes, gather relevant information, recall relevant information from experiences, organize and produce clear and coherent written responses, draw evidence and conclusions from informational texts, label using appropriate vocabulary, revise thinking

Mathematics:

Use place value understanding and properties of operations to perform multi-digit problems
Creating tables and graphs, interpret data
Using metric measurements and estimation of intervals of time

Using critical and higher order thinking to solve problems

Assessment: How will I know what students have learned?

Performance Expectations:
Does the formative or summative assessment require students to show their understanding in an observable way?
Does it make students' thinking visible?
Are there criteria and are the criteria relevant to the big ideas for the unit?

Other evidence:
Include multiple types of learning to give a more accurate picture of learning.

Embedded Formative Assessments for all Investigations:

- Survey prior to starting module (Benchmark assessment)
- Science notebook entries
- Response sheets
- Performance assessments
- Class discussions
- Reflections
- Exit slips

Summative Assessments:

- I-Check after each investigation
- Post-test after all investigations are complete

Investigation 1:

- **Part 1 Two Forces -** Focus Question- What happens when magnets interact with other magnets and with paper clips?
  Science Notebook Check:
  - Students draw a model that indicates two forces at work: magnetism and gravity.
  - Students write a few sentences to describe their model.
- **Part 2 Magnetic Force Investigation-** Focus Question- How is the magnetic field affected when more magnets are added?
  Performance Assessment Checklist:
  - Students are able to collaborate and carry out the investigation. (Planning and carrying out investigations.)
  - Students are able to use the snap data they collect from one magnet and three magnets to make a reasonable prediction for two magnets snap

distance. (Analyzing and interpreting data; using mathematics and computational thinking.)
    - Students are able to communicate their findings. (Obtaining, evaluating, and communicating information; PS2.B: Types of interactions.)
    - Students know that they are looking for a pattern in the data from which to make a prediction. (Patterns.)

  Response Sheet:
    - Students determine the the units of force needed to hold the cart in place. (If one student is pushing with 500 units of force the other student must be pushing with the same force to keep the cart in one place.)
    - Students know that forces hold the apple in place. Gravity is pulling the apple down toward Earth's center; the hand is pushing with an equal upward force to keep the apple in one place.
- **Part 3- More about Forces-** Focus Question: What causes change of motion?
  Investigation 1 I-Check

Investigation 2: Patterns of Motion

- **Part 1 Wheel and Axis Systems-** Focus Question - How can we change the motion of wheels running down ramps?
  Science Notebook Check:
    - Students clearly describe and/or draw a system they constructed.
    - Students describe the motion of the system and logically connect the structure of the system with the motion observed.
- **Part 2 Predicting Motion of New Systems -** Focus Question - What rules help predict where a rolling cup will end up?
  Response Sheet A and B - Investigation 2:
    - Students choose an object with different-sized ends to roll off the ramp at position 1; the smaller end of the object should start closest to side 1.
    - Students choose an object with equal_sized ends to roll off the ramp at position 2; e.g. the pencil or the vase with the wide opening.
    - Students choose an object with different-sized ends to roll off the ramp at position 1; the smaller end of the object should start closest to side 3.
- **Part 3 Twirly Birds -** Focus Question - Student created questions, e.g., What happens to the motion of a twirly bird when the design changes?
  Performance Assessment:
    - Students ask testable questions.
    - Students change only one variable at a time and compare the varied twirly bird with the standard.
    - Students communicate their findings.
    - Students describe the forces at work when the twirly bird is in motion.
    - Students describe cause-and-effect relationships that they observe. For example, if they cut the wings short (cause) they can connect short wings to faster spin and faster descent (effect).

- **<u>Part 4 Tops -</u>** Focus Question - What is the best design for a top?
  Investigation 2 I-Check

What some ways we could possibly differentiate instruction to reach all learners?

How shall we teach for understanding?
Incorporate different learning styles as well hands-on and engaging activities?

- Graphic organizers
- Provide definition for vocabulary
- Online activities
- Written directions
- Small group instruction
- Visual cues to assist in organizing science notebook
- Specific roles for group work
- Sentence starters for focus question responses
- Shared slides, videos, and documents on Google
- Provide individual and group activities
- Math Extensions (within Teacher Resource text)
- Home/ School Connections (within Teacher Resource text)
- Outdoor connected activities
- Morning Meeting activities

Title: Structures of Life **Grade: 3**

Length: 25 days

Enduring Understandings:

<u>Investigation 1: Origin of Seeds</u>

- 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.
- 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.

Standards to be addressed: NGSS, CCSS ELA, CCSS Math

<u>NGSS:</u>

3-LS1 Life Systems: From molecules to organisms: structures and processes- How do organisms live, grow, respond to their environment, and reproduce?
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.
3-LS3 Life Systems: Heredity:

<u>Investigation 2: Growing Further</u> ● 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 produces 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 other parts of the plant. Different kinds of plants have different root systems.	**Inheritance and variation traits- How are characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics?** **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. **3-LS3-2.** Use evidence to support the explanation that traits can be influenced by the environment. **<u>CCSS ELA:</u>** **<u>Investigation 1: Origin of Seeds</u>** Rl 1: Ask and answer questions to demonstrate understanding of a text. RI 2: Determine the main idea of text. RI 3: Describe the relationship between scientific ideas, using language that pertains to cause and effect. RI 5: Use text features to locate information. RI 7: Use information gained from illustrations and words to demonstrate understanding of text. W 3: Write a narrative. SL 1: Engage in collaborative discussions. SL 4: Recount an experience with appropriate facts and relevant descriptive details. L 4: Determine the meaning of unknown words. L 6: Acquire and use domain-specific words. **<u>Investigation 2: Growing Further</u>** RI 4: Determine the meaning of domain-specific words and phrases in text. RF 4: Read with fluency. SL 1: Engage in collaborative discussions. SL 2: Determine the main idea from information presented orally. SL 3: Ask and answer questions, offering appropriate elaboration and

	detail. L 5: Demonstrate understanding of word relationships. **CCSS Math:** **MP.2.** Reason abstractly and quantitatively **MP.4.** Model with mathematics **MP.5.** Use appropriate tools strategically

Essential Questions:

What provocative questions will foster inquiry, understanding, and transfer learning? What questions can you use to connect this unit to Cross-Cutting Concepts?

Investigation 1: Origin of Seeds

- How do organisms grow?
- How are the characteristics of one generation related to the previous generation?

Focus 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

Investigation 2: Growing Further

- How do organisms live, grow, respond to their environment, and reproduce?
- How are characteristics of one generation passed to the next?

Focus 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?

Disciplinary Core Ideas:	**Scientific & Engineering Practices:**	**Crosscutting Concepts:**

<u>Investigation 1: Origin of Seeds</u> **LS1.B:**Growth and development of organisms: ● Reproduction is essential to the continued existence of every organism. Plants and animals have unique and diverse life cycles. **LS3.A:** Inheritance of traits: ● Many characteristics of organisms are inherited from their parents.	**<u>Investigation 1: Origin of Seeds</u>** ● 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	**<u>Investigation 1: Origin of Seeds</u>** ● Patterns ● Cause and effect ● Structure and function
<u>Investigation 2: Growing Further</u> **<u>LS1.A:</u>** Structure and function ● All organisms have external parts. Plants have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. **<u>LS1.B:</u>** Growth and development of organisms ● Reproduction is essential to the	**<u>Investigation 2: Growing Further</u>** ● Asking questions and defining problems ● Planning and carrying out investigations ● Analyzing and interpreting data ● Constructing explanations and designing solutions ● Engaging in	**<u>Investigation 2: Growing Further</u>** ● Patterns ● Cause and effect ● Structure and function

continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. **LS3.A:** 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.	argument from evidence ● Obtaining, evaluating, and communicating information	

Big Ideas-I want students to understand:

What scientific explanations and/or models are critical for student understanding of the content?
So what? Who cares?
What is the most important for students to understand about this topic?

<u>Investigation 1: Origin of Seeds</u>

- Seeds develop in the plant part called a fruit.
- Different kinds of plants have different kinds and numbers of seeds; seeds have a variety of properties.
- A seed is an organism, a living thing.
- Seeds undergo developmental changes in the presence of water.
- A seed contains an embryo plant and a supply of food. A seed grows into a new plant (reproduction).
- Seeds move away from parent plants via a number of seed disposal mechanisms, including wind, water, and animals.

<u>Investigation 2: Growing Further</u>

- Germination is the onset of a seed's growth.
- 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 produces new plants of the same kind.
- The fruit of the plant develops from the flower.
- Roots are plant structures that take up water and nutrients so they can be transported to other parts of the plant. Different kinds of plants have different root systems.
- Each kind of organism has inherited characteristics. Some characteristics are a result of the environment.

Do-I want students to be able to:

What scientific practices will we explicitly focus on in this unit?
What key knowledge and skills will students develop as a result of this unit?
(Use verb phrases)

<u>Investigation 1: Origin of Seeds</u>

- Observe and compare properties of fruits.
- Investigate the effects of water on seeds.
- Monitor and record daily changes in seeds.
- Compare the mass of dry seeds to those soaked in water.
- Design and test models of seed-dispersal systems.

<u>Investigation 2: Growing Further</u>

- Describe and compare different kinds of germinated seeds.
- Plant bean seedlings in nutrient solution and observe them throughout their life cycle.
- Observe plant structures as they appear during the plant's life cycle.

Know-What are the basics?:

What vocabulary formations or other facts do students need to know in order to understand the big ideas?

<u>Investigation 1: Origin of Seeds</u>

<u>Vocabulary:</u> 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

<u>Investigation 2: Growing Further</u>

Vocabulary: adult, fibrous root, flower, germination, growth, hydroponics, inherit, leaf, life cycle, nutrient, root, seedling, shoot, stem, taproot

How do I reinforce or build literacy or mathematics skills?

Literacy:

Reading skills supported through reading science resources book: reading fluency, reading comprehension, determining main ideas, integrating information from multiple texts, making connections, drawing evidence and conclusions from informational texts, distinguishing between evidence (fact) and opinion, determining meaning of domain specific vocabulary

Writing skills supported through writing in interactive science notebooks: take notes, gather relevant information, recall relevant information from experiences, organize and produce clear and coherent written responses, draw evidence and conclusions from informational texts, label using appropriate vocabulary, revise thinking

Mathematics:

Use place value understanding and properties of operations to perform multi-digit problems
Creating tables and graphs, interpret data
Using metric measurements and estimation of intervals of time
Using critical and higher order thinking to solve problems

Assessment: How will I know what students have learned?
Performance Expectations:
Does the formative or summative assessment require students to show their understanding in an observable way?
Does it make students' thinking visible?
Are there criteria and are the criteria relevant to the big ideas for the unit?

Other evidence:
Include multiple types of learning to give a more accurate picture of learning.
Embedded Formative Assessments for all Investigations:

- Survey prior to starting module (Benchmark assessment)
- Science notebook entries
- Response sheets
- Performance assessments
- Class discussions
- Reflections
- Exit slips

Summative Assessments:

- I-Check after each investigation
- Post-test after all investigations are complete

Investigation 1: Origin of Seeds

- **Part 1 Seed Search-** Focus Question- How are seeds alike and different?
  Science Notebook Check:
  - Students record the name of the fruit and the number of seeds.
  - Students describe and draw the properties of each kind of seed.

- **Part 2 The Sprouting Seed-** Focus Question- What effect does water have on seeds?
  Response Sheet- Investigation 1:
  - Students write and include the date of each observation and suggest ways to add more information and detail to the written observation with words and labeled drawings.
  - Students list properties that she could include, such as change in size, shape, color, texture, and so on.
  - Students understand that it is important to keep written records to remember exactly what happened over time.
  - Students understand that the focus question is asking about cause (water) and effect (changes to seeds).

- **Part 3- Seed Soak-** Focus question- How much water does a seed soak up?
  Performance Assessment Checklist:
  - Students plan and conduct a well-reasoned investigation, using the balance appropriately.
  - Students organize their observations and use logic to analyze data, and understand the cause-and-effect relationship: if you soak lima beans in water they soak up water and weigh more.

- **Part 4- Seed Dispersal-** Focus Question- How do seeds disperse away from the parent plant?
  Investigation 1 I-Check

Investigation 2: Growing Further

- **Part 1 Germination and Growth -** Focus Question - What structures does a seedling have to help it grow and survive?
  Response Sheet - Investigation 2:
  - Students write that a root is growing, not a stem.
  - Students write that the root usually grows first, not the stem.

- Students write that the root's function is to take in water and nutrients.
- Students write that germination is the pattern of growth in a living seed.

- **<u>Part 2 Life Cycle of the Bean</u> -** Focus Question - What is the sequence of the bean plant's life cycle?
  Science Notebook Check:
  - Students put all the pictures in the correct order.
  - Students caption the pictures as follows:
    1. Seed: contains the new plant.
    2. Root is beginning to grow.
    3. First leaves have grown. Cotyledon is drying up.
    4. Plant has grown and has many leaves.
    5. Flowers have appeared.
    6. Fruit or bean pods have appeared.
    7. Pods are fully grown and are full of seeds.
- **<u>Part 3 Roots and Shoots</u> -** Focus Question - How do the roots of schoolyard plants compare to the roots of bean plants?
  Investigation 2 I-Check

What some ways we could possibly differentiate instruction to reach all learners?

How shall we teach for understanding?
Incorporate different learning styles as well hands-on and engaging activities?

- Graphic organizers
- Provide definition for vocabulary
- Online activities
- Written directions
- Small group instruction
- Visual cues to assist in organizing science notebook
- Specific roles for group work
- Sentence starters for focus question responses
- Shared slides, videos, and documents on Google
- Provide individual and group activities
- Math Extensions (within Teacher Resource text)
- Home/ School Connections (within Teacher Resource text)
- Outdoor connected activities
- Morning Meeting activities

Title: Water and Climate **Grade: 3**

Length: 25 days

Enduring Understandings:

<u>Investigation 1: Water Observations</u>

- Water forms beads on waterproof materials and soaks into absorbent materials.
- Water moves downhill.
- Large water domes move faster down a slope than smaller domes.
- The steeper the slope of a surface, the faster a water dome moves.

<u>Investigation 2: Hot and Cold Water</u>

- Temperature is a measure of how hot matter is.
- Water expands when heated and contracts when cooled.
- A material the 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.

Standards to be addressed: NGSS, CCSS ELA, CCSS Math

<u>NGSS</u>

Grades 2-3-ESS2 Earth's Systems- How and why is Earth constantly changing?

3-ESS2-1. Represent data in tables and graphic displays to describe typical weather conditions expected during a particular season.

3-ESS2-2. Obtain and combine information to describe climates in different regions of the world.

3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

Grades 3-5-ETS1-1 Engineering Design- How do engineers solve?

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.

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.

3-5-ETS1-3. Plan and carry out fair tests

	<u>CCSS ELA:</u> **<u>Investigation 1: Water Observations</u>** RI: 1: Ask and answer questions. RI 2: Determine the main idea of text. RL 3: Describe in a text the steps in technical procedures. RL 5: Use text features to locate information. RI 7: Use information gained from illustrations to demonstrate understanding of the text. RF 4: Read with fluency, purpose and understanding. W 5: Strengthen writing by revising and editing. SL 1: Engage in collaborative discussions. SL 3: Ask and answer questions about speaker's information. SL 4: Recount an experience. L 4: Use glossaries to determine or clarify the precise meaning of key words. L 5: Demonstrate understanding of word relationships. L 6: Acquire and use domain-specific words. **Investigation 2: Hot Water, Cold Water** RI: 1: Ask and answer questions to demonstrate understanding of a text.. RI 2: Determine the main idea of text; recount key details. RL 3: Describe the relationship between scientific concepts using language that pertains to cause and effect. RI 4: Determine the meaning of domain-specific words and phrases in a text. W 5: Strengthen writing by revisiting and editing. SL 1: Engage in collaborative discussions. SL 2: Determine main ideas and supporting details of information presented in diverse formats.

	L 5: Demonstrate understanding of word relationships. **<u>CCSS Math:</u>** **MP.2.** Reason abstractly and quantitatively. **MP.4.** Model with mathematics. **MP.5.** Use appropriate tools strategically.

Essential Questions:

What provocative questions will foster inquiry, understanding, and transfer learning? What questions can you use to connect this unit to Cross-Cutting Concepts?

<u>Investigation 1: Water Observations</u>

- How and why is Earth constantly changing?
- How do Earth's surface processes and human activities affect each other?

Focus 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?

<u>Investigation 2: Hot Water, Cold Water</u>

- How and why is Earth constantly changing?
- How can one explain the structure, properties, and interactions of matter?

Focus 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?

Disciplinary Core Ideas:	**Scientific & Engineering Practices:**	**Crosscutting Concepts:**
<u>Investigation 1: Water Observations</u> ESS2.C: 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. Nearly all of Earth's available water is in the ocean. ESS3.C: 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. But individuals and communities are doing things to help protect Earth's resources and environments. **<u>Investigation 2: Hot Water, Cold Water</u>** ESS2.C: 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.	**<u>Investigation 1: Water Observations</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>Investigation 2: Hot Water, Cold Water</u>** ● Asking questions and defining problems ● Developing and using models ● Planning and carrying out investigations ● Analyzing and interpreting data ● Constructing explanations and designing solutions	**<u>Investigation 1: Water Observations</u>** ● Patterns ● Cause and effect **<u>Investigation 2: Hot Water, Cold Water</u>** ● Cause and effect ● Scale, proportion, and quantity

Nearly all of Earth's available water is in the ocean. ESS2.D: Weather and climate ● Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. PS1.A: 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.	● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information	

Big Ideas-I want students to understand:

What scientific explanations and/or models are critical for student understanding of the content?
So what? Who cares?
What is the most important for students to understand about this topic?

<u>Investigation 1: Water Observations</u>

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

- Large water domes move faster down a slope than smaller domes.
- The steeper the slope of a surface, the faster a water dome moves.

<u>Investigation 2: Hot Water, Cold Water</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 sense 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.

Do-I want students to be able to:

What scientific practices will we explicitly focus on in this unit?
What key knowledge and skills will students develop as a result of this unit?
(Use verb phrases)

<u>Investigation 1: Water Observations</u>

- Discover how water-dome size, slope, and speed are related.
- Use appropriate tools to make accurate measurements.
- Plan a procedure, and apply it to solve a problem.
- Collect and use measurement data to construct explanations.
- Differentiate evidence from opinion.

<u>Investigation 2:</u>

- Observe and explain the interaction between masses of water at different temperatures.
- Observe and explain the interactions between masses of water in liquid and solid states.

- Construct a thermometer to observe that water expands as it warms and contracts as it cools. Use thermometers to measure temperature.

Know-What are the basics?:

What vocabulary formations or other facts do students need to know in order to understand the big ideas?

Investigation 1: Water Observations

Vocabulary: absorb, bead, bead-up, data, direction, dome, earth material, evidence, gravity, move, natural material, observation, opinion, relationship, repel, slope, surface, waterproof

Investigation 2: Hot Water, Cold Water

Vocabulary: bulb, cold, contract, degree celsius, expand, float, freeze, hot, less dense, liquid, mass, melt, more dense, sink, solid, state, temperature, thermometer, volume

How do I reinforce or build literacy or mathematics skills?

Literacy:

Reading skills supported through reading science resources book: reading fluency, reading comprehension, determining main ideas, integrating information from multiple texts, making connections, drawing evidence and conclusions from informational texts, distinguishing between evidence (fact) and opinion, determining meaning of domain specific vocabulary

Writing skills supported through writing in interactive science notebooks: take notes, gather relevant information, recall relevant information from experiences, organize and produce clear and coherent written responses, draw evidence and conclusions from informational texts, label using appropriate vocabulary, revise thinking

Mathematics:

Use place value understanding and properties of operations to perform multi-digit problems

Creating tables and graphs, interpret data
Using metric measurements and estimation of intervals of time
Using critical and higher order thinking to solve problems

Assessment: How will I know what students have learned?

Performance Expectations:
Does the formative or summative assessment require students to show their understanding in an observable way?
Does it make students' thinking visible?
Are there criteria and are the criteria relevant to the big ideas for the unit?

Other evidence:
Include multiple types of learning to give a more accurate picture of learning.

Embedded Formative Assessments for all Investigations:

- Survey prior to starting module (Benchmark assessment)
- Science notebook entries
- Response sheets
- Performance assessments
- Class discussions
- Reflections
- Exit slips

Summative Assessments:

- I-Check after each investigation
- Post-test after all investigations are complete

Investigation 1: Water Observations

- **Part 1-** Focus Question- What happens when water falls on a surface?
  Science Notebook Check:
  - Students organize data in a meaningful way.
  - Students generate functional drawings.
  - Students incorporate new vocabulary into the answer correctly.
  - Students draw a model to represent water being absorbed or beading up on a surface.
- **Part 2-** Focus Question: How does water move on a slope?
  Performance Assessment Checklist:

    - Students collaborate and carry out the investigation
    - Students express the cause-and-effect relationships they should be noticing
- **Part 3-** Focus Question: How much water can a dry sponge soak up?
  Science Notebook Check :
    - Students measure mass accurately.
    - Students indicate that the sponge can soak up water about 10 times its own mass
- **Part 4-** Focus Question: What happens outdoors when rain falls on natural materials?
- Investigation 1 I-Check

Investigation 2: Hot Water, Cold Water

- **Part 1 -** Focus Question - How can you measure temperature accurately?
  Science Notebook Check:
    - Students write that the bulb of the thermometer must be immersed in the fluid.
    - Students write that they must wait a short time before reading the temperature.
    - Students read the temperature by comparing the top of the red liquid with the numbers printed on the thermometer scale.
- **Part 2 -** Focus Question - What happens to water when it gets hot? Cold?
  Science Notebook Check:
    - Students explain that water expands to take up more space when it is heated.
    - Students explain that water contracts to take up less space when it is cooled.
- **Part 3 -** Focus Question: What happens when hot or cold water is put into room-temperature water?
  Performance Assessment Checklist:
    - Students collaborate and carry out the investigation.
    - Students articulate a model that explains why water at different temperatures sinks or floats compared to room-temperature water.
- **Part 4 -** Focus Question - How does water change when it gets really cold?
  Response Sheet - Investigation 2:
    - Students write that when the water on the bottom of the pot is heated, it expands and gets less dense.
    - Students write that as the water is heated and becomes less dense, the cooler (more dense) water will sink to the bottom of the pot, and push the warmer (less dense) water up.
- **Part 5 -** Focus Question - Where should an animal go to stay warm or to stay cool?

- Investigation 2 I-Check

What some ways we could possibly differentiate instruction to reach all learners?

How shall we teach for understanding?
Incorporate different learning styles as well hands-on and engaging activities?

- Graphic organizers
- Provide definition for vocabulary
- Online activities
- Written directions
- Small group instruction
- Visual cues to assist in organizing science notebook
- Specific roles for group work
- Sentence starters for focus question responses
- Shared slides, videos, and documents on Google
- Provide individual and group activities
- Math Extensions (within Teacher Resource text)
- Home/ School Connections (within Teacher Resource text)
- Outdoor connected activities
- Morning Meeting activities