

Science

**Grade 4**

Magnetism and Electricity  
Structures of Life  
Land and Water

**Curriculum**

Vineland Public Schools  
Vineland, NJ

2004

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## Overview

To meet high standards, Science Education programs must provide hands-on, inquiry based explorations that engage students in the process and content of science. Through these experiences students develop a conceptual understanding of the natural world, critical thinking skills, the use of technology, safe practices in science and scientific habits of the mind, including curiosity, respect for evidence, flexibility of perspective and appreciation for living things. These acquired skills are supported by The Principles of Coalition of Essential Schools and the New Jersey Core Content Standards for Science and Workplace Readiness.

The program engages students in grades 3-5, in hands-on inquiry-based science. The program encourages the understanding of science content. The content areas that are covered include subjects from the three areas of science – Earth and Space, Life, and Physical. At each grade level students explore concepts from each of the three areas. Also of paramount importance is the program's emphasis on the process of science. This process includes identifying problems, creating a way to test hypothesis, collecting data, analyzing results and applying them to everyday living.

Students will develop and demonstrate the knowledge and understanding needed to become compassionate human beings, capable of independent thinking and participation in building and protecting an open, decent and vital society.

## **NEW JERSEY CORE CURRICULUM CONTENT SCIENCE STANDARDS**

- 5.1** All students will develop problem-solving, decision-making and inquiry skills, reflected by formulating usable questions and hypotheses, planning experiments, conducting systematic observations, interpreting and analyzing data, drawing conclusions, and communicating results.
- 5.2** All students will develop an understanding of how people of various cultures have contributed to the advancement of Science and technology, and how major discoveries and events have advanced Science and technology.
- 5.3** All students will integrate mathematics as a tool for problem-solving in Science, and as a means of expressing and/or modeling scientific theories.
- 5.4** All students will understand the interrelationships between Science and technology and develop a conceptual understanding of the nature and process of technology.
- 5.5** All students will gain an understanding of the structure, characteristics, and basic needs of organisms and will investigate the diversity of life.
- 5.6** All students will gain an understanding of the structure and behavior of matter.
- 5.7** All students will gain an understanding of natural laws as they apply to motion, forces, and energy transformations.
- 5.8** All students will gain an understanding of the structure, dynamics, and geophysical systems of the earth.
- 5.9** All students will gain an understanding of the origin, evolution, and structure of the universe.
- 5.10** All students will develop an understanding of the environment as a system of independent components affected by human activity and natural phenomena.

## **NJ CROSS-CONTENT WORKPLACE READINESS STANDARDS (WRS)**

- Standard 1:** All students will develop career planning and workplace readiness skills.
- 2:** All students will use information, technology and other tools.
- 3:** All students will use critical thinking decision-making, and problem-solving skills.
- 4:** All students will demonstrate self-management skills
- 5:** All students will apply safety principles

## **MAGNETISM AND ELECTRICITY:**

### **Investigation 1 – The Force**

#### A. Introduction

In Investigation 1, students will explore the properties of magnets. Students will explore how magnets react to each other as well as other objects and develop scientific vocabulary to communicate these observations. The essential questions that will be addressed are:

1. How do magnets react to each other?
2. How do magnets react to other materials?

#### B. Objectives

- 4-1.1 Use the scientific thinking processes to conduct investigations and build explanations: observing, communicating, comparing, and organizing (5.1.A.1-2,4; 5.1.B. 1-2)
- 4-1.2 Explore the properties of magnets. (5.7.A.2)
- 4-1.3 Use a magnet to detect iron (5.4.C.1)
- 4-1.4 Explore the force of magnets through different materials (5.6.A.4;5.7.A.2)
- 4-1.5 Measure the force of attraction between magnets and investigate changes in attraction(5.3.C.1;5.4.B.1)
- 4-1.6 Record data on a graph (5.3.D.1)

#### C. Activities

(Please note in each investigation response sheets, math extension and home/school connection sheets are provided and may be used as an activity or as a form of assessment.)

1. Magnetism & Electricity (FOSS Program) Part 1 - Investigating magnets and materials.
2. Magnetism & Electricity (FOSS Program) Part 2 - Investigating more magnetic properties.
3. Magnetism & Electricity (FOSS Program) Part 3 - Breaking the force.
4. Magnetism & Electricity (FOSS Program) Part 4 - Detecting the force of magnetism.

#### D. Optional

1. Science Stories folio - *Gets Stick Magnus*, *Magnificent Magnetic Models*, *How Magnets Interact*
2. Write a creative story about life from a magnet's point of view.
3. Find directions using a compass.
4. Make a water compass, find directions using a compass, conduct more force investigations, and explore different magnets.

## **MAGNETISM AND ELECTRICITY:**

### **Investigation 2 - Making Connections**

#### A. Introduction

In Investigation 2, students will explore the components of a circuit. Students will develop concepts about how electricity flows through a circuit and draw schematic diagrams of the circuits. Using circuits, students will test whether objects are conductors or insulators.

1. Where do connections need to be made to get electricity from a source to a receiver?
2. How does electricity flow through a circuit?
3. How is a motor and light bulb circuit alike/different?
4. What does a switch do in a circuit?
5. Do insulators and conductors complete a circuit?

#### B. Objectives

- 4-1.1 Use the scientific thinking processes to conduct investigations and build explanations: observing, communicating, comparing, and organizing (5.1.A.1-2,4; 5.1.B. 1-2)
- 4-1.7 Build and compare simple circuits (5.1B.1-2)
- 4-1.8 Identify the essential components of an electric circuit and understand their functions (5.1C.1-2)
- 4-1.9 Demonstrate the evidence of the flow of electricity (5.1A1-3)
- 4-1.10 Identify materials that are conductors and insulators (5.1B1-2;5.1C.1-2;5.3C.1;5.3D.1;5.4.C.2)
- 4-1.11 Draw pictures and schematic diagrams to represent electric circuits and communicate understandings (5.4.C.2)
- 4-1.12 Use technology to solve problems (5.2.A.1)

#### C. Activities

(Please note in each investigation response sheets, math extension and home/school connection sheets are provided and may be used as an activity or as a form of assessment.)

1. Magnetism & Electricity (FOSS Program) Part 1- Lighting a bulb.
2. Magnetism & Electricity (FOSS Program) Part 2- Making a motor run.
3. Magnetism & Electricity (FOSS Program) Part 3- Finding conductors and insulators.
4. Magnetism & Electricity (FOSS Program) Part 4- Investigating mystery circuits.

#### D. Optional

1. Science Stories folio – Making Static, A Fictional Interview with Benjamin Franklin, Two Reference Sources about Edison
2. Practice the Describe the Object game
3. Make posters about using electricity safely
4. Write about life without electricity

5. Read *Dear Mr. Henshaw*
6. Play Name That Conductor/Insulator
7. Research electricity in other countries
8. Research historical sources of energy
9. Examine the inside of a lightbulb and find evidence for the flow of electricity

## **MAGNETISM AND ELECTRICITY:**

### **Investigation 3 – Advanced Connections**

#### A. Introduction

In Investigation 3, students will discover a variety of ways to operate more than one component in a circuit. Students will construct parallel and series circuits using one or more D-cells to light bulbs. Students will work to solve customer complaints to a decorative-light manufacturer using their knowledge of parallel and series circuits. The essential questions that will be addressed are:

1. In a series circuit, will two bulbs light brightly at the same time?
2. In a parallel circuit, can two bulbs light brightly with just one battery?
3. How many different ways can you wire a parallel circuit?
4. Which design is better-series or parallel, for long strings of tree lights?

#### B. Objectives

- 4-1.1 Use the scientific thinking processes to conduct investigations and build explanations: observing, communicating, comparing, and organizing (5.1.A.1-2,4; 5.1.B. 1-2)
- 4-1.13 Construct circuits that can run more than one component (5.1.A.3-4;5.1.C.2;5.4.C.1-2;5.7.B.1&3)
- 4-1.14 Compare series and parallel circuits and organize data to support judgments about the advantages and disadvantages of each. (5.1.C.2;5.4.C.1-3;5.7.B.1)

#### C. Activities

(Please note in each investigation response sheets, math extension and home/school connection sheets are provided and may be used as an activity or as a form of assessment.)

1. Magnetism & Electricity (FOSS Program) Part 1- Building series circuits.
2. Magnetism & Electricity (FOSS Program) Part 2- Building parallel circuits.
3. Magnetism & Electricity (FOSS Program) Part 3- Solving the string-of-lights problem.

#### D. Optional

1. Science Stories folio – *Illuminating Teamwork: A Story of the Edison Pioneers, A True Pioneer: Lewis Latimer*
2. Research inventors such as Thomas Edison who have contributed to the use of electricity in everyday life.
3. Find out how houses are wired.
4. Invite an electrician to speak to the class.
5. Build a flashlight.
6. Make a burglar alarm.

## MAGNETISM AND ELECTRICITY

### Investigation 4: Current Attractions

#### A. Introduction

In Investigation 4, students will discover that, when current flows through an insulated wire wound around a steel core, the steel core becomes a magnet. Students will discover how the number of winds of wire and the location of the wire affect the strength of the magnet. Using data from experiments, students will graph and predict the strength of magnetism and propose ways to change the strength of an electromagnet. The essential questions to be addressed are:

1. Can you make a magnet that turns on and off?
2. How does the number of winds of wire around a core affect the strength of the magnetism?
3. How can the strength of an electromagnet be changed?

#### B. Objectives

- 4-1.1 Use the scientific thinking processes to conduct investigations and build explanations: observing, communicating, comparing, and organizing (5.1.A.1-2,4; 5.1.B. 1-2)
- 4-1.15 Make an electromagnet (5.1.A.4;5.1.C.2;5.4.C.1)
- 4-1.16 Experiment with different variables to determine what contributes to the strength of the electromagnet (5.4.B.1;5.4.C.1-2)

#### C. Activities

(Please note in each investigation, Response Sheets, Math Extensions, and Home/School Connection Sheets are provided and may be used as an activity or as a form of assessment).

1. Magnetism & Electricity (FOSS Program) Part 1- Building an electromagnet.
2. Magnetism & Electricity (FOSS Program) Part 2- Changing number of winds.
3. Magnetism & Electricity (FOSS Program) Part 3- Investigating more electromagnet.

#### D. Optional

1. Science Stories folio – *From Rags to Science: A Story of Michael Faraday, How Electromagnetism Stopped a War, Magnets and Electricity in Your Life*
2. Write a short story describing real or imaginary encounters with electromagnets.
3. Make a rheostat
4. Detect magnetism around wires carrying current
5. Compare magnets to electromagnets

## MAGNETISM AND ELECTRICITY

### Investigation 5: Click It

#### A. Introduction

In Investigation 5, students apply their knowledge of circuitry and electromagnetism to build a telegraph. Students will invent a code and connect two telegraphs together to send messages. Throughout the investigation, students will be challenged with circuit design, resistance imposed by the long lines, and long-distance procedural signals. Students review magnetism and electricity and create a project to present to the class. The essential questions to be addressed are:

1. Can you use your knowledge of electricity and electromagnetism to reinvent the telegraph?
2. Can you connect two telegraph systems to send messages back and forth to other groups?

#### B. Objectives

4-1.1 Use the scientific thinking processes to conduct investigations and build explanations: observing, communicating, comparing, and organizing.

4-1.17 Build a telegraph (5.1.A.4;5.1.C.2;5.4.C.1)

4-1.18 Learn the concept of technology (5.4.C.1;5.2.B.1)

#### C. Activities

(Please note in each investigation, Response Sheets, Math Extensions, and Home/School Connection Sheets are provided and may be used as an activity or as a form of assessment).

1. Magnetism & Electricity (FOSS Program) Part 1- Reinventing the telegraph.
2. Magnetism & Electricity (FOSS Program) Part 2- Sending messages long- distance.
3. Magnetism & Electricity (FOSS Program) Part 3- Choosing your own investigation.

#### D. Optional

1. Science Stories folio- *Morse Gets Clicking: A Story of Samuel Morse*
2. Play Telephone
3. Read up on codes.
4. Investigate emergency codes
5. Create a code
6. Build a cardboard telegraph
7. Make an electric quiz board that lights up for a correct answer
8. Make a model motor

# Instructional Resources/Material

**Technology/Home Connection**  
[www.fossweb.com](http://www.fossweb.com)

## **Structures of Life:**

### **Investigation 1- Origin of Seeds**

#### **A. Introduction**

In Investigation 1, students will embark on a seed hunt, which will allow them to locate, describe, and count seeds. They will use two kinds of sprouting devices in order to see the effects of water on seeds, and they will compare seeds soaked in water to those which have not been watered. The essential questions that will be addressed are:

1. Where do seeds come from?
2. Where are seeds found on plants?
3. What effect does water have on seeds?

#### **B. Student Outcomes and Objectives**

- 4-2.1 Use scientific thinking processes to conduct investigations and build explanations: observing, communicating, comparing, and organizing. (5.1A.1-4; 5.1B.1-2)
- 4-2.2 Explore common fruits to find seeds. (5.5A.3; 5.5C.1)
- 4-2.3 Observe and compare properties of seeds and fruits. (5.5A.3; 5.5B2)
- 4-2.4 Organize and communicate information about seeds.(5.1A.2; 5.5B.1)
- 4-2.5 Set up a seed sprouter and maintain a watering schedule for a week.(5.5A.3)
- 4-2.6 Monitor and record changes in seeds over days. (5.1A.2; 5.1B.1; 5.5C.1)
- 4-2.7 Investigate the effect of water on seeds. (5.5A.3; 5.5C.1)
- 4-2.8 Compare and contrast the mass of dry seeds and those soaked in water. (5.1A.1-4)
- 4-2.9 Discuss information gathered by investigating dry and soaked seeds. (5.1A.1; 5.1B.1-2)

#### **C. Activities**

(Please note in each investigation, Math Extensions, and Home/School Connection Sheets are provided and may be used as an activity or as a form of assessment).

1. Structures of Life (FOSS Science Program) Part 1: *Seed Search*
2. Structures of Life (FOSS Science Program) Part 2: *The Sprouting Seed*
3. Structures of Life (FOSS Science Program) Part 3: *The Seed Soak*

#### **Optional**

1. Science Stories folio- *Seeds are Everywhere, The Most Important Seed, Barbara McClintock*
2. Brainstorm idioms based on plants
3. Make seed art
4. Research fruits in grocery stores
5. Research seed dispersal
6. Plant seeds in soil
7. Hold a sprout taste test

## **Structures of Life:**

### **Investigation 2- Growing Further**

#### **A. Introduction**

In Investigation 2, students will compare four seeds as they germinate in minisprouters, hydroponics, and a nutrient solution. They will identify and describe emerging plant structures, and also sequence illustrations of the life cycle of a bean plant. The essential questions that will be addressed are:

1. What effect does water have on the seeds in the minisprouter?
2. How do the plants change over time?
3. How can you grow plants without soil?
4. What conditions do plants need in order to grow?
5. What is the sequence of the bean plant's life cycle?

**B. Student Outcomes and Objectives**

4-2.1 Use scientific thinking processes to conduct investigations and build explanations: observing, communicating, comparing, and organizing. (5.1A.1-4; 5.1B.1-2)

4-2.10 Describe properties of germinated seeds and compare them to other types of germinated seeds. (5.5B.1; 5.5C.1)

4-2.11 Plant bean seedlings in nutrient solution and observe them throughout their life cycle. (5.5C.1)

4-2.12 Observe plant structures as they appear during the plant's life cycle.(5.5A.3; 5.5.C.1)

**C. Activities**

(Please note in each investigation, Math Extensions, and Home/School Connection Sheets are provided and may be used as an activity or as a form of assessment).

1. Structures of Life(FOSS Science Program) Part 1: *Germination*
2. Structures of Life (FOSS Science Program) Part 2: *Hydroponics*
3. Structures of Life (FOSS Science Program) Part 3: *Life Cycle of the Bean*

**Optional:**

1. Science Stories folio- *Hydro-growing, Seeding Space*
2. Keep journals of the growth of the bean plant
3. Play concentration with the life cycle pictures
4. Research the staple food crops around the world
5. Take home hydroponics
6. Explore other conditions for growth
7. Compare flower structures
8. Compare plants grown in soil to those grown hydroponically

**Structures of Life:**

**Investigation 3- Meet the Crayfish**

**A. Introduction**

In Investigation 3, students observe and record the structures of the crayfish and learn safe handling of them through interaction and caring for them. They investigate the behavior of crayfish in two different habitats and set up a long-term observing and recording system to investigate the territorial behavior of the crayfish. The essential questions that will be addressed are:

1. What are the structures of a crayfish?
2. What do we need to think about in order to build a suitable habitat for crayfish in the classroom?
3. Does each crayfish have its own house that it always goes to?
4. How do we keep track of crayfish movements over many days?
5. What does a crayfish do if something happens to it?

**B. Student Outcomes and Objectives**

4-2.1 Use scientific thinking processes to conduct investigations and build explanations: observing, communicating, comparing, and organizing. (5.1A.1-4; 5.1B.1-2)

4-2.13 Care for and feed crayfish . (5.5A.3; 5.5C.1)

4-2.14 Record and observe the structures and behaviors of crayfish and share with other students. (5.1A.1-4; 5.1B.1-2)

4-2.15 Monitor and record investigations of crayfish over several days.(5.1A.1-4; 5.1B.1-2; 5.5C.1 )

4-2.16 Investigate the territorial behavior of crayfish. (5.5B.1-2)

### C. Activities

(Please note in each investigation, Math Extensions, and Home/School Connection Sheets are provided and may be used as an activity or as a form of assessment).

1. Structures of Life (FOSS Science Program) Part 1: *Meet the Crayfish*
2. Structures of Life (FOSS Science Program) Part 2: *Crayfish Habitat*
3. Structures of Life (FOSS Science Program) Part 3: *Crayfish at Home*
4. Structures of Life (FOSS Science Program) Part 4: *Crayfish Territory*

### Optional:

1. Science Stories folio- Answering Kids' Questions: Crayfish, Crawfish, Crawdaddy, Life Cycle of a Crayfish
2. Plan presentations of the crayfish for other classes
3. Invent and tell crayfish territorial stories
4. Label the structures on the crayfish diagram
5. Write stories about a day in the life of a crayfish
6. Investigate crayfish food preferences
7. Investigate changes in the crayfish's habitat

### **Structures of Life:**

#### **Investigation 4- Meet the Bess Beetle**

##### A. Introduction

In Investigation 4, students will observe the bess beetle's structures and behaviors and will learn how to care for and handle them through interaction, and creation of an appropriate habitat. They will compare and contrast beetles and crayfish using a Venn diagram and identify similar structures and their uses. The students will observe the mass a beetle can pull in relation to the mass of the beetle itself. They will view a list of questions and determine which can be answered through investigation and which need research to be answered, and choose a question to pursue a project. The essential questions that will be addressed are:

1. What structures do bess beetles have?
2. What does a beetle need in its habitat?
3. How are the life structures of bess beetles and crayfish alike and different?
4. How much mass can a beetle pull?
5. What is important to consider when planning investigations of animals?
6. What else can I learn about the structures and functions of plants and animals?

##### B. Student Outcomes and Objectives

4-2.1 Use scientific thinking processes to conduct investigations and build explanations: observing, communicating, comparing, and organizing. (5.1A.1-4; 5.1B.1-2)

4-2.17 Maintain a care and feeding routine for bess beetles. (5.5A.3; 5.5C.1)

4-2.18 Compare and contrast the structures, functions, and behaviors of bess beetles and crayfish.(5.1A.1-4; 5.1B.1-2; 5.5B.1-2; 5.5C.1)

4-2.19 Investigate and record the pulling strength of bess beetles and share with other students. (5.1A.1-4; 5.1B.1-2; 5.5B.1-2; 5.5C.1)

4-2.20 Monitor and record observations of bess beetles over time. (5.1A.1-4; 5.1B.1-2; 5.5B.1-2; 5.5C.1)

### C. Activities

(Please note in each investigation, Math Extensions, and Home/School Connection Sheets are provided and may be used as an activity or as a form of assessment).

1. Structures of Life (FOSS Science Program) Part 1: *Bess Beetles at Night*
2. Structures of Life (FOSS Science Program) Part 2: *Comparing Crayfish and Beetles*
3. Structures of Life (FOSS Science Program) Part 3: *The Beetle Pull*
4. Structures of Life (FOSS Science Program) Part4: *Choosing your own Investigation*

Optional:

1. Science Stories folio- *A Beetle's Journey, Crayfish, Beetles, and Kids, The Food Web, A Chance Encounter*
2. Prepare short oral presentations on projects
3. Design effective presentation posters
4. Shine some light on beetles
5. Set up a beetle terrarium
6. Investigate what a beetle will eat
7. Investigate surfaces for beetle travel.

## **Instructional Resources/Material**

**Technology/Home Connection**

[www.fossweb.com](http://www.fossweb.com)



## LAND AND WATER

### Lesson 1-3 – Investigation land and water

#### A. INTRODUCTION

In lessons 1-3 students will discuss prior knowledge of land and water and how they interact. Students will discover the water cycle by creating a stream table. Students will investigate the effects of rain on land.

1. What do students know about land and water on earth?
2. How do students identify relationships between land and water?
3. How does the intensity of rain effect land?
4. What happened to the rainwater as it hit the land?
5. How is the water in the bucket different than the water poured into the stream table?

#### B. OBJECTIVES

- 4-3.1 Discover that water has an important role in shaping the land on earth through the use of stream tables. (5.1.A.1,4;5.1.B.1-2;5.8.C.1-2)
- 4-3.2 Analyze soil and its combination of a variety of materials that have unique properties.(5.1.A.1,4;5.1.B.1-2;5.8.A1-2)
- 4-3.3 Investigate the process and the causes of erosion and deposition and how humans affect it (5.7.A.1; 5.8.C.1)
- 4-3.4 Explain and diagram the water cycle (5.6.A.2-3;5.7.A.2;5.8.B.4,6)
- 4-3.6 Discover the effects of water on landforms (5.7.A.1-2;5.8.B.2;5.8.C.1-2)
- 4-3.7 Describe what causes water to change direction (5.7.A.1-2)
- 4-3.8 View, explain and diagram aerial views of landforms (5.8.C.1-2;5.8.D.1)
- 4-3.10 Relate stream table results to the natural process (5.1.A.1,4;5.8.B.2;5.8.C.1-2)
- 4-3.11 Design and build models of dams and landscapes and their affects on land and water (5.4.A.1)
- 4-3.12 Analyze models and modify dams and landscapes (5.4.C.3)
- 4-3.13 Recognize the importance of models for investigating processes(5.1.B.1)
- 4-3.14 Explain how the interactions between land and water effect humans and how humans can manipulate the interactions between land and water(5.4.A.1;5.4.C.3;5.10.B.1)

#### C. ACTIVITIES

(Please note in each investigation students will utilize their science notebooks to record their ideas, questions and data pertaining to rocks and minerals.)

1. Land and Water (STC Science Program) Lesson 1: *Thinking about Land and Water.*
2. Land and Water (STC Science Program) Lesson 2: *Water Cycle: Modeling Land and Water*
3. Land and Water (STC Science Program) Lesson3: *Modeling Rain on Land*

#### Optional:

1. Create a list of adjectives to describe land and water.
2. Assemble an interactive bulletin board.
3. Survey adults about unusual landforms that have been visited.
4. Graph the visited landforms.

5. Use a flashlight to represent the sun.
6. Using different variables investigate the rate of evaporation.
7. Use other materials to create a water cycle.
8. Measure the temperature of water, both freezing and boiling, in Celsius and Fahrenheit.
9. Research the location of rainforests and how they contribute to or hinder the effects of rain on land.

## **Land and Water**

### **Investigation 4-8: Investigating Streams and Earth Materials**

#### **A. INTRODUCTION**

In investigations 4-8, students will explore how runoff from rain creates stream formations. They will manipulate the stream table to observe how water affects land. Students will examine the properties of soil components and discover how they hold, release water and their porous properties. They will explore how the different speeds of runoff affect erosion and deposition. Students will create aerial drawings of their stream tables and compare results. The essential questions that will be addressed are:

1. How did the water from the stream source change the land?
2. What did you observe about the soil components in the stream table?
3. What is the difference in the lengths of the streams and soil block?
4. How did the water wear away and deposit the soil components in your stream table?
5. Where does water go when it meets land?
6. Where did most of the erosion occur in your stream table?
7. Where did most of your deposition occur in your stream table?
8. How does the slope of the land and the speed of water affect the amount of soil that is eroded or deposited?
9. How does your aerial drawing compare to other aerial drawings?

#### **B. OBJECTIVES**

- 4-3.1 Discover that water has an important role in shaping the land on earth through the use of stream tables. (5.1.A.1,4;B.1-2;5.8.C1-2)
- 4-3.2 Analyze soil and its combination of a variety of materials that have unique properties.(5.1A1,4;B1-2;5.8A.1-2)
- 4-3.3 Investigate the process and the causes of erosion and deposition and how humans affect it (5.7A.1;5.8C.1)
- 4-3.4 Understand and diagram the water cycle(5.6.A.2-3;5.7.A.2;5.8.B.4,6)
- 4-3.6 Discover the effects of water on landforms(5.7A.1-2;5.8.B.2,C.1-2)
- 4-3.7 Describe what causes water to change direction(5.7A.1)
- 4-3.8 View, explain and diagram aerial views of landforms(5.8.C.1-2;5.8.D.1)
- 4-3.9 Investigate earth materials for porous and adhesive qualities(5.8.A.1-2)
- 4-3.10 Relate stream table results to natural process(5.1.A.1,4;5.8.B2;5.8.C1.2)
- 4-3.11 Design and build models of dams and landscapes and their affects on land and water(5.4.A.1)
- 4-3.12 Analyze models and modify dams and landscapes(5.4.C.3)
- 4-3.13 Recognize the importance of models for investigating processes(5.1.B.1)
- 4-3.14 Explain how the interactions between land and water effect humans and how humans can manipulate the interactions between land and water(5.4.A.1,5.4.C.3;5.10.B.1)

#### **C. ACTIVITIES**

(Please note in each investigation students will utilize their science notebooks to record their ideas, questions and data pertaining to land and water.)

1. Land and Water (STC Science Program) Lesson 4: *Investigating Streams*.
2. Land and Water (STC Science Program) Lesson 5: *Examining Earth Materials*.
3. Land and Water (STC Science Program) Lesson 6: *Where does water go? Looking at ground water and runoff*.
4. Land and Water (STC Science Program) Lesson 7: *Where does soil go? Looking at erosion and deposition*.
5. Land and Water (STC Science Program) Lesson 8: *Bird's Eye View: Looking at the parts of the stream*.

Optional:

1. Have students list songs that contain the words water, land, stream or river.
2. Practice measuring non-linear objects using string.
3. Create a list of adjectives to describe a list of properties in the stream table.
4. Have students write a story about a time they mixed soil components.
5. Investigate how stalactites and stalagmites are formed.
6. Take a field trip after hard rain and observe evidence of soil erosion and deposition
7. Read and find other poems about rivers and streams.
8. Create and illustrate poems about rivers and streams.
9. Have students create a skit in which they act out erosion and deposition.
10. Create an aerial drawing of an interesting place.
11. Write a story about an eagle in flight include what an eagle can see from its bird's eye view of the landscape below.
12. Invite a mapmaker or surveyor into the room.

**Land and Water:**

**Investigation 9-12 - Streams, Rivers, Hills and Dams**

**A. INTRODUCTION**

In Investigations 9-12, students will use a multiple stream source to model the simultaneous formation of three streams. Using the stream cup, they will vary the flow of water to observe the formation of canyons. Students test how land affects the direction of land and water. They explore how humans control flowing water. The essential questions that will be addressed are:

1. What happens when several streams flow at the same time?
2. How does rushing water change the land?
3. How does your stream table compare to others in the class?
4. How did the hills and rocks affect the direction and flow of water?
5. Did the water affect the hills?
6. How did your dam affect the direction and flow of water?
7. Did the placement of your dam protect your town from flooding?

**B. OBJECTIVES**

- 4-3.1 Discover that water has an important role in shaping the land on earth through the use of stream tables.(5.1.A.1,4;5.1B.1-2)
- 4-3.2 Analyze soil and its combination of a variety of materials that have unique properties. .(5.1.A.1,4;5.1B.1-2;5.8.A1-2)
- 4-3.3 Investigate the process and the causes of erosion and deposition and how humans affect it(5.7.A.1;5.8.C.1)
- 4-3.4 Understand and diagram the water cycle
- 4-3.5 Explain what tributaries are and their purpose (5.8.B.2)
- 4-3.6 Discover the effects of water on landforms (5.7.A.1-2;5.8.B.2;5.8.C.1-2)
- 4-3.7 Describe what causes water to change direction(5.7.A.1-2)
- 4-3.8 View, explain and diagram aerial views of landforms(5.8.C.1-2;5.8.D.1)
- 4-3.9 Investigate earth materials for porous and adhesive qualities (5.8.A.1-2)
- 4-3.10 Relate stream table results to natural process(5.1.A.1,4;5.8.C.1-2)
- 4-3.11 Design and build models of dams and landscapes and their affects on land and water(5.4.A.1)

- 4-3.12 Analyze models and modify dams and landscapes(5.4.C.3)
- 4-3.13 Recognize the importance of models for investigating processes(5.1.B.1)
- 4-3.14 Explain how the interactions between land and water effect humans and how humans can manipulate the interactions between land and water(5.4.A.1;5.4.C.3;5.10.B.1)

### C. ACTIVITIES

(Please note in each investigation students will utilize their science notebooks to record their ideas, questions and data pertaining to land and water.)

1. Land and Water (STC Science Program) Lesson 9: *When Streams Join: Modeling Tributaries.*
2. Land and Water (STC Science Program) Lesson 10: *Rushing Rivers: Exploring Flows.*
3. Land and Water (STC Science Program) Lesson 11: *Hills and Rocks: How Nature Changes the Direction and Flow of Water.*
4. Land and Water (STC Science Program) Lesson 12: *Dams: How Humans Change the Direction and Flow of Water.*

#### Optional:

1. Using a map locate major drainage basins in North America.
2. Write a story using your imagination as a leaf's journey caught in a fast flowing stream after a rainstorm.
3. Investigate how residents and animals along the Huang He River in China have adapted their lives to cope with constant flooding.
4. Use string to measure the total distance of streams in their stream table and compare with others.
5. Write a story using your imagination as an animal that lives in a home near a river flooded by a dam.
6. Create labeled detailed drawings of the dams.

## **LAND AND WATER**

### **Lesson 13-14- Exploring Slope and Plant Protection**

#### A. INTRODUCTION

In Investigations 13 and 14 students will investigate the effects of slope on stream formation and analyze the amount of runoff on sloped soil. They will examine vegetation and see how plants hold back runoff and reduce erosion.

1. In what ways did water change the sloped land?
2. How does slope of the land affect the amount of soil the water carries?
3. How did plants affect the way water flowed on the sloped land?
4. How did plants affect the way water eroded the soil?
5. What happened when you removed the plants from the stream table?
6. What do you observe about the contents of the two cylinders?
7. What conclusions can be made about how plants affect erosion and runoff?

#### B. OBJECTIVES

- 4-3.1 Discover that water has an important role in shaping the land on earth through the use of stream tables.(5.1.A.1.4;5.1.B.1-2)
- 4-3.3 Investigate the process and the causes of erosion and deposition and how humans affect it(5.7.A.1;5.8.C.1)
- 4-3.4 Understand and diagram the water cycle(5.6.A.2-3;5.7.A.2)
- 4-3.6 Discover the effects of water on landforms(5.7.A.1-2;5.8.B.2)
- 4-3.7 Describe what causes water to change direction(5.7.A.1-2)
- 4-3.8 View, explain and diagram aerial views of landforms(5.8.C.1-2;5.8.D.1)
- 4-3.10 Relate stream table results to natural process(5.1.A.1,4)
- 4-3.11 Design and build models and landscapes and their affects on land and water(5.4.A.1)
- 4-3.12 Analyze models and modify dams and landscapes(5.4.C.3)

- 4-3.13 Recognize the importance of models for investigating processes(5.1.B.1)
- 4-3.14 Explain how the interactions between land and water effect humans and how humans can manipulate the interactions between land and water.(5.4.A.1;5.4.C.3,5;5.10.B.1)
- 4-3.15 Discover the effects of plants on erosion and runoff.(5.4.A.1;5.8.C.1-2)

### C. ACTIVITIES

(Please note in each investigation response sheets, math extension and home/school connection sheets are provided and may be used as an activity or as a form of assessment.)

1. Land and Water (STC Science Program) Lesson 13: *Exploring Slope*
2. Land and Water (STC Science Program) Lesson 14: *Plants: Protecting Sloped Land from Erosion*

#### Optional

1. Invite a farmer into the classroom to discuss the use of contour farming.
2. Using stopwatch and sand, measure the sloped at which water travels over slopes of various angles.
3. Use magazine cutouts of sloped landscapes to create a collage or montage that is shaped like a mountain.
4. Test how plants grow in each type of soil.
5. Based on the above test results, have students test the suitability of local soil sample for growing plants.

## **LAND WATER**

### **Lesson 15-16-Designing, Building and Testing a Landscape**

#### A. INTRODUCTION

In lessons 15 and 16, students build on all previous lessons by planning and creating a landscape. After designing their landscapes, students use concepts they have studied in the past 14 lessons to predict the direction water will take in their landscapes, how the land will alter the direction and flow of water, and how the shape of the land may change. Students select homesites that they predict will remain unaffected by water flow and soil erosion. The essential questions that will be addressed are:

1. Can you create a landscape that will make a habitable neighborhood?
2. Why did you build your landscape as you did?
3. How did the water affect the homesites?
4. Considering your results, would you still locate yhour house in the location you originally selected? Why?
5. If you were to build your landscape again, what would you do differently?

#### B. OBJECTIVES

- 4-3.1 Discover the water has an important role in shaping the land on earth through the use of stream tables.(5.1A1,4;5.1B1-2)
- 4-3.2 Analyze soil and its combination of a variety of materials that have unique properties.(5.1A1,4;5.1B1-2.5.8A1-2)
- 4-3.3 Investigate the process and the causes of erosion and deposition and how humans affect it.(5.7A1;5.8C1)
- 4-3.4 Understand and diagram the water cycle.(5.6A2-3;5.7A2;5.8B4,6)
- 4-3.6 Discover the effects of water on landforms.(5.7A1-2;5.8B2;5.8C1-2)
- 4-3.7 Describe what causes water to change direction.(5.7A1-2)
- 4-3.8 View, explain and diagram aerial views of landforms.(5.8C1-2;5.8D1)
- 4.3.9 Investigate earth materials for porous and adhesive.(5.8A1-2)
- 4-3.10 Relate stream table results to the natural process.(5.1A1,4;5.8B2;5.8C1-2)
- 4.3.11 Design and build models of dams and landscapes and their affects on land and water.(5.4A1)

- 4-3.12 Analyze models and modify dams and landscapes.(5.4C3)
- 4-3.13 Recognize the importance of models for investigating processes.(5.1B1)
- 4-3.14 Explain how the interactions between land and water affect humans and how humans can manipulate the interactions between land and water.5.4A1;5.4C3;5.10B1)
- 4-3.15 Discover the effects of plants on erosion and runoff.(5.4A1;5.8C1-2)

### C. ACTIVITIES

(Please note in each investigation response sheets, math extension and home/school connection sheets are provided and may be used as an activity or as a form of assessment.)

1. Land and Water (STC Science Program) Lesson 15: *Planning Our Homesites: Designing and Building a Landscapes*
2. Land and Water (STC Science Program) Lesson 16: *Protecting Our Homesites: Testing the Interactions of Land and Water*

#### Optional

1. Research how the Grand Canyon was formed and how the Colorado River affected the landscape.
2. Write a story about what happens to their house they place in their landscape when a sudden storm goes through the area.
3. Have students research various landforms and find examples of them in New Jersey and United States Geography.

## Instructional Resources/Material

## **Assessments**

Satisfactory student achievement in each of the proficiencies listed in this curriculum shall be determined by student attainment of the 70% district-passing-standard. Such proficiency shall be measured by a multiplicity of evaluation techniques and activities that include, but are not restricted to the following:

Pre-Post unit Assessments

Class lists, graphs and charts

Record sheets

Class discussions

Teacher observation

Class webs

Student Drawings

Experiments

Student products

Oral Presentations