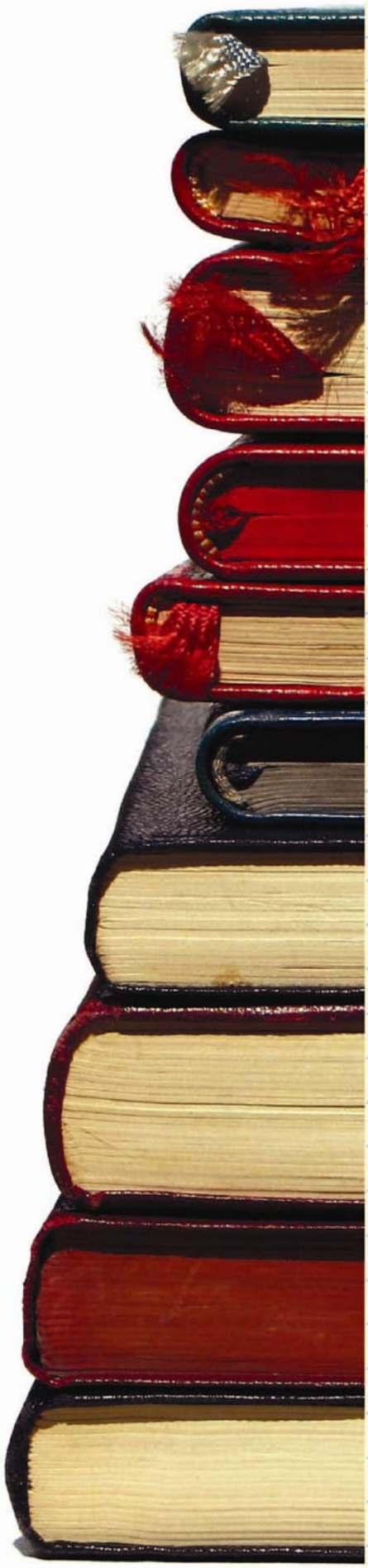

Comprehensive Curriculum

Revised 2008

Grade 3
Science

Louisiana Department of
EDUCATION

Paul G. Pastorek, State Superintendent of Education

Grade 3
Science

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***Louisiana Comprehensive Curriculum*, Revised 2008**
Course Introduction

The Louisiana Department of Education issued the *Comprehensive Curriculum* in 2005. The curriculum has been revised based on teacher feedback, an external review by a team of content experts from outside the state, and input from course writers. As in the first edition, the *Louisiana Comprehensive Curriculum*, revised 2008 is aligned with state content standards, as defined by Grade-Level Expectations (GLEs), and organized into coherent, time-bound units with sample activities and classroom assessments to guide teaching and learning. The order of the units ensures that all GLEs to be tested are addressed prior to the administration of *i*LEAP assessments.

District Implementation Guidelines
Local districts are responsible for implementation and monitoring of the *Louisiana Comprehensive Curriculum* and have been delegated the responsibility to decide if

- units are to be taught in the order presented
- substitutions of equivalent activities are allowed
- GLES can be adequately addressed using fewer activities than presented
- permitted changes are to be made at the district, school, or teacher level

Districts have been requested to inform teachers of decisions made.

Implementation of Activities in the Classroom
Incorporation of activities into lesson plans is critical to the successful implementation of the Louisiana Comprehensive Curriculum. Lesson plans should be designed to introduce students to one or more of the activities, to provide background information and follow-up, and to prepare students for success in mastering the Grade-Level Expectations associated with the activities. Lesson plans should address individual needs of students and should include processes for re-teaching concepts or skills for students who need additional instruction. Appropriate accommodations must be made for students with disabilities.

New Features
Content Area Literacy Strategies are an integral part of approximately one-third of the activities. Strategy names are italicized. The link (view literacy strategy descriptions) opens a document containing detailed descriptions and examples of the literacy strategies. This document can also be accessed directly at http://www.louisianaschools.net/lde/uploads/11056.doc.

A *Materials List* is provided for each activity and *Blackline Masters (BLMs)* are provided to assist in the delivery of activities or to assess student learning. A separate Blackline Master document is provided for each course.

The *Access Guide to the Comprehensive Curriculum* is an online database of suggested strategies, accommodations, assistive technology, and assessment options that may provide greater access to the curriculum activities**.** The *Access Guide* will be piloted during the 2008-2009 school year in Grades 4 and 8, with other grades to be added over time. Click on the *Access Guide* icon found on the first page of each unit or by going directly to the url http://mconn.doe.state.la.us/accessguide/default.aspx.

Grade 3
Science
Unit 1: Measuring and Describing Matter

Time Frame: approximately 15 instructional periods of 45 minutes per period

Unit Description

In this unit, the student will investigate and explain conditions under which matter changes physical states. Students will utilize both the metric and U.S. units of measurement in their investigations of these changes.

Student Understandings

Students will develop an understanding of the properties of matter, including changes in state and the conditions that lead to these changes, reaction to temperature changes, and conductivity of heat and electricity. The students will also identify and describe the properties of matter and how those properties can be altered. Students will be given the opportunity to use and select and properly use the correct tools for selected tasks. Students will use and create a variety of charts and graphs when conducting science investigations.

Guiding Questions

1. Can students cite what units of measurement are used to measure length and width?
2. Can students select the appropriate tool to measure temperature, liquid volume, and mass?
3. Can students distinguish what materials make up common objects?
4. Can students describe what physical changes occur when matter changes states and what causes these changes?

Unit 1 Grade-Level Expectations (GLEs)

GLE #	GLE Text and Benchmarks
Science as Inquiry	
2.	Pose questions that can be answered by using students' own observations, scientific knowledge, and testable scientific investigations (SI-E-A1)
3.	Use observations to design and conduct simple investigations or experiments to answer testable questions (SI-E-A2)

GLE #	GLE Text and Benchmarks
4.	Predict and anticipate possible outcomes (SI-E-A2)
5.	Use a variety of methods and materials and multiple trials to investigate ideas (observe, measure, accurately record data) (SI-E-A2)
6.	Use the five senses to describe observations (SI-E-A3)
7.	Measure and record length, temperature, mass, volume, and area in both metric system and U.S. system units (SI-E-A4)
8.	Select and use developmentally appropriate equipment and tools (e.g., magnifying lenses, microscopes, graduated cylinders) and units of measurement to observe and collect data (SI-E-A4)
9.	Express data in a variety of ways by constructing illustrations, graphs, charts, tables, concept maps, and oral and written explanations as appropriate (SI-E-A5) (SI-E-B4)
11.	Use a variety of appropriate formats to describe procedures and to express ideas about demonstrations or experiments (e.g., drawings, journals, reports, presentations, exhibitions, portfolios) (SI-E-A6)
12.	Identify and use appropriate safety procedures and equipment when conducting investigations (e.g., gloves, goggles, hair ties) (SI-E-A7)
15.	Recognize that a variety of tools can be used to examine objects at different degrees of magnification (e.g., hand lens, microscope) (SI-E-B3)
Physical Science	
18.	Compare and classify objects on properties determined through experimentation (e.g., ability to conduct electricity, tendency to float or sink in water) (PS-E-A1)
19.	Select the appropriate metric system and U.S. system tools for measuring length, width, temperature, volume, and mass (PS-E-A2)
20.	Measure temperature by using Fahrenheit and Celsius thermometers and compare results (PS-E-A2)
21.	Compare common objects and identify the original material from which they are made (e.g., paper, pencil, comb) (PS-E-A3)
22.	Investigate and explain conditions under which matter changes physical states: heating, freezing, evaporating, condensing, boiling (PS-E-A4)
Earth and Space Science	
47.	Describe the difference between weather and climate (ESS-E-A2)
48.	Identify examples of the processes of a water cycle (e.g., evaporation, condensation, precipitation, collection of runoff) (ESS-E-A3)
49.	Describe climate patterns from recorded weather conditions over a period of time (ESS-E-A4)

Sample Activities

Activity 1: Safety Matters (GLEs: 4, 6, 12)

Materials List: safety goggles, science text books, chart paper, reference materials on science safety

The teacher will use a modified version of a *Directed Reading – Thinking Activity (DR-TA)* (view literacy strategy descriptions) to teach students about safety in the science classroom.

1. The teacher will build background knowledge by holding up a pair of safety goggles and asking students if this is the only piece of safety equipment that should be used when conducting science investigations. The teacher will lead a discussion that elicits information the students may already know about keeping safe when conducting a science investigation. Students' ideas and information should be recorded on the board or chart paper.

2. Next, the students are encouraged to help make a list of guidelines to keep them safe during a science investigation. The teacher can prod the students by having them think about the five senses when making predictions to generate rules to protect their senses such as the following:
   - Eyes: wear goggles or safety glasses
   - Ears: wear earplugs
   - Skin: wear aprons or protective shirts, gloves
   - Mouth: unknown substances should not be tasted and should be kept away from the mouth
   - Nose: wave hand over a substance to draw the scent near the nose instead of directly smelling it

3. Next, guide students through a section of their text or other reference material containing information about science safety (check the reference section of your science textbook for this information) stopping periodically to check their lists. The teacher should model how to check and revise their guidelines. The students should also infer how these guidelines could keep them safe during a science investigation.

4. Once the reading is completed, have students help create a set of rules to be used by the class when conducting a science investigation. The following points should be taken into account when creating the lists of rules:
   - Listen to directions before beginning an experiment.
   - Keep hands away from face when working with chemicals.
   - Wash hands after conducting experiments.
   - Report any spills or broken equipment.
   - Immediately report any injuries.

Rules should be recorded and posted on a chart that will hang in the classroom. These rules could then be written in the form of a "Safety Contract" and sent home for students and parents to sign.

Explain to students that different rules apply to different situations. Before every investigation or experiment, the science safety requirements should be discussed.

5. Emphasize to students that they should use this same process (strategy) when they read in their science textbook on their own. However, students should be guided to employ the *DR-TA* process on their own when reading.

Activity 2: Finding a Standard (GLEs: 5, 7, 8, 19)

Materials List: per group - drinking straws cut at different lengths, student scissors, standard measuring tape, meter measuring stick, paper, markers, science learning logs, adding machine tape (optional)

Introduce this lesson by holding up several straws cut at different lengths and ask students if they could use these straws to measure things around the classroom. Answers will vary but allow students to comment.

1. Give students drinking straws cut at different lengths. Using the straw as the measuring tool, ask students to measure their book and model how to describe their results in a science *learning log* (view literacy strategy descriptions). Explain to students that scientists have always kept logs of their observations, thoughts, new understandings, hypotheses, and reflections. Tell students that in their science *learning log,* they could record progress, test new ideas, and document what they learn. Documenting ideas in a log about content being studied forces students to "put into words" what they know or do not know.

2. Students will discover that the straw is a nonstandard measurement and to measure accurately, they need to use a standard that is uniform in measurement.

3. Using adding machine tape cut into strips of one meter in length, have students work in groups to divide a meter tape into 10-decimeter increments. If adding machine tape is not available, use strips of paper taped together.

4. Ask students to measure items in the room using their meter measure. Then have students use a standard meter stick and repeat the activity. Compare the two measurements. Discuss how and why they may differ.

5. On a piece of paper, have students draw and cut out a tracing of their foot. Use this foot to measure different items in the classroom. Compare measurements from different students on like items. Discuss how they differ and why this is not a standard of measure that could be used by everyone.

Activity 3: Measuring Temperature (GLEs: 2, 5, 7, 8, 9, 12, 19, 20, 47, 49)

Materials List: per group - 3 foam cups, ice, access to both room temperature and hot water, non-mercury thermometers (that measure both Fahrenheit and Celsius), posters, science learning logs, Student Temperature Data Sheet BLM, Class Temperature Graph BLM, red and blue markers, Weather Journal BLM; student books on weather and climate

Safety Notes: Only non-mercury thermometers should be used. Inform students that they will be working with hot water and to identify some of the safety precautions that they should take when handling hot water.
Working in groups, students will measure the temperature of water at varying degrees.

1. Using three foam cups, instruct student groups to fill the first cup with ice, the second with water at room temperature, and the third with warm to hot (not boiling) water.

2. Students should then place a thermometer in each cup. (Students should use caution while handling hot water.) Students should record the temperature using the Student Temperature Data Sheet BLM, using both Celsius and Fahrenheit scales.

3. Direct student groups to record their results on a class graph using the Class Temperature Graph BLM to show the range of recorded temperatures for each scale for each container. Discussion questions, which could also be recorded in a science *learning log* (view literacy strategy descriptions), might include the following:
   - Which scale showed the greatest and least variation for each of the containers?
   - Which scale appears to provide the most accurate measurement?
   - What other factors might account for variation in temperature across containers?
   - Which scale of measurement is most widely used in the United States? Discuss some reasons why.

4. Have students use Fahrenheit and Celsius thermometers to measure and record the daily outside temperature and the time of day for several weeks.

5. Compare student data recorded to daily temperature data shown in the local newspaper, television weather broadcasts, or the Internet and discuss reasons for the apparent differences.

Introduce the terms *weather* and *climate*. The weather describes what is happening outdoors in a given place at a given time, i.e., what happens minute to minute. Climate describes the total of all weather occurring over a period of years in a given place, which includes the average weather conditions, regular weather sequences, etc. Ask students how they would describe the weather and climate in Alaska today (or in some other location). It would be helpful to have a recent weather report from the

site selected). The following website offers information on the difference between weather and climate: http://epa.gov/climatechange/kids/climateweather.html.

6. Have students research Louisiana's climate and report their findings to the class. The following website offers information on Louisiana's climate, including maps and graphics. Students could use this website to create posters about our climate: (http://www.worldbook.com/wb/Students?content_spotlight/climates/north_american_climate_louisiana). Note: Additional investigations on weather and climate appear in Unit 8.

7. Read either *Oh Can You Say What's the Weather Today: All About Weather* – Cat in the Hat's Learning Library or *What Will the Weather Be?* – Let's- Read-and-Find-Out Science 2 and discuss the difference between weather and climate.

Teacher note: The Weather Journal BLM may be used as an assessment tool for this activity.

Activity 4: Measuring Mass (GLEs: 2, 3, 4, 5, 7, 8, 9, 19)

Materials: ping pong ball, golf ball, a balance scale that measures both metric and U.S. systems, a bathroom scale, a measuring cup, variety of small objects to mass, science learning logs

Background Knowledge: While the terms *mass* and *weight* are often used interchangeably, they are not the same thing. Mass is a measure of the amount of matter in an object and stays the same no matter what force might be acting on the object. It is measured using a simple or digital balance. Weight is measured with spring scales that measure the force of gravity on the mass. An object's mass stays the same no matter where the measurement is taken. For example, an astronaut on the moon has the same mass as he or she does on Earth but his/her weight would not be the same on Earth as it would be on the moon. The metric unit of mass is the kilogram.

Hold up a ping pong ball and a golf ball and ask students which ball has more mass. If necessary, explain to students that a golf ball and a ping pong ball are about the same size, but a golf ball has much more mass than a ping pong ball.

1. Show students a balance, a bathroom scale, and a measuring cup and ask them which tool they think would be the best to use to measure the mass of the golf ball and Ping Pong ball and why.

2. Have students predict the mass of the ping pong ball and the golf ball and record it in their science learning *log* (view literacy strategy descriptions). Using the balance scale, demonstrate for students how to find the mass of the ping pong ball and the golf ball.

3. Working in pairs or small groups, students will use balances to determine the mass of a variety of several small objects. Have students chart their results and compare the masses of the objects.

Close this lesson with a discussion review about the findings of all groups.

Activity 5: Measuring Capacity (GLEs: 2, 5, 7, 8, 9, 19)

Materials List: for demonstration - beakers, rocks, aquarium gravel, sand; per group - small rectangular-shaped boxes, hard boiled egg, measuring cups with both U.S Systems and Metric Systems, meter stick, rulers, empty gallon container, graduated cylinders, safety goggles, food coloring, science learning logs, access to water

Background Knowledge: All matter takes up space and the amount of space matter takes up is called its volume. The volume of various liquids and solids will be measured through the following activities.

Use the following demonstration to introduce this lesson:

Fill a beaker or a cylinder to the top with rocks. Hold it up to the class and ask them if they think the beaker is full. They will probably say yes. Then add some aquarium gravel to the beaker or cylinder. Ask again if they think that the container is full. Students may not be so quick to say yes this time. Then add some water or sand to the container until it is full. This should lead to a class discussion about volume and the following student-directed investigations.

Finding the volume of a solid using length and width:

1. Display several different types of measuring devices, like an empty gallon container, graduated cylinders, and a measuring cup, meter stick, and small rulers and ask students which one would be appropriate to use to measure the length and width of this box. Allow students to decide which device to use and after the activity is complete, ask them to explain their choice of a measuring device.

2. Working in groups, students will use standard rulers and metric rulers to find the volume of small boxes and the area of one side. Discuss how to determine the volume of a box (length x width x height). The teacher should stress that the result of the volume calculation will be a cubic measure – usually cm^3. The teacher should also talk with students about why it is a cubic measure.

3. Discuss how to determine the area of one side of the box (length x width). Students are to record the results of their investigation in their science *learning logs* (view literacy strategy descriptions). Have students compare and discuss their findings.

Finding the volume of a liquid:

1. Display several different types of measuring devices, like an empty gallon container, graduated cylinders, and a measuring cup, meter stick, and small rulers available and ask students which one would be appropriate for them to use to measure an unknown volume of water. Allow students to decide which device to use and after the activity is complete, ask them to explain why they chose the measuring device that was selected.

2. Working in groups, students will use an unknown amount of water and various sizes of containers to find the volume of the water. Use graduated cylinders, measuring cups, etc. Be sure to use both metric and U.S. system unit containers. Students are to record the results of their investigation in their science *learning logs*. Students should draw and label pictures of the various containers used to measure the liquids.

Finding the volume of a solid using water displacement:

1. Display several different types of measuring devices, like an empty gallon container, graduated cylinders, and a measuring cup, meter stick, and small rulers and ask students which one would be appropriate for them to use to measure the volume of a solid object such as an egg.

2. As you hold up a hard boiled egg for students to see, explain that it was easy to measure the length, width, and height of the box to determine the volume, but how could the volume of the egg be determined as it is not so easy to measure its length, width, and height. After discussion, direct students to use the following procedure.

3. Working in groups, students should pour some water and a few drops of food coloring into a measuring device (graduated cylinder or measuring cup) and record the level of the water.

4. Gently place the hard boiled egg in the water and record the new water level.

5. The difference in the two water levels equals the volume of the egg, i.e., it is the amount of space that the egg took up (displaced).

Close this lesson with a review discussion about the findings of all groups which will enhance their understanding of volume.

Activity 6: What Are Things Made Of? (GLEs: 4, 5, 9, 21)

Materials List: per group - small objects made from a variety of different materials including plastic, paper, metal, and wood (e.g., pencil, notebook paper, cardboard cereal box, plastic toy), magnifying glasses, pictures of raw materials, What Are Things Made Of ? BLM

Working in small groups, students examine a variety of common objects to make predictions and identify the materials that were used to make them. Objects should be made of different materials including plastic, paper, metal, wood, etc. (e.g., pencil, notebook paper, cardboard cereal box, plastic toy). Provide students with magnifying glasses and pictures of raw materials that these objects are made from to assist them in discovering what material each item is made.

Have students create a chart using the What Are Things Made Of? BLM. Students will list and illustrate these materials by drawing or cutting out pictures from magazines. Students will then answer the following questions: Are there materials common to several objects? Are there materials found in only one object? Where did the materials originate? Have the students complete a tally chart on the What Are Things Made Of? BLM that shows the frequency with which the same material is found in the various objects. Have groups share their findings with the rest of the class.

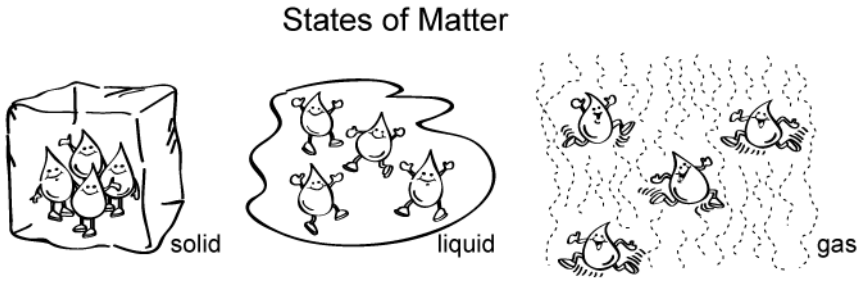
Activity 7: Changing Matter (GLEs: 3, 4, 5, 9, 11, 12, 48)

Materials List: scissors; pictures from magazines that represent solids, liquids, and gases; container to heat ice cube; hot plate; glass plate; safety goggles; cube trays; paper cups with flat and/or pointed bottoms; popsicle molds; cupcake or cookie molds; shallow pan; beaker or coffee carafe; science learning logs; Science Investigation Guidelines BLM; Science Investigation Rubric BLM

The website http://www.harcourtschool.com/activity/states_of_matter/ has an excellent interactive visual of the 3 states of matter. This could be used to engage students and can also help students when they are dramatizing the movement of the particles in a solid, liquid, and a gas.

1. Use the following interactive website to introduce examples of the three states of matter. Create a chart with the headings: solids, liquids, and gases. Students are to name examples for each category using those from the website and others that they are familiar with. You could either pre-cut or have students cut pictures from magazines representing the three states of matter and have them place them under the correct heading on the chart. (http://www2.mcdaniel.edu/Graduate/TI/pages/LEWIS/matterweb.htm)

2. Students will dramatize the movement of particles in matter. Divide the class into thirds, with one-third demonstrating a solid (the slowest moving particles), one-third demonstrating a liquid (moderate particle movement), and one-third demonstrating a gas (the fastest moving particles). Discuss how each of the three groups represents the same matter, but a different state of that matter.



3. Explain to students that matter can change from a solid to a liquid and from a liquid to a gas. Tell them that today they will explore how matter undergoes these physical changes.

Safety Note: Before beginning the investigation, ask students to identify what safety guidelines the teacher should follow when heating water for this demonstration activity. Use caution when heating water and wear safety goggles.

Teacher Note: Students should check their safety guidelines from Activity 1.

Solid to a liquid to a gas:

1. Modeling safety practices by wearing safety goggles, the teacher should demonstrate the phase changes of water by heating an ice cube (solid) to liquid to steam (gas). First have students make predictions about what will happen to the ice cube as heat is applied. As it starts to melt, students should begin to record the changes that the water is undergoing in their science *learning log* (view literacy strategy descriptions). Use the Science Investigation Guidelines BLM for students when recording data in their science *learning log*. You can also use the Science Investigations Rubric BLM to assess their data collected. You will need to model how to answer these questions as a whole class when students are using these guidelines for the first time.

2. When heating the water, use a heat safe glass container such as a beaker or coffee carafe so that students can observe the change. Place a glass plate over the container of boiling water so students may observe condensation. Relate this concept, along with evaporation, to the water cycle.

3. Students should write a paragraph in their science *learning logs* describing what happened to the ice cube (water) in each phase change.

Changing from a solid to a liquid:

1. Prepare ice cubes of equal volume ahead of time by pouring the same amount of water into different shaped containers such as ice cube trays, paper cups with flat and/or pointed bottoms, Popsicle molds, cupcake or cookie molds, etc.

2. Show the cubes to the students, asking them to predict the melting times of the different shapes of ice. (Ones with greater surface area may melt faster.)

3. Place ice shapes in a shallow pan. Have students make visual observations throughout the melting time. Make a chart of the melting times with the different shapes.

Close this lesson with a review discussion about the changes that the three states of matter and the movement of particles in these three states of matter.

Activity 8: Using the Senses for Matter (GLEs: 3, 4, 5, 6, 9, 11, 15, 22)

Materials List: powdered drink crystals, salt, 2 small dark colored containers, glass of ice, small spoon for stirring, access to water, hand lenses, microscope (if available) or an additional hand lens with a different magnification, science learning logs

Students will examine salt crystals and powdered drink crystals under a hand lens and/or microscope to observe and compare the general shape of the crystals. Have students explain why they think a hand lens or microscope is needed to examine these crystals. This should lead to a discussion that will allow students to recognize that a variety of tools can be used to examine objects at different degrees of magnification. Have students illustrate and record observations in their science *learning logs* (view literacy strategy descriptions).

Next, using a spoon, have the students mix a small amount of water with the salt and set it aside to evaporate in a dark colored container so that students can see the salt crystals that will be left behind. This will take a few days to evaporate. Have students predict what will be the outcome.

In the second container, add water and ice to the powdered drink crystals and mix. Ask students to observe the mixture and discuss what happened to the crystals.

Let a glass of ice sit for a few minutes so that condensation forms and students can observe this change in matter. Lead students into a discussion so that they can conclude that condensation is the changing of a gas into a liquid.

Close this lesson with students making science *learning log* entries that include crystal drawings and an explanation of how matter changed in the different activities.

Activity 9: Floating and Sinking—An Identifying Property (GLEs: 2, 3, 4, 5, 9, 18)

Materials List: per group - small container, Science Investigation Guidelines BLM (Activity 7), Float or Sink BLM, paper clips, buttons, corks, coins, pencils, keys, marbles, table tennis balls, small balloons; per student - science learning logs; for demonstration purposes only - large, clear, plastic container filled with water, potato, corn, stone, carrot, celery stalk, green bean to be added to the water as the story is read to the class
The following is a list of additional trade books that could be used with this activity:

- *Will It Float or Sink?* (Rookie Read-About Science) by Melissa Stewart
- *The Magic School Bus Ups and Downs: A Book About Floating and Sinking b*y Jonna Cole
- *Floating and Sinking* (First Facts: Our Physical World) by Ellen S. Niz

Introduce this lesson by reading *Stone Soup* retold by Heather Forest to the class. Along with information on floating-and-sinking, this story shares an important life lesson: When each person makes a small contribution, big things can happen! Fill a clear plastic container with water and while reading the story, drop in the ingredients from the story while having the students predict whether they will sink or float before putting them in the container. At this point, the teacher should explain to students that whether an object or material floats or sinks in water is a physical property.

Working in cooperative groups, students will test several small objects to observe and conclude their tendency to sink or float. Prepare enough containers of small objects (paper clips, buttons, corks, coins, pencils, keys, marbles, table tennis balls, small balloons) for each group to use with this activity.

1. Students will look at their container of objects and record their predictions on the Float and Sink BLM as to which objects will sink or float.

2. Students will divide the objects into two piles: a "Sink Pile" and a "Float Pile" and test their predictions. Results should be recorded.

Close this activity with a closure discussion in which students identify the materials objects are made of that affected whether they floated or sunk.

Sample Assessments

General Guidelines

Assessment techniques should include drawings/illustrations/models, laboratory investigations with reports, laboratory practicals (problem-solving and performance-based assessments), group discussion and journaling (reflective assessment), and paper-and-pencil tests (traditional summative assessments).

- Students should be monitored throughout the work on all activities via teacher observation of their work and lab notebook entries.
- All student-developed products should be evaluated as the unit continues.
- Student investigations should be evaluated with a rubric (see BLM Lab Report Rubric)
- For some multiple-choice items on written tests, ask students to write a justification for their chosen response.

General Assessments

- The student should provide accuracy of measurement of objects using appropriate U.S. system and metric system.
- The student will complete a written test on measuring.
- The student will write about observations during the investigations.
- The student will complete a chart that categorizes solids, liquids, and gases.
- The investigation of floating and sinking would be assessed as students complete the activity. Have student complete the chart as a written assessment.
- Students record on a chart daily outside temperatures using Fahrenheit and Celsius thermometers, comparing results from daily to weekly changes.

Activity-Specific Assessments

- Activity 3: Provide students with the Weather Journal BLM and have students record data about the weather for several weeks. After journals are complete, discuss the difference between weather and climate with students.

- Activity 4: The students will chart the results of finding the mass of several items and then compare the mass found in the various items.

- Activity 8: The students will use various hand lenses to observe and make a chart comparing salt crystals and powdered drink crystals. Students will also make a science *learning log* entry that includes crystal drawings and a description of how matter changed from before evaporation to after evaporation.

Grade 3
Science
Unit 2: Energy

Time Frame: approximately 15 periods of 45 minutes per period

Unit Description

Explorations of the transformation of energy into sound, heat, and electricity are the focus of this unit. Hands-on activities are used to explore sound through pitch and volume, heat through temperature changes, and electricity through basic circuitry.

Student Understandings

Students will develop an understanding of energy and practical uses of it. Students will create instruments for sound, describing and comparing both pitch and volume of sound. Explorations of electrical circuits will expand student knowledge of electricity and assist in the identification of insulators and conductors. Students will investigate materials to identify the reflection, absorption, and insulating properties of the materials.

Guiding Questions

1. Can students describe how the structure of an object changes the pitch and volume of the sound?
2. Can students describe the relation of an object's color to its absorption and reflective properties?
3. Can students identify materials that are a good conductor of heat and electricity and tell which materials make the best insulators?
4. Can students describe the effect of color on the temperature of an object when it is exposed to sunlight?
5. Can students diagram a circuit and identify the direction of electrical energy flow in an open and closed circuit?

Unit 2 Grade-Level Expectations (GLEs)

GLE #	GLE Text and Benchmarks
Science as Inquiry	
1.	Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1)
2.	Pose questions that can be answered by using students' own observations, scientific knowledge, and testable scientific investigations (SI-E-A1)
3.	Use observations to design and conduct simple investigations or experiments to answer testable questions (SI-E-A2)
4.	Predict and anticipate possible outcomes (SI-E-A2)
5.	Use a variety of methods and materials and multiple trials to investigate ideas (observe, measure, accurately record data) (SI-E-A2)
9.	Express data in a variety of ways by constructing illustrations, graphs, charts, tables, concept maps, and oral and written explanations as appropriate (SI-E-A5) (SI-E-B4)
11.	Use a variety of appropriate formats to describe procedures and to express ideas about demonstrations or experiments (e.g., drawings, journals, reports, presentations, exhibitions, portfolios) (SI-E-A6)
12.	Identify and use appropriate safety procedures and equipment when conducting investigations (e.g., gloves, goggles, hair ties) (SI-E-A7)
13.	Identify questions that need to be explained through further inquiry (SI-E-B1)
14.	Distinguish between what is known and what is unknown in scientific investigations (SI-E-B1)
16.	Describe procedures and communicate data in a manner that allows others to understand and repeat an investigation or experiment (SI-E-B5)
17.	Explain and give examples of how scientific discoveries have affected society (SI-E-B6)
Physical Science	
27.	Use the words *high/low* to compare the pitch of sound and the words *loud/soft* to compare the volume (amplitude) of sound (PS-E-C1)
28.	Describe the reflection/absorption properties of various colored objects (PS-E-C2)
29.	Determine which materials insulate best by using experimental data (PS-E-C3)
30.	Demonstrate and explain the movement of electricity in closed and open circuits (PS-E-C4)
31.	Compare and describe the common forms of energy and explain how they are used in everyday life (e.g., light, electricity, heat, mechanical) (PS-E-C6)
32.	Give examples of how energy can be used to move or lift objects (PS-E-C6)

Sample Activities

Activity 1: Forms of Energy (GLEs: 1, 2, 3, 9, 11, 13, 31)

Materials List: lamp with working light bulb, science learning logs, Forms of Energy BLM

Safety Note: Use caution so that the children do not touch the light bulb.

Use the following prompt as a science *learning log* (view literacy strategy descriptions) assignment or class discussion to engage students in identifying questions that need to be explained through further inquiry. Think about what happens when you are riding your bike. How are you able to pump the pedals to move forward or to stop? Lead the discussion to explain to students that these actions require energy and energy is the ability to cause change or make something happen. Energy allows movement in the world.

1. Ask students to identify common forms of energy (heat, light, electrical, and mechanical) and ways in which these forms of energy are produced, such as the Sun producing heat and light, a battery producing electricity, etc.

2. Students should also name ways the energy is used, such as the Sun or solar energy gives us heat and light. A lamp with a light bulb could be used to let students feel the heat from it and see the light. (This should be a demonstration.)

3. Discuss forms of energy at this time by modeling how to use a *word grid* (view literacy strategy descriptions) on chart paper labeled "Heat, Light, Electrical, and Mechanical." The teacher may use the Forms of Energy BLM as a reference when creating a chart. The students could also use the Forms of Energy BLM to record their answers as the teacher is modeling the process.

4. Label the top of your chart with the following forms of energy: "Heat," "Light," "Electrical," and "Mechanical." Randomly call on students to help complete the first vertical column by providing names of common objects, devices, etc. that produce energy. Continue calling on students to place an X in the box that corresponds to a type of energy that the item in the vertical column produces. Teacher Note: Be careful not to confuse the energy that a devise *produces* with the energy that the device *uses.* For Example, A clothes dryer *uses* electricity to *produce* heat.

5. Students can complete their chart that was started in step four by drawing pictures or cutting pictures from magazines or newspapers to represent the items that produce energy. After the chart is made, have students describe each form of energy and how it is used in their daily lives.

Discussion and science *learning log* entries should include the following questions:

- What forms of energy do you use in the following environments: at home, at school, at an outside football or baseball field during the day, or at an outside football or baseball field during the night?
- How have people used the Sun's energy to dry clothes?

Getting to Know Energy is an excellent video that can be used to close this activity. This video can be accessed from the Louisiana Public Broadcasting's' Cyberchannel (www.lpb.org/cyberchannel). This is a fee-based service. Check with the school administration to see if the district has a membership.

Activity 2: Bottle Challenge (GLEs: 2, 11, 13, 27)

Materials List: *The Three Bears* storybook, several identical glass bottles, food coloring, pencil, science learning logs

Background Knowledge: The volume of a sound, how loud or soft it is, depends on how much energy went into creating the sound. Loud sounds have large amplitudes **(**volumes**)** and carry a lot of energy. Soft sounds have small amplitudes (volumes) and carry less energy. You can vary the volume of a sound by varying how much energy is used to create it. The pitch of a sound, or how high or low it is, depends on the rate of vibration of the wave; therefore, low-pitched sounds result from slower moving vibrations and high pitched sounds result from more frequent, rapidly moving vibrations.

Use the story of *The Three Bears* to introduce the differences in pitch. The teacher will read or tell the story of *The Three Bears* and should stress the changes in voice when portraying the characters. Papa Bear's voice should be portrayed in a *low pitch,* Mama Bear's voice should be portrayed with a *medium pitch* voice, and Baby Bear's voice should be portrayed using a *high pitch* voice. The students should be told about the pitch every time the teacher portrays the character's voice (i.e., and Papa Bear said in his low-pitched voice, "Who's been sitting in my chair?"). Students should then make the voice of Papa Bear with a *low pitch and an increase in amplitude* (volume). Use the same process with the voice of Baby Bear using a *high pitch* and *increasing the amplitude* (volume) while keeping the pitch the same. Discuss voices of well-known people such as actors, singers, and cartoon characters (e.g., compare the pitches of the voices of the actor James Earl Jones and the cartoon character Mickey Mouse.)

1. The teacher should fill clear glass bottles of the same size with differing amounts of water. Use a drop or two of food coloring to make the water better visualized by all students. Randomly call on students to tap one of the glass bottles with a pencil to create a sound.

2. Direct students to make predictions about whether the bottle with less water or more water will have the higher pitch. Arrange the glass bottles by the sounds

made with the lowest pitch to the left and ascending to the higher pitches on the right.

3. The pitch will depend on the amount of water in the bottles when tapped. Tapping the bottle causes the glass to vibrate, producing sound. Bottles with more air space (less water) will vibrate with more frequency causing a higher pitch than bottles with less air space (more water) in them, which will vibrate with less frequency and a lower pitched sound. (The reverse is true if you blow across the top of the bottles in which the *air* is vibrating not the *bottle.*)

4. After the bottles are arranged, students should lightly strike the bottles with a pencil. The sound will be slightly different but will still be in the correct pitch order. Students should make a drawing of the bottles noting the amount of liquid in each bottle distinguishing the pitch from lowest to highest in ascending order. The website http://www.lhs.berkeley.edu/shockwave/jar.html has a very good interactive lesson using glass bottles and water the same way this lesson used the bottles and water. The site also makes music using the bottles by labeling the bottles with a number and using those numbers to create music.

5. Discussion and science *learning log (*view literacy strategy descriptions) questions:
   - Which bottle makes the highest pitched sound? Why?
   - Which bottle makes the lowest pitched sound? Why?

   Teacher Notes: Students should conclude that the amount of water in the glass affects the sound produced. When the *bottles* are tapped, the bottle with the least amount of water will vibrate the fastest and will have the highest pitch.

Activity 3: Rubber Band Guitars (GLEs: 3, 5, 11, 13, 27)

Materials List: per group - safety goggles, science learning logs, rubber bands that vary in length and thickness, plastic shoe box

Safety Note: Students should wear safety goggles for protection when stretching rubber bands.

If the technology is available, use the following website to introduce this lesson. This site allows the teacher and the student to virtually pluck a guitar to make various sounds. (http://www.bbc.co.uk/schools/ks2bitesize/science/activities/changing_sounds.shtml)

Explain to students that they re going to use plastic shoe boxes and rubber bands to create their own guitars.

1. In cooperative groups, students will construct a rubber band guitar to differentiate among pitches using rubber bands that vary in length and thickness.

2. The rubber bands will be stretched over an open, sturdy box so the sound can resonate. Have students predict what type of pitch they will hear from each rubber band. As students pluck the strings, they will be able to discriminate between high and low pitch.

3. Display constructed guitars in the classroom, and if available, compare them to how a real guitar makes different sounds. If real guitars or not available, the teacher can also use the same website used in the beginning of this lesson for sounds from real guitars. Instruct students to write an explanation in their science *learning logs* (view literacy strategy descriptions) of how the tightness and thickness of the strings changes the pitch. They should also answer the following questions in their science *learning logs* :
   - What could you do to a string on a guitar to make it sound higher or lower?
   - What other type of stringed instruments can you name?
   - How is the sound made by these stringed instruments different from or similar to the guitar?

Students should formulate questions about different materials that could be used instead of the rubber bands. Discussion questions include the following:

- What is pitch and how does the thickness of the string change it?
- Does the tension or tightness of the string change the pitch? How?
- How could you change the strings to make the sound different?
- What change would occur if you changed the size of the box?
- What causes changes in the pitch of voices?

If time allows, have student groups perform a song with their rubber band guitar. Invite a parent or member of the community to visit the class and play a guitar or other stringed instrument for students.

Activity 4: Reflector or Absorber of Heat? (GLEs: 1, 2, 3, 4, 5, 9, 11, 12, 28)

Materials List: per group - 2 shoeboxes, 2 non-mercury thermometers that show metric and U.S. degrees, Reflector or Absorber of Heat BLM

Safety Note: Only non-mercury thermometers should be used in the classroom due to the potential safety hazard that mercury presents. If mercury thermometers are in your classroom, they should be properly disposed of by someone in authority at your school or school system.

Begin the lesson by using the following prompt with the students: School is almost over and summer vacation will soon be here. That can mean only one thing, "Baseball Time." The coach of one of our teams is trying to decide what color uniforms he should purchase that would keep his team the coolest in this summertime heat we have in Louisiana. Should he buy light colored uniforms or dark colored uniforms? Then ask students to try to generate questions that would guide them into an investigation to scientifically

determine what color uniforms the coach should buy for his team. Listen and discuss student responses and guide them to an investigation similar to the one below.

1. Student groups will cover two shoeboxes with colored paper or fabric to test the materials for reflection of absorption qualities. One box will be covered with a *light* colored paper or fabric; the other will be covered with a *dark* colored paper or fabric.

2. Students should generate a list of safety precautions to use with thermometers. Before placing a thermometer inside each box, instruct students to predict what they think will be the results of the investigation.

3. Covered boxes are to be placed in sunlight for a period of thirty minutes to allow for transfer of heat to occur. Students should record temperature changes and make other observations as indicated on the Reflector or Absorber of Heat BLM.

4. When the students have collected all data, they should analyze their findings and then answer the following questions based on the data collected.
   - What color clothing would you choose for a very cold, sunny day to help keep you warm? Explain your choice.
   - What color clothing would you want to wear on a hot, sunny day? Explain your choice.

Close this activity with a review discussion about absorption and reflection. Explain to students that dark colors absorb more light energy and light colors reflect light energy.

Activity 5: Solar Cooker (GLEs: 4, 5, 9, 11, 12, 13, 17, 28)

Materials List: per group - *Energy from the Sun* by Allan Fowler or *Done in the Sun – Solar Projects for Children* by Anne Hillerman, Science Investigation Guidelines BLM (see Unit 1, Activity 7), Science Investigation Rubric BLM (see Unit 1, Activity 7), Solar Cooker Data Sheet BLM, two pieces of black poster board, cardboard box (copy paper box top or the soft drink boxes work well), graham crackers, marshmallows, plain chocolate candy bar, aluminum foil, re-sealable plastic bags, 1 thermometer, learning logs

This activity may take two instructional class periods to complete.

Before beginning this investigation, students should generate questions they have about solar energy based on a modified version of a *Student Questions for Purposeful Learning - SQPL* (view literacy strategy descriptions).

1. Tell students that they should respond to the following statement: *Solar energy cannot be used for cooking.* This statement should be written on the board or projected on the overhead or computer and recorded in a science *learning log* (view literacy strategy descriptions) .

2. Have students work in pairs to think of one *good* question they have about solar energy based on this statement. As students respond, record their questions on whatever media source you used to write the statement. A question that is asked more than once should be marked with a smiley face to signify that it is an important question. These questions should be periodically referred to when conducting the investigation.

3. When students finish asking questions, the teacher should contribute questions to the list, if necessary. After the science investigation is complete, the students will answer questions that are recorded on chart. Also, remind students they should always ask questions before learning something new, then listen and look for answers to their questions.

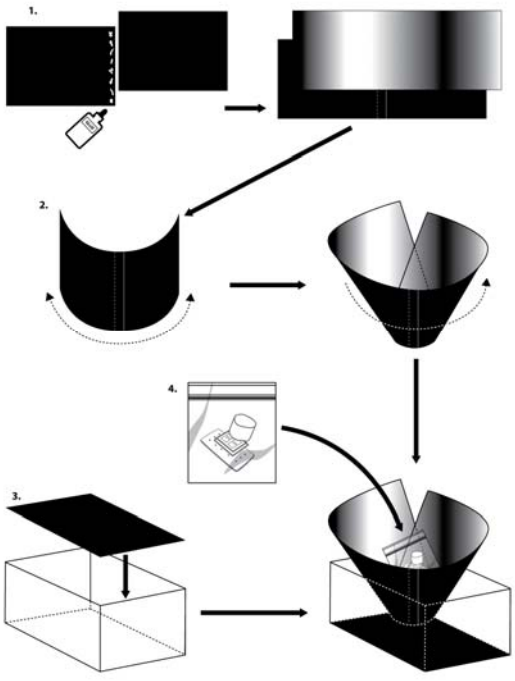
4. Working in cooperative groups, have students use the Science Investigation Guidelines BLM to guide them in this investigation. The Science Investigation Rubric BLM could be used to assess this investigation

Building the Solar Cooker:

1. Glue two pieces of black poster board together to make one long piece. Cover one side with aluminum foil.

2. Bend the poster board, foil side in, into a cone shape and tape it together. The cone should still be open on both ends.

3. Put black construction paper in the bottom of a cardboard box. This dark surface will absorb heat into the bottom of the box. Prop the cone in the box with the narrower opening pointing down.



Tell students that they will be cooking a S'more. If students are not familiar with a S'more, explain that this is a snack made from graham crackers, marshmallows, and chocolate. Ask students to predict in what order they think the ingredients should be placed in the re-sealable bag and to predict how long it will take the chocolate to melt.

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4. Instruct each student to put a graham cracker, a piece of chocolate, a marshmallow on top and then another graham cracker on top of it in a re-sealable

bag and then place the bag on the bottom of the Solar Cooker, in the center of the cone (see diagram).

Make an extra S'more to serve as the control and place it in the Sun near the Solar Cooker. Students should predict how long it will take to cook the S'more in the Sun outside the Solar Cooker and the S'more in the Solar Cooker. The S'more should be considered "cooked" when the chocolate begins to melt.

5. Once the Solar Cooker has been set up outside, the student should place a thermometer inside of the Solar Cooker and one near the control S'more. This will help the students compare the temperature in the Solar Cooker to the temperature outside. Ask students how they will know if the Solar Cooker is working?

6. Using the Solar Cooker Data Sheet BLM, students should check their Solar Cookers every 15 minutes to be sure that the cooker is still in the Sun and to record data.

7. While waiting for the S'mores to cook, the teacher may choose to read one of the following trade books:
   Energy from the Sun by Allan Fowler
   This book defines energy and explains how energy from the Sun provides us with heat, light, plants, food, and other things necessary for life on Earth.
   Done in the Sun – Solar Projects for Children by Anne Hillerman
   This book teaches the basic principals of solar energy while providing fun experiments that can be done at school or at home.

8. After all data has been collected, direct student groups to answer and discuss the following questions:
   - Which Solar Cooker got the hottest? What temperature did it reach?
   - Which Solar Cooker melted the chocolate the quickest? Why do you think it was faster?
   - What was the temperature near the S'more that was not in the Solar Cooker?

The teacher can now lead a class discussion about the *SQPL* statement that was used at the beginning of the activity: ***Solar Energy Cannot Be Used For Cooking.*** Class discussions should also include how the discoveries of solar energy have affected society. For example, how the use of solar panels in homes has helped saved natural resources (like coal) by using energy from the sun, which is a renewable resource to make electricity in homes.

Activity 6: Insulators of Heat? (GLEs: 2, 3, 4, 5, 9, 11, 13, 16, 29)

Materials List: per group - prepared ice cubes, newspaper, aluminum foil, plastic bags, packing peanuts or other packing materials, sawdust etc.; Science Investigation Guidelines BLM (see Unit 1, Activity 7); Science Investigation Rubric BLM (see Unit 1, Activity 7); Melting Time Data Sheet BLM

Begin this activity by using the following prompt with students. Pretend your mom has just ordered pizza for you and your friends, and when it arrived, it was cold. You noticed that when the pizza was delivered, it was just in the cardboard pizza box. Start the class discussion by asking the students what could the delivery person have done to keep the pizza from getting cold? The discussion should lead students to draw conclusions that the pizza was delivered in a cardboard box and was not wrapped in an insulated bag.

1. Have students pose questions about how they might insulate cold foods to keep them cold. This discussion should be followed by students designing an investigation (using the Science Investigation Guidelines BLM) that would determine the best insulator to use to keep an ice cube from melting. Students can select from materials provided as insulators. Have students conduct at least three trails to draw a valid conclusion about insulting properties of materials used in the activity.

2. Using their science *learning logs* (view literacy strategy descriptions), direct students to write their planned procedure, sketch the set up, and then submit the drafts to the teacher for approval.

3. The ice cubes used should all be the same size and shape and should be prepared by the teacher in advance. Examples of insulating materials to use are newspaper, aluminum foil, plastic bags, packing peanuts or other packing materials, sawdust, etc.

4. Students, in cooperative groups of three or four, will choose one material to investigate. (e.g., the ice cube could be wrapped in a piece of aluminum foil.)

5. Provide students with the Melting Time Data Sheet BLM to use to record their collected data: material that was chosen, the time the experiment began, and predictions about how long it will take for the ice cube to melt. To prevent body heat and room temperature from becoming factors in the rate of melting, caution students to leave the ice cube alone and not to peak repeatedly into the container, except at the designated times.

6. Place the containers in a centralized place in the classroom (preferably not in direct sunlight). Have students check their ice cube approximately every 20 minutes. The students should chart the time and sketch a picture of how the ice cube looks every 20 minutes.

Teacher Note: While waiting for time to elapse, students could read about energy from their textbook or trade book (if available) like *Science Book of Energy* by Neil Ardley, that gives instructions for a variety of simple experiments that explore and explain different forms of energy. If this book is not available, the teacher may use similar books that he/she already have in his/her classroom. If available, the LPB Cyberchannel (www.lpb.org/cyberchannel) also has a video clip titled *Heat, Temperature, and Energy* that discusses insulators of energy.

7. From the data collected, students can then determine which materials tested were the best insulators of heat. Discussion questions include the following:
   - What types of materials would be best as insulators to keep the ice from melting?
   - Do you think that these same materials would keep hot foods hot?
   - What other materials could be used for insulators?
   - Have students generate questions about insulators that could be explained or further investigated.

Activity 7: Lighting Bulbs (GLEs 2, 3, 4, 9, 11, 12, 14, 17, 29, 30)

Materials List: per group - science learning logs, insulated wire, flashlight bulbs or Christmas tree bulbs, D-cell batteries

Safety Note: Help students to list some safety guidelines to follow before beginning this activity. Caution students not to try these experiments at home without an adult present with them. Students should never perform explorations involving electrical outlets. Use only insulated wires in these experiments. Use only a D-cell battery or smaller to prevent burns and or electrical shocks.

Use the following prompt to engage students in this lesson: Have you ever put batteries in an electronic game the wrong way? What happened? Why do you think this happened? Explain to the students that in order for the game to work, the batteries had to be connected a certain way. In this investigation, students will experiment with a battery, a bulb, and wires.

Before beginning this activity, direct students to complete a KWL *graphic organizer* (view literacy strategy descriptions) about what they know and do not know about constructing a circuit.

1. Working in pairs, student should be instructed to light a bulb in as many ways as possible using insulated wires, D-cell batteries, and a small flashlight bulb or Christmas tree bulb.

2. After completing the task, students will draw and label at least one successful way they created a simple circuit in their science *learning logs* (view literacy strategy descriptions). Students should also draw and label the circuits that did not work.

3. Student pairs should then share their findings and explanations with another group.

4. Through a class discussion, share the various successful paths as well as those that did not work. Lead students to conclude that in order for the bulb to light, there needs to be an unbroken pathway (closed circuit) from the battery (the source of energy) to the bulb and back to the battery. Use the battery, wire, and light bulb to demonstrate what happens when that path of electricity is broken (open circuit).

5. Assist students in making a connection between electricity and energy by explaining how the chemical energy in the battery works. Explain to students that chemical energy in the battery is transformed to electrical energy which is then transformed to light energy in the bulb. Direct students to record this information under what they have learned in their KWL *graphic organizer.*

If technology is available, these interactive websites allow the students to build a simple circuit. Using these websites and the battery and light bulb with the wires, discuss open and closed circuits. Switches close electrical circuits allowing electrical energy to flow through the wires. These transformations are also a result of scientific discoveries.
http://www.ngflcymru.org.uk/vtc/learnpremium/electric_circuits/Introduction/default.htm
http://www.andythelwell.com/blobz/

Close this activity with a class discussion about how discoveries, like the light bulb have affected society. Included in this discussion should be the importance of insulated wiring, electric transformers, and power plants, all of which have transformed society. It is imperative that students understand that electrical energy is essential to modern society.

Activity 8: Heat Energy (GLEs: 4, 11, 13, 32)

Materials List: hot plate, safety goggles, microwave (or electric teapot works well for heating water), non-mercury thermometers, cup or beaker, working light bulb or candle

Safety Note: The teacher should caution students on dangers presented by hot water and should monitor their work. When conducting the teacher demonstration, use caution when suspending the pan over a heat source such as a light bulb or candle.

Forms of energy such as heat, light, sound, and electricity can make things move. In this activity, students will relate the movement of the liquid in a thermometer to heat energy. This experiment should be done in small groups with teacher guidance or it can be done as a teacher demonstration.

1. Students will place a thermometer into a cup of hot water and observe the red liquid in the thermometer. After the liquid in the thermometer stops rising,

instruct students to gently lift the thermometer out of the water and observe the red liquid. Ask students what caused the liquid to go up in the thermometer? Help students to realize that the heat in the water caused the liquid in the thermometer to move.

The teacher should cut out a circular bottom of an aluminum pie pan into a spiral. When suspended over a heat source, such as a light bulb or candle, the spiral will begin to move. Before placing the spiral over the heat source, ask students to predict what they think will happen when the spiral is placed over the heat source. Questions to be discussed include the following:

- What caused the aluminum spiral to spin?
- What will happen to the spiral if the light bulb were turned off? Why?

Close this activity with a concluding discussion in which students provide examples of how other sources or forms of energy can move or lift objects. If students do not conclude that gasoline (chemical energy) is used to provide the energy that allows the car or mower to move, include this one in the concluding discussion. Students should also be familiar with the fact that food (chemical energy) is used to power their own movement.

Sample Assessments

General Guidelines

Assessment techniques should include drawings/illustrations/models, laboratory investigations with reports, laboratory practicals (problem-solving and performance-based assessments), group discussion and journaling (reflective assessment), and paper-and-pencil tests (traditional summative assessments).

- Students should be monitored throughout the work on all activities via teacher observation of their work and lab notebook entries.
- All student-developed products should be evaluated as the unit continues.
- Student investigations should be evaluated using the Science Investigation BLM rubric.
- For some multiple-choice items on written tests, ask students to write a justification for their chosen response.

General Assessments

- Have student write an explanation of how tension and thickness of rubber band guitar strings change pitch.
- The student will record materials used and time elapsed for ice cube to melt.
- The student will draw and label a simple circuit.
- The student will assemble a simple circuit with a switch and a bulb.
- Science Learning Logs are used throughout the unit and could be assessed by teacher observation.

Activity-Specific Assessments

- Activity 1: Students will complete a word grid about various forms of energy and how they are used.

- Activity 2: Using drawings of the same size bottles, the student must draw water lines on the bottles to show ranges of pitches from highest to lowest if the bottle is struck with a pencil.

- Activity 4: Your soccer team is choosing uniforms for their winter season. What color clothing would be the best to keep you warmer during the cold days playing outside soccer? The student should write an explanation of the best color clothing to wear to keep warmer using data that was collected in the activity.

- Activity 5: Students will conduct an investigation using a solar cooker, and the Science Investigation Rubric BLM will be used to assess student performance as evidenced on students' *Solar Cooker Data Sheet* (BLM).

- Activity 7: Using a battery, wire, and a bulb, the student will create and diagram a complete circuit and label each component.

Grade 3
Science
Unit 3: Forces and Motion

Time Frame: Approximately 10 instructional periods of 45 minutes per period

Unit Description

The exploration of Newton's laws of force, motion, and the position of objects over time is the focus of this unit. Investigation of the characteristics of force and motion is provided throughout the activities.

Student Understandings

Through the design of their own investigation, students will explore the ideas of force, reaction, and motion. Students will explain the relationship of height and distance when measuring speed, the effect of friction on an object, and the influence of a push or a pull on an object.

Guiding Questions

1. Can students explain how force is a push or a pull on an object?
2. Can students describe the relationship of the height of an inclined plane and the distance an object will roll?
3. Can students explain how the height of an inclined plane determines the speed at which an object moves?
4. Can students describe how the effect of friction determines an object's movement?
5. Can students observe and analyze shadows and the apparent path of the Sun across the sky from data collected?

Unit 3 Grade-Level Expectations (GLEs)

GLE #	GLE Text and Benchmarks
Science as Inquiry	
1.	Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1)
2.	Pose questions that can be answered by using students' own observations, scientific knowledge, and testable scientific investigations (SI-E-A1)
3.	Use observations to design and conduct simple investigations or experiments to answer testable questions (SI-E-A2)
4.	Predict and anticipate possible outcomes (SI-E-A2)

GLE #	GLE Text and Benchmarks
5.	Use a variety of methods and materials and multiple trials to investigate ideas (observe, measure, accurately record data) (SI-E-A2)
7.	Measure and record length, temperature, mass, volume, and area in both metric system and U.S. system units (SI-E-A4)
8.	Select and use developmentally appropriate equipment and tools (e.g., magnifying lenses, microscopes, graduated cylinders) and units of measurement to observe and collect data (SI-E-A4)
9.	Express data in a variety of ways by constructing illustrations, graphs, charts, tables, concept maps, and oral and written explanations as appropriate (SI-E-A5) (SI-E-B4)
11.	Use a variety of appropriate formats to describe procedures and to express ideas about demonstrations or experiments (e.g., drawings, journals, reports, presentations, exhibitions, portfolios) (SI-E-A6)
12.	Identify and use appropriate safety procedures and equipment when conducting investigations (e.g., gloves, goggles, hair ties) (SI-E-A7)
17.	Explain and give examples of how scientific discoveries have affected society (SI-E-B1)
Physical Science	
23.	Demonstrate how force is a *push* or a *pull* by using students' bodies, toy cars, or balls (PS-E-B2)
24.	Explain how the amount and direction of force exerted on an object (e.g., push, pull, friction, gravity) determine how much the object will move (PS-E-B2)
25.	Observe and analyze motion and position of objects over time (e.g., shadows, apparent path of the Sun across the sky)
26.	Explain the effect of varying amounts of force on the motion of an object (PS-E-B4)
32.	Give examples of how energy can be used to move or lift objects (PS-E-C6)
33.	Identify simple machines and the tasks they make possible (PS-E-C6)

Sample Activities

Activity 1: Moving Objects (GLEs 3, 5, 7, 8, 9, 24, 26)

Materials List: Moving Objects Data Sheet BLM, Vocabulary Self-Awareness Chart BLM, science learning log, identical masses such as washers or other similar weights, electronic balance (if available), small cup with handle, string, ruler, book or notebook

Lead a class discussion about force by using the following prompt. Suppose you pull an empty wagon down the street. Then a friend gets in the wagon, and you pull again. The second time, you have to pull a lot harder. Why? Lead students in this discussion to conclude that a *force* is a push or pull. *Force* should also be added to the students' *Vocabulary Self-Awareness* (view literacy strategy descriptions) Chart BLM and their *vocabulary cards* (view literacy strategy descriptions).

To begin this activity, provide students with the *Vocabulary Self-Awareness* BLM. This chart will be used to record information about vocabulary that is used throughout the unit. These vocabulary terms can then be made into *vocabulary cards* and used as study aids for test and quizzes. Remind students to use the format below when creating their flashcards. Students should fill in this chart with definitions of these terms as they are discussed in the activities in this unit. Students should not define terms until it is discussed in the activities.

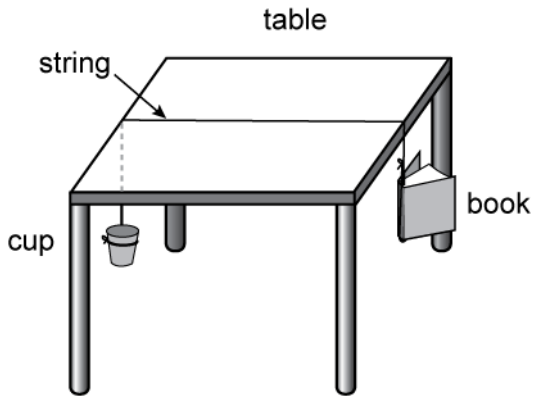
Example of information on *vocabulary cards*:

Vocabulary Word - *incline plane*
Definition - Is a flat surface set at an angle to another surface
Characteristics - to lean or slant, smooth surface
Examples - ramps used for things like: skateboarding and wheelchairs
Illustration – have students draw pictures or cut illustrations from magazines

In this activity, students will explore, gather, and interpret data about the amount of force that is needed to move a book across a tabletop. Explain to students that scientists often organize their data into charts. Scientists then study the completed charts, looking for patterns and relationships. Explain to students that they have been recording data in charts provided by the teacher, but today they will be responsible for devising an appropriate chart for organizing their data. Students will then analyze the data and discuss any trends they see in the data. This activity should be done as a class demonstration so that students can focus on collecting their data.

1. Tie one end of a length of string to a light weight book or notebook and the other end of the string to a cup. The string should be long enough to allow the book to hang off the side of the tabletop. See illustration in step two.

2. Suspend the cup from the end of the table letting it hang off the table. Add identical masses such as washers or other similar weights to the cup until the book begins to move.



3. Using a measurement tool, measure the distance the book has moved each time a different amount of weight is added to the cup. Guide students in recording these measurements using the Moving Objects Data Table BLM. Use the example below as a guide, if needed, to assist students in designing their chart.

Trial #	# of weights used	Mass of weights (optional)	Distance book moved

4. As additional weights are added, have students record the amount of washers and the measurement of the distance the book moved. Students can measure washers using an electronic balance, if available. Compare the amount of washers needed to the distance the book moved each time.

Ask students to predict the amount of washers it would take to make another book (that the teacher has chosen) move across the table. Students should compare at least three different books varying in mass. Ask the following:

- Which book required more force to make it move? Why?
- Which book required less force to make it move? Why?
- Why do some things require more force to move than others?
- Explain how the amount and direction of force exerted by the weights determined how far the book(s) moved.

These questions and answers should also be recorded in the students' science *learning logs* (view literacy strategy descriptions).

Activity 2: Tennis Ball Roll (GLEs: 2, 3, 4, 7, 8, 23, 24, 26)

Materials List: per group - science learning logs, stopwatch or watch with second hand, tennis balls, yardsticks, meter sticks, Tennis Ball Race Data Sheet BLM, books, cardboard box top (copy paper box top works well)

Hold up a box top and a tennis ball, and point to a stack of four or five textbooks. Tell students that they will use these items to build an incline plane that will be used to roll a tennis ball. Create an incline plane using the box top and one book. Ask students if they can think of another name to describe this set-up. If students do not respond with the word "ramp," then lead the discussion to the word and some uses of ramps. Students will then roll a tennis ball on an inclined plane, as described, to investigate the relationship between the height of the incline plane and the distance the tennis ball will roll. Caution students to try and release the ball with the same amount of force each time to avoid introducing additional variables into their experiment.

1. Students should first predict the optimum height of the ramp that will allow the tennis ball to travel the *greatest distance.* Then in cooperative groups, students will measure the distance the tennis ball travels from the end of the ramp until it stops, using three different heights. Instruct students to try and release the ball with the same amount of force each time. Demonstrate to the class how to measure the height of the ramp.

2. Have students record data on the Tennis Ball Race Data Sheet BLM using both metric and US systems.

3. Next, students should roll the ball keeping the same height, but trying to use more force. They should run at least three trials and record data. Help students to see the effect of a *push* and the amount of force and direction given to the tennis ball upon release (when describing a *push*, relate the contrary, a *pull*). Explain to students that a force is a push or pull. For example, the force of the wind *pushes* sailboats and windmills and the force of a student's arm can *pull* a wagon on the sidewalk.

4. Discussion and science *learning log* (view literacy strategy descriptions) questions include the following:
   - When did the tennis ball roll the greatest distance —with one book, two books, or three books? Why do you think this was so?
   - When the height was kept the same and different amounts of force were applied to the tennis ball, which rolled the greatest distance? Why do you think this was so?
   - Describe the movement of the tennis ball using the terms *push, force,* and *direction.*

Activity 3: Rolling Toy Race (GLEs: 2, 4, 5, 9, 12, 24, 26)

Materials List: per group -Science Investigation Guidelines BLM (see Unit 1 – Activity 7), Science Investigation Rubric BLM (see Unit 1 – Activity 7), Rolling Toy Race Data Sheet BLM, Vocabulary Self-Awareness Chart BLM, science learning logs, sandpaper, rolling toy, aluminum foil, construction paper, a smooth surface, a small piece of carpet

Teacher Note: this activity may take two 45 minute instructional periods.

Begin a discussion about *friction* by asking the students what would cause a rolling ball in an open field to stop. Lead students to conclude that friction would eventually stop the ball from rolling. Be sure students understand that friction exists between all moving objects. Explain that if there was no friction, a ball rolled along an open field would roll forever because there would be no force to slow the ball down. Have students identify some examples of friction.

To demonstrate one example of friction, have students rub their hands together and then ask them to describe how their hands feel. Explain to students that as the particles in your left hand rubbed against particles in your right hand, friction was created.

Have students generate questions in their science *learning log* (view literacy strategy descriptions) about friction and how it affects motion. Students should also record the definition of friction (the force between two moving objects that tries to keep the objects from moving freely) on a *vocabulary self-awareness* (view literacy strategy descriptions) chart which has been provided as a blackline master. See Vocabulary Self-Awareness BLM.

Instruct students to design (with teacher guidance) an investigation using rolling toys to test how friction affects the movement of objects. Students should use the Science Investigation Guidelines BLM as a guide when designing an investigation and the Science Investigation Rubric BLM to assess the activity. They should also make a list of safety precautions to follow. The following is a suggested investigation**:**

1. Students will test rolling toys rolled from an inclined plane onto a variety of materials to determine how friction affects their movement. Student groups will test materials such as sandpaper, aluminum foil, construction paper, a smooth surface, and carpet. Students are to test each toy on each material for a predetermined amount of time, such as one two minute, including multiple trials.

2. Students are to average the time of the multiple trails for use in determining the friction winners on the Rolling Toy Race Data Sheet BLM. if students are not familiar with finding the average of a set of data, the teacher may have to assists students with this task.

3. Students are to provide a written or pictorial account of their procedure using the Rolling Toy Race Data Sheet BLM and should predict the outcome of each test.

4. After observing the movement of the toys on the different materials, students will rank materials from which is most effective for slowing the toy down (provides the most friction) to least effective in slowing an object down (provides the least friction). Students are to record their findings using the Rolling Toy Race Data Sheet BLM.

A teacher-led discussion on friction should be incorporated with group presentations of their results. Discussion and science *learning log* questions that could be used as individual formative assessment include the following:

- Which material allowed the toy to move the fastest? Why? Can you explain your answer using the terms *force* and *friction*?
- Which material was best for slowing the toy down? Why? Can you explain your answer using the terms *force* and *friction*?
- Name some other materials that will cause the toy to travel at a slower speed.
- Name some other materials that will cause the toy to travel at a faster speed.

- Can students name some daily incidents in which friction could affect them?

Activity 4: Simple Machines (GLEs: 2, 5, 11, 17, 32, 33)

Materials List: Simple Machines Data Sheet BLM; set of simple machines which include inclined plane, wedge, lever, wheel and axle, gears, and pulley; 3 sets of the following - box top (copy paper box tops work well), 2x4 piece of wood, box of heavy books or blocks, apple, plastic knife, spool of thread on a small dowel rod or pencil, small bucket, block; safety goggles

Safety Note: Students should use caution when using the plastic knife.

The teacher should assemble a classroom set of simple machines: inclined plane, wedge, lever, wheel and axle, gears, and pulley. The following website is also useful when introducing simple machines: (http://www.beaconlearningcenter.com/WebLessons/SimpleMachines/machines005.htm). This is an excellent interactive site as well as having many visuals of simple machines. These can include but are not limited to kitchen utensils, common tools, boards propped on chairs or tables for planes, etc. A discussion of simple machines will identify the machine and the type of work each does. Ask students how the discoveries of these simple machines have affected society.

1. Place students in groups of three or four and give each a simple machine to pantomime and have other groups try to guess what the simple machine is being demonstrated.

2. Set up three stations around the room. Have groups of students try to complete the given task at each station without the use of a simple machine. Then the students should repeat the task using the simple machine and record data on the Simple Machine Data Sheet BLM.

    - *Incline Plane*
      Materials Needed: box, 2x4 piece of wood, and a box of heavy books or blocks
      Task: Move the books from the floor to the table.

    - *Wedge*
      Materials: apple, plastic knife
      Task: Divide the apple into pieces, first without using the knife, and then using the knife.

    - *Pulley*
      Materials Needed: spool of thread on a small dowel rod or pencil, small bucket, block

Task: Lift block into air, first with just "manpower" and then using the pulley.

Working in their same cooperative groups, students will complete a modified version of a science *story chain* (view literacy strategy descriptions) to summarize what they did at each station. This process involves a group of students writing a summary while providing students a time to reflect on their understanding of simple machines. The science *story chain* can begin with a short summary (two-three sentences) of the first station that the group visited proceeding in the order in which the stations were visited. On a sheet of paper, ask the first student in the group to write the first summary (two-three sentences) about the first station. Students should be encouraged to use data gathered during this activity when writing their summary, identifying the simple machine and the task it made possible. The student passes the paper to the student sitting to the right, and that student writes their brief summary (two-three sentences) about the next station that was visited. This process continues until each student has written about one station. All group members should be prepared to revise the summary based on the last student's input, whether the summary was clear or not.

Example of science *story chain:*

Student one – The first station we went to was the Incline Plane station. It was easier getting the box from of books from the floor to the table using the incline plane.

Student two – Next, we went to the Wedge Station and used a plastic knife to cut an apple. That plastic knife made it a lot easier to cut the apple. We were not able to cut it without using the knife.

Student three - Next stop, the Pulley Station. At this station, we were able to lift the bucket without the pulley, but it was easier to lift with the pulley.

Activity 5: Movement Over Time (GLEs: 1, 3, 5, 11, 25)

Materials List: chart tablet, sidewalk chalk, science learning logs

Introduce this lesson by taking students outside to an immovable object such as a flagpole, basketball goal, tree, fence post, etc. Show students the shadow created from one of these objects and have them *brainstorm* (view literacy strategy descriptions) reasons why or how this shadow was created. As students brainstorm, the teacher should record their ideas on a chart tablet. The teacher should also explain to the students that in *brainstorming,* all ideas are accepted. *Brainstorming* is an effective method to use when activating prior knowledge. After the *brainstorming* is complete, explain to students that they are going to investigate what causes shadows and why they may change size and position.

Short-term shadow activity:
Teacher Note: This activity works best on a sunny morning.

- Working in pairs, have each pair draw a circle on the pavement and then write his/her name next to the circle.
- Have one student stand in the circle and draw an arrow pointing straight ahead.
- While the student is standing still in the circle, the partner traces the outline of his/her shadow.
- Have the pairs switch and repeat the process. Students should then measure and record the length and width of the shadow in their science *learning log* (view literacy strategy descriptions). Explain to students that they will come back to this same spot later in the day and repeat this same processes for measuring their shadows. Ask students to predict whether or not the size of their shadow will change.
- Have students return much later in the day to repeat this same process and check the predictions that were made earlier in the day.

Long-term shadow activity:
The students will now observe the changing shadow of an immovable object such as a flagpole, basketball goal, tree, fence post, etc. The observations should take place during the course of the entire school year.

- Have students measure the length and width of an available immovable object in your school yard. Have students make predictions of where the shadow will be on the next prescribed observation time.
- Students observe the object from a set position each time noting the position of the shadow of the object, the length of the shadow and the position of the Sun.
- A teacher led discussion should state the Sun is stationary in space, but Earth's rotation causes the Sun to *appear to move* across the sky from east to west each day. Because of the changing position of Earth, the shadow cast by the object moves from one side of the object to the other.
- Using the (view literacy strategy descriptions) r *science learning logs* students should make drawings of the object, its shadow, and the position of the Sun. Each drawing should include a label with the time of the day by each drawing.

Use the following questions to close this activity:

- How does the shadow of the object change from time to time?
- Describe where the shadow is in relation to the Sun.

Teacher note: This activity should be an ongoing one so that students clearly see the changes in the shadow of the specified object, not only during the course of the day but during a substantial amount of time, i.e., months or the entire school year.

Sample Assessments

General Guidelines

Assessment techniques should include drawings/illustrations/models, laboratory investigations with reports, laboratory practicals (problem-solving and performance–based assessments), group discussion and journaling (reflective assessment), and paper-and-pencil tests (traditional summative assessments).

- Students should be monitored throughout the work on all activities via teacher observation of their work and lab notebook entries.
- All student-developed products should be evaluated as the unit continues.
- Student investigations should be evaluated with the Science Investigation Rubric BLM.
- For some multiple-choice items on written tests, ask students to write a justification for their chosen response.

General Assessments

- The student will complete a written assessment to include the chart of trials and a short answer and an extended response.
- The student will complete a written assessment to include the chart, a short-answer response, and an extended response on the best materials to speed objects up or slow them down.
- The student will write an explanation of which surface is best for speed and which is best for slowing objects down.

Activity-Specific Assessments

- Activity 2: Students will complete the Tennis Ball Race Data Sheet BLM with data they have collected in this activity.
  Short Answer Question:
  a. Which tennis ball rolled the fastest, and why do you think so?

  b. Did the amount of push or pull you used affect how much the tennis ball moved?

  c. Explain how the amount and direction of force exerted on the tennis ball determines how much the tennis ball will move.

  d. Describe the movement of the tennis ball using the terms *push*, *force*, and *direction*.

- Activity 3: Have students complete the Rolling Toy Race Data Sheet BLM and answer the following questions:

  a. Which of the following materials would you choose to make your car move the fastest: sandpaper, construction paper, carpet, or smooth floor? Why?

  b. Which material would you choose to make your car move the slowest or cause the most friction? Why?

- Activity 4: Given an example of a simple machine, have the student write an explanation of how the machine works and about a task it can perform.

Grade 3
Science
Unit 4: Rocks, Soils, and Change

Time Frame: Approximately 10 instructional periods of 45 minutes per period

Unit Description

This unit focuses on the properties of Earth's materials and how they are formed. Explorations will include the characteristics of minerals and the identification of rocks and minerals. Both physical and chemical processes will be analyzed to determine changes to the environment through weathering, rusting, and erosion.

Student Understandings

Students will investigate various rocks, minerals, and soils to reveal the differences among these materials. Investigations will be based on either the composition or the formation of the materials. Students will acquire an understanding of the physical and chemical processes that cause the formation and breakdown of rocks, minerals, and soils as revealed through studies of fossils and rock samples. Students will also make model rocks which will be used to study the formation and breakdown of rocks. Students will also investigate the formation of sedimentary, igneous, and metamorphic rocks to further develop their understanding of the formation and breakdown of rocks and the rock cycle.

Guiding Questions

1. Can students describe the composition of rocks?
2. Can students explain how Earth's processes have affected their neighborhood?
3. Can students identify igneous, sedimentary, and metamorphic rocks?
4. Can students identify the components of soil?
5. Can students identify the characteristics of fossils?
6. Can students explain how fossil records are used to learn about the past?

Unit 4 Grade-Level Expectations (GLEs)

GLE #	GLE Text and Benchmarks
Science as Inquiry	
1.	Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1)
4.	Predict and anticipate possible outcomes (SI-E-A2)

GLE #	GLE Text and Benchmarks
5.	Use a variety of methods and materials and multiple trials to investigate ideas (observe, measure, accurately record data) (SI-E-A2)
6.	Use the five senses to describe observations (SI-E-A3)
8.	Select and use developmentally appropriate equipment and tools (e.g., magnifying lenses, microscopes, graduated cylinders) and units of measurement to observe and collect data (SI-E-A4)
9.	Express data in a variety of ways by constructing illustrations, graphs, charts, tables, concept maps, and oral and written explanations as appropriate (SI-E-A5) (SI-E-B4)
10.	Combine information, data, and knowledge from one or more of the science content areas to reach a conclusion or make a prediction (SI-E-A5)
11.	Use a variety of appropriate formats to describe procedures and to express ideas about demonstrations or experiments (e.g., drawings, journals, reports, presentations, exhibitions, portfolios) (SI-E-A6)
12.	Identify and use appropriate safety procedures and equipment when conducting investigations (e.g., gloves, goggles, hair ties) (SI-E-A7)
15.	Recognize that a variety of tools can be used to examine objects at different degrees of magnification (e.g., hand lens, microscope) (SI-E-B3)
Earth and Space Science	
45.	Recognize and describe that rock is composed of different combinations of minerals (ESS-E-A1) (ESS-E-A5)
46.	Describe earth processes that have affected selected physical features in students' neighborhoods (e.g., rusting, weathering, erosion) (ESS-E-A1)
50.	Compare and group common rocks according to their characteristics (i.e., igneous, metamorphic, sedimentary) (ESS-E-A5)
51.	Identify and compare the components found in soil (ESS-E-A6) (ESS-E-A1)
52.	Identify characteristics of selected fossils and explain how fossil records are used to learn about the past (ESS-E-A7)

Teacher notes regarding timing and materials:

- Activity 1 requires the teacher to make model rocks that will take a week to set before they can be used by students. If possible, it is recommended that they be made as a demonstration in class so that students can observe the process. Alum, one of the ingredients for making the rocks can be purchased in most grocery stores near the spices.

- Activity 2 also requires a variety of "real" rocks for students to examine. If the school does not have a set of rocks for this purpose, check to see if a set could be borrowed from another teacher or school. The teacher may also collect examples from different locations such as along railroad tracks, construction sites, stream beds, etc.
- Activity 4 requires that one student group place steel wool in oil and water and leave undisturbed for three to four days before it is used in the activity. Adjust time for other student groups accordingly.

Sample Activities

Activity 1: Rocks and Model Rocks (GLEs: 1, 5, 6, 9, 15, 45)

Materials List: two teaspoons alum **(**in most grocery stores near the spices); one cup flour; one-half cup salt; a few drops of red, blue, and yellow food coloring; one-half cup water; cup sand; one-fourth cup each of two different-colored types of gravel (aquarium gravel can be used); mixing bowl; one-eighth cup shell pieces; paper plates; clear vials or jars for model rocks; nails; science learning logs

Teacher Note: Brick, pottery and cement are man-made objects and do not fit the definition of a rock.

Part A: A few days prior to starting this activity, instruct students to bring in rocks from home. The teacher should supply some, as well. Mix the rocks up and then provide each group with several rocks along with additional non-rock items (e.g., paper clip, screw, brick pieces, cement pieces, pottery pieces, etc.). Students should then make a grouping of rocks and non-rocks.

Ask students to think about the following questions but do not provide answers at this time:

- What reasons did you use to separate the rocks from non-rocks?
- How are rocks different from the non-rocks?

Each student in the group should then pick a rock from their rock pile. Using a hand lens or microscope, students should examine the details of their rock and make observations and drawings of their rock in their science *learning log* (view literacy strategy descriptions). Students should also look for signs of weathering or erosion features on their rock. Have students identify questions that need to be explained and record these to address throughout the unit.

Put all the rocks from the entire class back into one large pile and mix them up. Students should then be directed to identify their own rock from the group of rocks, using the characteristics and details which were written in their science *learning log.* Revisit the two questions posed to students above and discuss their answers.

Part B: Model rocks can be made as a class demonstration or at another time by the teacher; however, they need to be made a week in advance to allow sufficient time to harden. (Model rocks are used to enable students to easily separate the materials as they learn about rocks). Model rocks can be made with two teaspoons alum; one cup flour; one-half cup salt, a few drops of red, blue, and yellow food coloring; one-half cup water along with one cup sand; one-fourth cup each of two different-colored types of gravel (aquarium gravel can be used); and one-eighth cup shell pieces. Mix all ingredients together. Shape into six rocks—one rock per group of four students. Let dry at room temperature for four or five days or until hardened.

Explain to students that some of these ingredients are being used to represent minerals and that minerals make-up rock. Minerals such as gold, silver, and diamonds are used in jewelry making, for example. Minerals are not just found in rocks, however. They are also found in many plants and animals and are necessary for good health. Students should also be provided with a definition of *minerals*; for example, a mineral is an object that is a solid, was formed in nature, and has never been alive.

Using a T-Chart like the one below, assist students in *brainstorming* (view literacy strategy descriptions) ways in which we use both minerals and rocks.

Minerals	*Rocks*
computer chips	building materials
nutrients	soap
jewelry & make-up	jewelry
manufacturing	roads and highways

Have students use their science *learning log* for recording observations, drawings, notes, etc. Ask students about questions they may have about exploring rocks. Students should also be questioned about experiences they have had with rock collecting themselves either around their homes or on a vacation, then precede with an exploration of the model rocks.

1. Working in groups of four, students should examine the model rocks with hand lenses and record observations in a science *learning log.* Students will use a nail to pick the model rocks apart to examine it further.

2. Make a list of the identifiable materials found in the rock. All the model rock pieces should be mixed with water and placed in clear vials (or jars) and left aside in order for the water to have time to evaporate. During the evaporation process the students should make observations and drawings of the layering of the rock materials occurring in the water.

3. Using a few of the real rocks, allow students to observe that they are composed of different minerals and that not all rocks are made the same. Point out again that rocks are not man-made. Have students discuss why they think that rocks are not all made of the same exact materials.

4. Discuss with students how model rocks can be useful in their study of rocks and if they think that this is a good model.

Activity 2: Types of Rock (GLEs: 5, 8, 9, 50)

Materials List: classroom set of rocks, hand lens, resource books with various rocks, Types of Rocks BLM, Vocabulary Self-Awareness Chart BLM

Before beginning this activity, direct students to complete the *Vocabulary Self-Awareness* (view literacy strategy descriptions) BLM chart as these terms are discussed throughout this activity and Activity 6 (about fossils). Do not give students definitions or examples at this stage. Students are to rate their understanding of each word with either a "+" (understand well), a "√" (limited understanding or unsure), a "-" (don't know). Over the course of the readings and exposure to other information, students should return to their chart to add new information. The goal is to replace all check marks and minus signs with a plus sign.

Once the Vocabulary Self-Awareness Chart BLM is completed, students can transfer these vocabulary words to *vocabulary cards* (view literacy strategy descriptions). When students create *vocabulary cards,* they see connections between words, examples of the word, and the critical attributes associated with the word. *Vocabulary cards* require students to pay attention to words over time, thus improving their memory of the words. These cards can then be used as a study aid for quizzes, tests, and other activities with the words.

Use the website, http://www.fi.edu/fellows/payton/rocks/create/index.html, as the opening engagement for this activity. The site offers an excellent interactive visual of how igneous, sedimentary, and metamorphic rocks are formed.

Show the class a classroom set of rocks and have them predict what types of rocks are in this collection, referring them back to their experiences from Activity 1. The sample set should include *sedimentary rocks* such as limestone, sandstone, conglomerate, and shale; *igneous rocks* such as basalt, obsidian, granite, and pumice; and *metamorphic rocks* such as marble, gneiss, quartzite, and slate. The sets can be ordered from school supply catalogs or science catalogs. Rocks are clearly labeled in sets for teacher identification.

1. Using resource books such as the Golden Guide Books or a textbook that has information about rocks, list the general characteristics of each group of rocks on a classroom chart. Include the formation of the rocks and names of the rocks. Use the website http://volcano.und.edu/vwdocs/vwlessons/lessons/Slideshow/Slideindex.html to obtain images of various minerals and the type of rock where they are found.

Below is an example of a chart. (See Types of Rock BLM for student copy). Use at least one rock from each group to model how to complete this *graphic organizer* (view literacy strategy descriptions).

Sedimentary Rocks Formed from pieces of material that has settled into layers.		**Igneous Rocks** Formed from rock that was once melted but has cooled and hardened.		**Metamorphic Rocks** Formed when sedimentary, igneous, or other metamorphic rock has been changed by heat and pressure.	
Examples	**Pictures**	**Examples**	**Pictures**	**Examples**	**Pictures**
These examples should come from the class set of rocks	These could be printed from the website or drawn by students				

2. After class discussion on the formation and types of rocks, give groups of students several rocks from the collection and have students sort the rocks into the proper classifications. Make sure that each group has at least two rocks from each group. Students should be allowed to use a hand lens and the classroom chart as a guide.

3. The students will use the Types of Rocks BLM to record data about their rocks.

Teacher Note: Students should note that rocks are composed of different combinations of minerals, and they should be looking for the "pieces and parts" as they examine the various specimens. This leads to a better understanding of what happens when the rocks break up into smaller pieces during weathering**.**

In closing this activity, use the website http://www.fi.edu/fellows/payton/rocks/create/index.html as a follow-up discussion in which the students clearly describe the differences among these types of rocks.

Activity 3: Rock Detectives (GLEs: 1, 6, 9, 12, 15, 45)

Materials List: per group - *Let's Go Rock Collecting* by Roma Gans or a similar book; Internet; hand lens; Rock Detective BLM; small paper bags; classroom set of igneous, sedimentary, and metamorphic rocks; science learning logs; rocks collected from Activity 1

Teacher Note: This activity may take two 45 minute instructional periods.

Safety Note: Review safety precautions that should be taken when picking up rocks. For example, make sure that students wash hands after collecting rocks and are listening closely to teacher directions while looking for samples.

Read *Let's Go Rock Collecting* by Roma Gans or a similar book before taking students rock collecting. After reading the book, students will complete an *anticipation guide (*view literacy strategy descriptions) using the Rock Detective BLM before going outside. Students will then become "Rock Detectives" while looking for rocks in their school yard and parking lot. (If rocks are not available around the school yard, the classroom set that was used in Activity 1 could be used instead). Take students on a walking tour of the school yard and parking lot so that they can search for different types of rocks. Provide students with a hand lens and a small paper bag to use when collecting various kinds of rocks. Upon returning to the classroom, have students use their Rock Detective BLM and the rocks that they found to check their anticipation guide.

1. Show the class some examples of igneous, sedimentary, and metamorphic rocks. Let students examine these with the hand lens and/or some other type of magnifier to observe if they appear to be made of different materials. If rock samples are not available, the following website has images of these rocks: http://geology.about.com/library/bl/images/blrockindex.htm

2. Using reference books or textbooks, students should continue their study of rocks which should be followed with a discussion about the different minerals that make up rocks. Using the rocks students have found or the class set, a class chart should be made listing the type of rock and examples of minerals that make up that rock. The website http://volcano.und.edu/vwdocs/vwlessons/lessons/Slideshow/Slideindex.html can be used to obtain images of various rocks and the minerals they contain.

   Teacher Note: Be sure that students stay focused on the common rocks and do not get side tracked on some of the more exotic rock samples. The website http://saltthesandbox.org/rocks/find.htm is an excellent resource which gives information about common rocks found in yards and gardens, streets and parking lots, railroad tracks, and beaches.

3. Students should compare the real rock samples to the model rocks from Activity 1, using a Venn diagram *graphic organizer* (view literacy strategy descriptions) in their science *learning log* (view literacy strategy descriptions).

Teacher Note: It is critical that students realize that any rocks that they find probably do not come from Louisiana, but have been transported here by river action or human activity. It is also very important for students to understand that ALL rocks are made from minerals and that some rocks may be composed of only one or two minerals.

Activity 4: What's Happening? (GLEs: 4, 5, 10, 11, 46)

Materials List: digital camera (optional); sedimentary rocks or small pieces of brick; rocks that have been weathered; film canister; watering can; safety goggles; smooth, rounded rocks; small amount of sand; a few twigs; a small pile of leaves; shallow baking

pan; 4 or 5 small pieces of steel wool; 3 poster boards of any color; science learning logs; clear plastic container

In this investigation, students will work in groups to understand the effects of rusting, weathering, and erosion. They will then report their findings to the class.

To begin this activity, teacher should write the words *rusting, erosion*, and *weathering* on the board and ask students what they know about these terms and how they might affect rocks. After students respond, explain to them that they will be working in three expert groups to conduct an investigation in order to learn how rusting, erosion, and weathering affect rocks, and that following their investigation, they will become *professor know-it-alls* (view literacy strategy descriptions) and present what they have learned to the class. The groups should first present a poster to the class that illustrates what they have learned about rusting, weathering, and erosion. Then the teacher should invite questions from the class. Before the group responds to a question, the team should huddle as a team to talk about the answer and then return to their position to give answers in complete sentences.

At the conclusion, let each group rotate through the various stations so that they can see the results of each activity first hand after each group has presented a report from their station. All students should be given the opportunity to visit all 3 stations. Students should then examine their data collected from each activity and use it to reach a conclusion as to how each of the three processes (rusting, erosion, weathering) affect rocks.

Rusting
Teacher Note: Students who are assigned this task will need to set their experiment up 3-4 days before the day that the other student groups conduct their investigation.

- Student groups should put oil on one piece of steel wool and water on a second piece of steel wool. Let both pieces sit undisturbed in a clear container for three to four days.

- Students should write their prediction of the outcome and then observe the setup each day and record their results in their *science learning logs* (view literacy strategy descriptions). If available, use a digital camera to take pictures of the steel wool on a daily basis. Have students use information and data collected to make conclusive statements about rusting.

- Students will also use data collected to create a poster about their experiment on rusting that will be used in their presentation to the class.

Weathering

- Student groups will put small sedimentary rocks or small pieces of brick into a film canister and shake vigorously. Students should use eye protective goggles. If using small pieces of brick, be sure that students understand that brick is not a true rock but is made from rock material.

- Students should open the canister and observe the broken particles as evidence of weathering. If a camera is available, students should take pictures of the results which could be used in their class presentation. Show students rocks that have been weathered by water in a stream bed, if available. (These should easily be identified and obtained from a gravel driveway/road or construction site.)

- Students should compare the smooth, rounded rocks weathered by water to the jagged ones from the canister that were shaken. Ask students if they know of changes to objects that were caused by weathering? Students should list examples of weathering in science *learning logs* and describe specific examples of how weathering has affected their neighborhood, the school, etc.

- Students will also use data collected to create a poster about their experiment on weathering that will be used in their presentation to the class.

Erosion

- Student groups will use a shallow baking pan, a book, sand, water, and a watering can to build a mound to illustrate erosion.

- On one side of the pan, students will build a tall mound using damp sand. Using the book or some other flat surface raise one end of the pan to tilt the pan.

- With the watering can students should pour water over the sand slowly straight down over the mound to simulate rain. The sand should begin eroding down into the end of the pan. Talk about erosion caused by water.

- Students should then add some leaves or twigs to the mound and add more water. Ask the following: Did this change the process of erosion? How did it change the process of erosion? What would happen if the flow of water was heavy?

- Students will also use data collected to create a poster about their experiment on erosion that will be used in their presentation to the class.

After students have had the opportunity to visit all stations, have them examine their data collected from each activity to reach a conclusion as to how each of the three processes (rusting, erosion, weathering) affect rocks. Using their conclusions, ask students if they can predict where on the school ground, their home, or in town they might find examples of these processes. Answers will vary.

Ask students why erosion would be harmful to the Louisiana coastline. Explain to students that the erosion of Louisiana's wetlands puts us at greater risk of hurricane damage because wetlands give us some protection from hurricanes.

In closing, look back over questions generated in Activity 1, Part A by students and see if all questions they had about rocks have been answered.

Activity 5: Soil Composition (GLEs: 1, 9, 11, 12, 51)

Materials List: hand lens, sand, humus, clay soil, popsicle stick or tiny brushes to move soil around, paper plates, safety goggles, soil samples brought in by students, school yard soil sample, disposable gloves, Comparing Soils BLM

Safety Note: Have students generate a list of safety precautions to use while observing and investigating the composition of soil. Students should at least wear eye protective goggles and gloves. When collecting soil from home, students should collect the sample in plastic, sealable storage bags. Students should be cautioned to gather soil only, being careful not to include such things as ants or other visible organisms.

Before beginning the following activity, students should generate questions they have about soil based on an *SQPL* prompt (view literacy strategy descriptions). State the following: *There is more to soil than meets the eye.* Write it on the board or on a piece of chart paper as it is being said. Next, ask students to turn to a partner and think of one good question they have about soil. As students respond, write their questions on the board or chart paper. A question that is asked more than once should be marked with a smiley face to signify that it is an important question. When students finish asking questions, contribute your own questions to the list. As students are conducting the following investigation, have them record any answer that they may find on the board or chart paper next to the appropriate question, and at the end of the activity, review these questions and answers.

- Working in small groups, students will examine sand, humus (decayed plant and animal matter), and clay soil. They will use hand lenses and draw what each sample looks like using the Comparing Soils BLM as they observe the materials. Using the same Comparing Soils BLM, students should compare a soil sample from the schoolyard to the potting soil.

- Students should conclude that soil is basically made up of minerals, organic matter (living and decaying matter), air, and water.

Activity 6: Fossils (GLEs: 5, 8, 9, 12, 52)

Materials List: plaster of Paris; small trays or cups for every student; science learning logs; measuring cup; large mixing bowl; sticks, leaves, or shells; examples of fossils (if available)

Teacher Note: This activity may take two 45 minute instructional periods.

Safety Note: Students should be reminded not to eat anything that is used in conducting a science experiment, unless directed to do so by the teacher.

As most students are intrigued by dinosaurs introduce this lesson by asking students how they think scientists know so much about dinosaurs since they are extinct. Point out that there were no humans on Earth when the dinosaurs were alive. If this discussion does not lead to the word *fossil,* probe students until it is discussed.

Explain to students that fossils are remains or evidence of plants and animals of long ago and these fossil records are used to learn about the past. Also explain to students that the term *paleontology* refers to the study of ancient life on Earth and a paleontologist is a scientist who studies fossils and the history of life on Earth. Many fossils are formed when mud or sand covers a dead animal or plant and it remains covered for a long time under heat and pressure from Earth. Discuss how fossils are usually found in sedimentary rock, as most remains are destroyed by the heat and pressure that form metamorphic rocks and the melting that occurs with the formation of igneous rocks.

Explain to students that they are going to use plaster of Paris to make a model of a fossil to show how fossils might have formed. If available, the teacher should show students examples of real fossils (petrified wood, rocks with imprints, fossilized shells, etc.). Students who also have fossils at home could bring these in to share with the class for this activity.

1. Working in groups, students will make plaster of Paris fossil models using objects such as sticks, leaves, or shells to simulate how real fossils were formed long ago.

2. Give each group member—or take them on a nature walk and allow them to gather a supply of small objects—such as shells, leaves, twigs, and feathers.

3. Provide each student with a small tray or a cup that will be used to make a fossil. Pour a small layer of sand into the bottom of the cup or the tray. Students should then place their small object on top of the sand. Explain to students that this layer of sand will represent the ground that the object came to rest on. (It becomes sedimentary rock which is usually where fossils are found later).

4. Then mix two parts plaster of Paris to one part water and pour on top of their object to make a fossil. To have a sufficient amount you will probably need at least 3 cups of plaster and 1 1/2 cups of water. You will want to mix it in small amounts since it thickens quickly. Allow the plaster of Paris to dry for 24 hours. The students can then flip the cup or tray over and wash off the sand to reveal their fossils. Again remind students that fossil records are used to learn about our past. Note: The pouring of the plaster of Paris simulates how objects are buried by sediments and how sedimentary rocks form in layers. This burial protects the object from animal predators, covers them from the forces that would weather the area and the object.

5. To assess this activity, the teacher could prepare ahead of time one fossil for each group and allow each group to break the fossil and examine it to help them identify the object that was used to create the fossil.

If available, Louisiana Public Broadcasting's Cyberchannel (www.lpb.org/cyberchannel) has an excellent video titled *TLC Elementary School: Prehistoric Earth.* This video has three segments titled *Dinosaurs and Fossils, Excavation and Study, and Clues from the Past* that really enforce concepts learned in this activity. If this technology is not available, the following books can also be used to enforce concepts taught in this lesson:
Fossils Tell of Long Ago – Let's-Read-and-Find Out Science 2
Digging Up Dinosaurs - Let's-Read-and-Find Out Science 2

After reading one of the books to the class, begin a class discussion about fossils.

6. Using chart paper or the chalkboard, help students *brainstorm* (view literacy strategy descriptions) what they learned about fossils and how they help us learn about the past. Students could use the following website to view images of various fossils and learn more about how fossils help us to lean about the past: http://www.fossilmuseum.net/Education.htm

7. Students will then write a paragraph explaining why fossils are important to us and how they help us to learn about the past. Students are to research the state fossil of Louisiana and find out where it can be collected. The following websites http://www.netstate.com/states/symb/la_symb.htm and http://www.intersurf.com/~chalcedony/Palm.html can be used to locate information about the state fossil of Louisiana which is petrified palmwood.

Sample Assessments

General Guidelines

Assessment techniques should include drawings/illustrations/models, laboratory investigations with reports, laboratory practicals (problem-solving and performance-based assessments), group discussion and journaling (reflective assessment), and paper-and-pencil tests (traditional summative assessments).

- Students should be monitored throughout the work on all activities via teacher observation of their work and lab notebook entries.
- All student-developed products should be evaluated as the unit continues.
- Student investigations should be evaluated with a rubric.
- For some multiple-choice items on written tests, ask students to write a justification for their chosen response.

General Assessments

- The student will give orally or write an explanation of the different materials that compose rocks.
- The student will test rocks with vinegar to find calcite.
- The student will sort and classify igneous, sedimentary, and metamorphic rocks.
- The student will complete drawings of rocks, listing characteristics of rocks.
- The student will provide an explanation of the process of rusting and how it causes physical changes.
- The student will explain how weathering wears down rocks and makes them smooth.
- The student will explain how particles in soil are different sizes and why the composition of soil can be different in different areas.
- The student will explain how fossils are used to find out about the past.
- The student will keep a journal record of all entries in an Earth Science Notebook.

Activity-Specific Assessments

- Activity 2: Have students group a selection of rocks according to their characteristics as igneous, metamorphic, and sedimentary and write descriptions of each of these types of rocks.

- Activity 4: Build a mound of soil outside on the school ground making sure it is out of a normally tracked area. On one side of the mound, place leaves, twigs, plant parts, etc. On the other side leave the soil exposed. Have students predict what will happen to the mound over time after rain, wind, and other weather exposure. After several days, have students compare what is happening to this mound compared to the mound that was made in the classroom using a Venn diagram *graphic organizer* (view literacy strategy descriptions).

- Activity 6: After making model fossils and studying about why fossils have helped paleontologist learn about the history of life on Earth, students will write a paragraph explaining why fossils are important to us and how they help us to learn about the past. The paragraph should include details that mention that fossils are remains or evidence of plants and animals of long ago and that these fossil records are used to learn about the past. The paragraph should also include details about how fossils are formed when mud or sand covers a dead animal or plant and how it remains covered for a long time, under heat and pressure from Earth. A teacher-made rubric should be used to assess the paragraph.

Grade 3
Science
Unit 5: Plant and Animal Systems

Time Frame: Approximately 15 instructional periods of 45 minutes per period

Unit Description

In this unit, several human body structures will be examined, as well as the skeletal and digestive systems. Relationships and growth will be analyzed with respect to proper diet using the food pyramid. The relationships of plants and animals to each other and to their environment will also be explored.

Student Understandings

Students will gain an understanding of the underlying concepts of structure and function of living organisms. Students will compare and contrast plant and animal structures, describing those necessary to sustain life. Through the study and exploration of the digestive and skeletal systems, students will describe the basic components and functions of these systems.

Guiding Questions

1. Can students describe what the human body needs to grow and be healthy?
2. Can students give examples of how the structures of plants and animals enable each to meet their basic needs?
3. Can students cite common characteristics that are used to classify groups of organisms?
4. Can students describe the components and function of the digestive system and the skeletal system?
5. Can students describe what is meant by a balanced daily diet and determine if he or she (as well as his or her classmates) is meeting the requirements?

Unit 5 Grade-Level Expectations (GLEs)

GLE #	GLE Text and Benchmarks
Science as Inquiry	
1.	Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1)

GLE #	GLE Text and Benchmarks
2.	Pose questions that can be answered by using students' own observations, scientific knowledge, and testable scientific investigations (SI-E-A1)
3.	Use observations to design and conduct simple investigations or experiments to answer testable questions (SI-E-A2)
5.	Use a variety of methods and materials and multiple trials to investigate ideas (observe, measure, accurately record data) (SI-E-A2)
8.	Select and use developmentally appropriate equipment and tools (e.g., magnifying lenses, microscopes, graduated cylinders,) and units of measurement to observe and collect data (SI-E-A4)
9.	Express data in a variety of ways by constructing illustrations, graphs, charts, tables, concept maps, and oral and written explanations as appropriate (SI-E-A5) (SI-E-B4)
10.	Combine information, data, and knowledge from one or more of the science content areas to reach a conclusion or make a prediction (SI-E-A5)
11.	Use a variety of appropriate formats to describe procedures and to express ideas about demonstrations or experiments (e.g., drawings, journals, reports, presentations, exhibitions, portfolios) (SI-E-A6)
12.	Identify and use appropriate safety procedures and equipment when conducting investigations (e.g., gloves, goggles, hair ties) (SI-E-A7)
14.	Distinguish between what is known and what is unknown in scientific investigations (SI-E-B3)
Life Science	
34.	Describe what the human body needs to grow and be healthy (LS-E-A1)
35.	Compare structures (parts of the body) in a variety of animals (e.g., fish, mammals, reptiles, amphibians, birds, insects) (LS-E-A3)
36.	Compare structures (e.g., roots, leaves, stems, flowers, seeds) and their functions in a variety of plants (LS-E-A3)
37.	Describe how plant structures enable the plant to meet its basic needs (LS-E-A3)
38.	Classify groups of organisms based on common characteristics (LS-E-A4)
39.	Compare organisms from different groups (e.g., birds with mammals, terrestrial plants with aquatic plants) (LS-E-A4)
40.	Explain how the organs of the digestive system function (LS-E-A5)
41.	Describe how the components of the skeletal system function (LS-E-A5)
42.	Describe the relationship between eating habits and maintaining a healthy body (LS-E-A6)
43.	Identify a meal that includes representatives from each group of the food pyramid (LS-E-A6)
44.	Graph, analyze, and interpret personal and class data (LS-E-B4)

Sample Activities

Activity 1: Healthy Body (GLEs: 9, 11, 34, 42, 44)

Materials List: healthy snacks or pictures of healthy snacks (from various food groups), Anticipation Guide BLM, Anticipation Guide Answer Key BLM, Sleep Chart BLM

Before beginning this activity, students will complete an *anticipation guide* (view literacy strategy descriptions). This strategy is highly beneficial in promoting deep and meaningful understandings of content area topics by activating and building relevant prior knowledge and building interest in and motivation to learn more about particular topics. As students complete the following activity, they should focus on the statements in the *anticipation guide*. After completing the activity, students should share their responses and what in the activity supported or did not support their answers. Provide students with the Anticipation Guide BLM and have them read the statements before beginning the following activity.

1. Begin this activity by having students *brainstorm* (view literacy strategy descriptions) a list of basic needs that humans need to maintain a healthy body. Record student responses on the board or medium of your choice. Use the following list as a guide to explain to students that these things are needed by humans to maintain a healthy body.
   Basic needs of a healthy body: food, water, shelter, sleep, exercise, and air

Allow students to ask questions that they would like to answer in their exploration of the human body. Have students make observations and inferences about eating habits and how this relates to having a healthy body. Use books and other references to read and locate information on the human body and its needs such as food, water, sleep, shelter, exercise, and oxygen.

Provide students with the Sleep Chart BLM and have them record the amount of sleep they get every night for the next week. Once the chart is completed, have students create a personal bar graph using the data from their Sleep Chart BLM in their science *learning log* (view literacy strategy descriptions). The teacher should then assist the students in creating a class graph of the amount of sleep the class got using data—the personal bar graphs that were created by the students. Students should then analyze their personal bar graph and the class bar graph using the questions from the Sleep Chart BLM.

Discussion and science *learning log* entries questions may include the following:

- How can humans keep their bodies healthy? Discuss correct amounts of sleep, exercise, water, etc. Students could also create an exercise chart similar to their sleep chart in their science *learning* logs and record the amount of time they exercise for a week. Note: Students should realize that they can be getting their exercise in by being active as opposed to sitting at a computer or in front of the television set.

- Discuss an action plan for each student to formulate to meet his or her own personal need(s) for improving his or her own health.

Remind students that scientists have always kept logs of their observations, thoughts, new understandings, hypotheses, and reflections. Tell students that in their science *learning log,* they could record progress, test new ideas, and document what they learn. Documenting ideas in a log about content being studied forces students to "put into words" what they know or do not know.

Activity 2: Eating Healthy (GLEs: 1, 9, 10, 34, 42, 43, 44)

Materials List: food guide pyramids (www.MyPyramid.gov), a variety of boxed and canned foods brought in by teacher or students, timer, Food Label Scavenger Hunt Chart BLM, Food Journal BLM

Teacher Note: This activity may take two 45 minute class periods.

Show students the various boxed and canned foods that were brought to school. Tell students that they will be using these to go on a food label scavenger hunt. Show students a nutrition label and ask if anyone is familiar with or has ever read a nutrition label. Explain that virtually each box or can of food contains a nutrition label that lists the number of calories per serving, the types and amounts of certain vitamins and minerals, the percentage of recommended daily amount of vitamins and minerals, and the ingredients in the food. Note: Some foods are exempt from the labeling requirement.

Display the unopened food items around the classroom. The students will need some practice in reading labels before starting the Scavenger Hunt. This can be done by copying a few of the labels on a sheet of paper and allowing students to read labels while the teacher is modeling. If available, a digital camera with a LCD projector can be used to project and enlarge a food label from a package of food. The LPB Cyberchannel (www.lpb.org/cyberchannel) also has a video titled *Nutrition Labels: Our Guides to Healthy Eating* that thoroughly explains how to read a food label. The following websites http://www.cfsan.fda.gov/~acrobat/foodlab.pdf; http://www.cfsan.fda.gov/~dms/foodlab.html also offer information on reading nutritional food labels.

1. Divide the class into pairs. Give each pair of students a Food Label Scavenger Hunt Chart BLM. Tell students they will read the labels on the different food items to try to find a food item that matches one of the descriptions on their chart.

2. Once a match is found, students are to record the name of the food next to the description. For example**,** if a can of mixed vegetables has 0 grams of fat, students would record mixed vegetables next to *Find a food with 0 grams of total fat.*

3. You may want to set a timer so that students do not stay too long at one food item. When the time is up, have pairs of students share their findings. See if any pairs were able to successfully find a matching food item for every description.

4. Distribute copies of the food pyramid and review this tool with them; then with assistance from the students, create a class menu together for the next three days. Students should then design a one-day menu in their science *learning log* (view literacy strategy descriptions) of three meals and 2 snacks that includes foods represented from each group of the food guide pyramid.

5. In their *science learning log,* students should make a chart using the food groups from the food guide pyramid as headings and then answer the following questions:
   - What did you eat yesterday?
   - Approximately how many servings from each food group did you have?
   - Did you think that you ate healthy yesterday? Why or why not?

6. Have students pose questions about daily dietary needs that include the correct foods and amount from each food group needed. Instruct students to keep a daily record, such as a food journal using the Food Journal BLM, for four or five days, listing all the foods they have eaten in each 24-hour period.

7. Discussion questions may include the following:
   - Can you identify each food group on the pyramid and how many servings are needed in a day, and explain why each group is important to maintain a healthy body?
   - Can you explain how a food could belong to more than one group?

Teacher Note: Lead a discussion by asking students if they know of anyone who has to follow a special diet because of a medical condition, like diabetes, food allergies, etc. The teacher may also discuss other diets that people follow such as a vegetarian diet. Be sensitive to religious or ethnic food choices that some students may identify.

Activity 3: Life Size Digestive Systems (GLEs: 9, 11, 35, 40)

Materials List: per group - reference materials about the digestive system (check the handbook section in your science textbook), four to five foot piece of bulletin board paper, a piece of thick yarn five feet long to represent the large intestine, one thinner piece of yarn 22 feet long to represent the small intestine, small-clear plastic bags, small pieces of candy, tape; science learning logs; Steps to Digestion BLM; Steps to Digestion Answer Key, BLM; Human Digestive System BLM

Teacher Note: This activity may take two 45 minute class periods.

Students will be given a copy of the Human Digestive System BLM. Using books, textbooks, and reference materials, students will label the parts of the digestive system and will trace the path that food takes as it undergoes changes in the digestion process. After completion, students will then create a life-size model of the digestive system.

1. In groups of 4, students will trace the outline of a group member's body onto bulletin board paper. Students will then use the Human Digestive System BLM to sketch and outline the digestive system including the mouth, esophagus, liver, stomach, small intestine, and large intestine.

2. Students should glue 22 feet of thinner yarn to represent the small intestines and 5 feet of thicker yarn to represent the large intestines.

3. Fill a small, clear, plastic bag with air to create the stomach, and a small balloon for the liver. Students could also place crushed or small pieces of candy in the bag to represent food in the stomach. Do not place whole pieces of candy because once the food is in the stomach it should be in small pieces. Tape these in the proper place on the diagram.

4. Students will then cut apart the Steps to Digestion BLM to correctly sequence the steps to digestion. Students can then glue these steps onto their outline of the digestive system and/or into their science *learning logs* (view literacy strategy descriptions).

Class discussion questions include the following:

- Why is it important to chew food before it is swallowed?
- Can very young babies eat the same kinds of food that you do? Explain.
- What changes occur to the food when it is in the stomach?
- Describe what happens to food in the small intestine.
- What role does the large intestine play in the digestive system?
- Do other animals have digestive systems?
- Compare the digestive system of humans to those of other animals**.** (e.g., crop in a chicken, cow stomachs, etc.).

Activity 4: Skeletal System (GLEs: 9, 11, 41)

Materials List: bean bag animal, chicken leg bone, jar with lid, vinegar, Skeletal System Outline BLM, Skeletal System Outline Answer Key BLM, My Skeleton BLM, My Skeleton Answer Key BLM, Ball and Socket and Hinge Diagram BLM

Safety Note: Do not allow the students to eat the hard candies because of possible contamination from handling.

Using a bean bag animal, let several students try to make it stand alone. If someone tries to prop up the animal to make it stand, explain that by propping it up, the animal is not standing on its own. Ask students why they think the animal cannot stand on its own. Ask students to explain how they are able to stand up. Explain to students that we have bones that help hold the body up.

1. Students will examine a model of a human skeleton (if available); if not, posters and other visuals of the skeletal system may be used to observe how the bones are ordered and connected.

2. Students will read books, textbooks, and other reference materials to find information on the skeletal system and its function. Listed below are several trade books that could be used with this lesson:
   - *Amazing Pull-Out Pop-Up Body in a Book* by David Hawcock
     Using this hands-on book, children can explore the lungs, heart, skeleton, and brain.

   - *The Children's Book of the Body* by *Anna Sandman*
     Breathing, eating, senses, bones, the brain, blood, and skin are presented through entertaining projects.

   - *What's Inside? My Body* by Angela Royston
     The outside and inside of various body parts are depicted in facing pages through illustrations, photographs, and simple annotations.

3. Using the My Skeleton BLM, have students label the parts of the skeletal system. As students are labeling, discuss with them the function of the skeletal system parts.

4. Provide students with a copy of the Skeletal System Outline BLM to describe the five functions of the skeletal system.

   Teacher Note:
   There is also an answer key to the Skeletal System Outline BLM to be used in assisting students with the correct functions of the skeletal system on their outline. These answers should be written on the board or any medium of your choice for students to use when completing their outline.

   Have students move their arms and legs and explain to students that individual bones cannot bend and that it is at the joints in their body where it is able to bend, turn, and twist. The teacher may use the Ball and Socket and Hinge Diagram BLM to create an overhead transparency or reproduce to give to students to help them understand the function of these two types of joints.

5. Discussion and science *learning log* (view literacy descriptions) questions include the following:

- How do the bones in our body help us?
- Do different bones help different parts of our body? How?
- Why is it important that our spine be flexible and bendable?

This part of the activity should be done as a demonstration to illustrate the concept that minerals (calcium) are needed for strong bones.

1. Show students a clean chicken bone and gently exert pressure to show that it will not bend.
2. Ask students to predict what will happen to the chicken bone after it is soaked in vinegar for several days. Put the bone in a jar, cover it with vinegar, and put the lid on the jar.
3. Leave the bone in the jar for 5-7 days.
4. At the end of the time wash the bone and dry it.
5. Try to bend the bone.
6. Ask students "Why do you think that the bone can now bend?"
7. Explain that the vinegar dissolved the minerals in the bone. The minerals are what keep the bones hard. In our bodies, the mineral calcium that comes from the foods we eat and drink helps to strengthen our bones, along with vitamin D.

Discussion and science *learning log* (view literacy descriptions) questions include the following:

- Why do you think it is important for us to eat foods that contain calcium and vitamin D?
- What are some good food sources for calcium and vitamin D?

Activity 5: Animal Structures (GLEs: 9, 11, 35, 38, 39)

Materials List: magazines with animal pictures that will be used for cutting, scissors, stapler, 1 piece of construction paper per a student, Internet access, Animal Characteristics BLM

Teacher Note: This activity may take two 45 minute class periods.

Students will need to assemble pictures from magazines, books, Internet sites and other sources of different types of animals, including insects. Direct students' attention to the various structures of these animals and explain to students that animals with a skeleton either have one outside the body (exoskeleton) or inside the body (endoskeleton). Ask students if they can think of an animal that has an outside skeleton (insects, crawfish, shrimp, turtle) and one that has an inside skeleton (humans, birds, other mammals). Both types provide protection.

1. Discuss other structures of the animals in the pictures (include beaks, claws, teeth, appendages, ears, etc.) that help them to survive in their habitat. Ask students to explain the function of the body structures.

2. Discuss common traits of mammals, birds, reptiles, insects, amphibians, and arthropods. Using the same pictures, instruct students to sort them into these categories: mammals, birds, reptiles, insects, amphibians, and arthropods; and then have students create a flip-book about these animals like the example below.

3. First give each student three pieces of plain paper. Next, have them place the sheets of paper on top of each other leaving a one-inch margin showing at the bottom of each page.

4. Direct the students to fold the sheets over to create a step booklet. The teacher should then staple the paper along the fold onto a piece of construction paper.

5. Have the students write the following words on the stacked pages and draw or glue an example of that animal. Then, read the characteristics of each animal and have them point in their flip book to which animal it belongs.
   - Mammals – have fur or hair, use lungs to breathe, give birth to live young, and feed its young with milk
   - Reptiles – covered with scales, lay eggs on land and breathe with lungs,
   - Amphibians – begin life in the water and move onto land as adults; lay eggs in water
   - Insects – a major group of arthropods and have segmented body parts (head, thorax, abdomen) supported by an exoskeleton
   - Arthropods – include insects, crustaceans; have segmented body parts with appendages on each segment; all arthropods are covered by a hard exoskeleton
   - Birds – have feathers, two legs, and wings

6. The students should then write the characteristics about each animal in their flip book using the Animal Characteristics BLM.

7. Using their flip-books, students should then compare various groups of organisms such as mammals and amphibians, insects and arthropods, etc. in their science *learning log* (view literacy strategy descriptions). Allow time for discussions of classifications and why the animals were placed in the chosen categories.

Example of science *learning log* entry:

Mammals and Amphibians	
Alike	**Different**

8. Again, have students identify and classify animals as those that have an outside skeleton (exoskeleton) and those that have an inside skeleton (endoskeleton).
   Examples:
   Outside skeleton- insects, spiders, crawfish, shrimp
   Inside skeleton – humans, monkeys, sharks

Listed below are several trade books that could be included in this lesson:

- *Amazing Pull-Out Pop-Up Body in a Book* by David Hawcock
  Using this hands-on book, children can explore the lungs, heart, skeleton, and brain.
- *The Children's Book of the Body* by Anna Sandman
  Breathing, eating, senses, bones, the brain, blood, and skin are presented through entertaining projects.
- *What's Inside? My Body* by Angela Royston
  The outside and inside of various body parts are depicted in facing pages through illustrations, photographs, and simple annotations.

Activity 6: Worm Bins (GLEs: 1, 2, 3, 8, 10, 12, 35)

Materials List: plastic 10-12-gallon size storage container, earthworms, strips of newspaper, cornmeal, water, hand lens, rulers, paper towels, soil, disposable gloves, torn strips of newspaper, Science Investigation Guidelines BLM, Science Investigation Rubric BLM (see Unit 1 Activity 7 for these BLM's), Worm Investigation Ideas BLM

Safety Note: Before observing the earthworms, discuss which safety rules students should follow in handling the worms, such as use disposable gloves, handle the earthworms gently, wash hands following the activity, etc.

Begin this activity by using the following *SQPL* (view literacy strategy descriptions) prompt: *Earthworms are useful to our environment.* Write it on the board or on a piece of chart paper as it is being said. Next, ask students to turn to a partner and think of one good question they have about worms being beneficial to our environment based on the above statement. As students respond, write their questions on the board or any other type of media of choice. However, a question that is asked more than once should be marked with a smiley face to signify that it is an important question. When students finish asking questions, contribute your own questions to the list. As students are doing the following activity, have them record any answer that they may find on the board or chart paper next to the appropriate question. Students will then help to make a worm bin habitat for the class.

1. Obtain a plastic 10- to 12-gallon size storage container and fill with torn strips of newspaper. Be sure not to use the colored advertisement inserts. Add ½ cup cornmeal and a handful of soil. Moisten and gently stir.

2. Place about 30 red worms or earthworms inside the container. (Red worms can be purchased from bait stores and generally reproduce faster and are easier to propagate than the earthworms found in home gardens, etc.)

3. Make several holes in the lid of the container to provide air. Add biodegradable materials that have been chopped such as banana peels, apple peelings, apple cores, etc., but do not add meat or dairy products**.** Place these materials under the newspaper so as not to attract fruit flies and gnats. You may need to add more material each week.

4. Carefully secure the lid and place in a warm place but not in direct Sun. Optimal temperature ranges from 55^0-75^0 F. Allow students to observe the worms and their habitat for several weeks.

5. In order to observe and collect data, place a worm on a moist paper towel for each student or student group. The students will use a hand lens and ruler to observe the worms and record their observations in both sketches and words using their science *learning logs* (view literacy strategy descriptions). Allow students to feel the tiny bristles (setae) by running their fingers up and down the length of the worm. This will have to be done without gloves, so be certain that the students thoroughly wash hands immediately after feeling the bristles and before writing in their science *learning logs*. At this point, the teacher should discuss some of the other body parts of the worm which include the *clitellum*, the light band near the head end that will drop off as a "cocoon" full of little worms and the many *segments* that make up the worm's body. The worm has 5 *hearts* which pump blood; they breathe through the skin so there are no lungs. They also do not have a skeleton but they do have strong *muscles* that help them move through the soil. Students should include the following in their sketches of the worm:
   labeled drawing of the anterior (head), posterior (anus), segments, clitellum, and bristles (setae).

6. Go to www.clinton-county.org/waste/documents/TheWonderOfWorms_000.pdf to obtain a lesson on the important role worms play in the composting of organic waste and their significance to plant health. It also has a diagram that will be helpful to students when labeling their worm.

Encourage students to generate questions about earthworms and their functions in the ecosystem. Have students plan an investigation of the earthworm using the Science Investigation Guidelines BLM. Potential topics to investigate might include what they eat, if they prefer light or dark, sensitivity to heat or cold, how they move, etc. This investigation could also be scored using the Science Investigation Rubric BLM.

If needed, see the Worm Investigations Ideas BLM for other suggestions of experiments using the earthworms.

Discussion and science *learning logs* (view literacy strategy descriptions) questions include the following:

- What are the functions of each body part of the earthworm?
- Does the earthworm have any of the same body parts as mammals?
- Why are earthworms important?
- How do earthworms affect the soil?

Activity 7: Plant Shoots and Roots (GLEs: 1, 9, 10, 11, 36, 37)

Materials List: clear plastic jar (with lid); cotton; pumpkin, radish, pea, or lima bean, seeds; water; science learning logs

Background Knowledge: Gravitropism is the growth of plants in response to gravity. A plant lying on its side will soon redirect its roots to grow downward, toward the center of Earth. It does this in response to the pull of gravity. Plant roots find "down" no matter how they are planted and plant stems find "up" no matter how they are planted, as well.

Introduce this lesson by asking students to predict what they think is going to happen to the roots of a seed if it is planted on its side.

1. Fill an empty clear plastic jar with cotton. Place seeds such as pumpkin, radish, pea, or lima bean between the cotton and the side of the jar. Be careful not to place the seeds too close to each other.

2. Wet the cotton and keep it damp for several days. Be sure the container is in a well-lit area once the shoots emerge. After several days the emerging shoots will be growing upward and the roots will be growing downward. Keep the cotton damp but not soaking wet.

3. Students should observe the seeds daily and record observations in their science *learning log* (view literacy strategy descriptions) daily. These recordings should include sketches as the roots and shoots grow, along with their explanation of what they observe.

4. After several days, cover the jar and then invert the jar and ask students to predict what they think may happen to the roots and stems, if anything. (The shoots and roots will turn so that again the emerging shoot containing the stem and leaves will grow up and the roots grow downward.) After several days, plant the shoots in soil to keep them growing.

5. Discussion questions may include:
   - What are the functions of the roots?
   - What is the importance of roots growing downward?
   - What are the functions of the stems and leaves?
   - Why do stems grow upward?

Activity 8: Yummy Plant Parts **(GLEs: 1, 2, 3, 5, 9, 36)**

Materials List: per group: *Tops and bottoms* by Janet Stevens, six large or colored index cards used for headers, 24 index cards

Introduce this activity by asking students to name some plants that they enjoy eating. This question may surprise some students because they often do not realize that they eat plants on a daily basis. This activity will increase awareness of edible plant parts. Before beginning the activity, read *Tops and Bottoms* by Janet Stevens to the class. This humorous story will help students understand that we eat a variety of plant parts. If this book is not available, use visuals of a variety of edible root and leafy plants and ask students to name how many of these plants they have eaten today.

1. Create six cards with the 6 plant parts listed below using six different colors. The word header should be written on the back so that students will understand that these will be used as headers. Using the list of plant parts below, create 24 index cards with the name of the edible plant part, using corresponding colors to match their plant part. For example, if seed is written in orange, then peanut, corn, pea, and lima bean would also be written in orange. Pictures could also be added to these cards to enhance this lesson.

seed	**root**	**stem**	**leaf**	**fruit**	**flower**
almond	**carrot**	**celery**	**lettuce**	**orange**	**broccoli**
corn	**radish**	**asparagus**	**cabbage**	**tomato**	**cauliflower**
pea	**turnip**	**potato**	**spinach**	**watermelon**	**artichokes**
white bean	**beet**	**sugar cane**	**mustard greens**	**apple**	**dandelions**

2. Working in groups, have students sort these cards as headers for the different categories. Students should then place the correct plant part with the corresponding header.

3. Groups of students could be assigned a plant part and directed to find pictures of the foods that are listed below that part. These pictures could then be used to create a collage of their plant part and then presented to the class as using the *professor know-it-all* literacy strategy (view literacy strategy descriptions). To add novelty to the strategy, the teacher may provide the group with a lab coat and a clipboard when they are presenting. The groups should present their collages to the class and what they have learned about plants and their importance to our well being.

4. Then the teacher should invite questions from the class. Before the group responds to a question, the team should huddle as a team to talk about the answer and then return to their position to give answers in complete sentences.

5. The teacher should close this activity by asking students to recall their use of the food pyramid in Activity 2 and to determine where these foods fit on that Food Guide Pyramid. Explain to students that most of these food items would be a healthy snack for them to enjoy and that fresh fruits and vegetables have lots of vitamins and minerals that are essential to a healthy body.

Activity 9: Roots and Leaves-Are They Useful or Not? (GLEs: 2, 3, 5, 11, 14, 37)

Materials List: 4 identical young plants (e.g., petunias, begonias, or other seasonal available plant), science learning logs

Ask students to recall from Activity 7 what they know about roots, stems, and leaves. Then ask them to hypothesize what would happen to a plant if the roots were removed or if the leaves were removed? Ask students for suggestions on ways they could test their hypothesis. The investigation should be similar to the following:

No Roots

1. Obtain two identical plants (e.g., petunia plant). Have students make sketches and write observations of the plants in their science *learning log* (view literacy strategy descriptions). Students should also include what they know about the roots of a plant and what is unknown, based upon this activity.

2. Remove all the roots from one of the plants. Place both plants in a well-lit area keeping them watered. Students should observe both plants daily and make sketches of their observations.

3. Discuss the role of roots in the plant.

No Leaves

1. Using two more similar plants, have students make sketches and write observations of the plants in their science *learning log* (view literacy strategy descriptions). Students should also include what they know about the leaves of a plant and what is unknown, based on this investigation.

2. Remove all the leaves from one of the plants. Place both plants in a well-lit area keeping them watered. Students should make daily observations for several days and make sketches of their observations.

3. Discuss the role of the leaves in the plant.

Sample Assessments

General Guidelines

Assessment techniques should include drawings/illustrations/models, laboratory investigations with reports, laboratory practicals (problem-solving and performance-based assessments), group discussion and journaling (reflective assessment), and paper-and-pencil tests (traditional summative assessments).

General Assessments

- The student will list activities that help to keep people healthy.
- The student will develop a one-day menu of three meals that includes representatives of each food group on the food pyramid.
- The student will complete an outline describing the five functions of the skeletal system.
- The student will write an explanation of what selected body structures of animals or insects enable them to do.
- The student will exhibit the ability to sort mammals, reptiles, insects, amphibians, and arthropods into proper categories.
- The student will identify the function of the leaf and the roots and explain how each helps the plant to survive.
- The student will write a journal of his/her dietary intake.

Activity-Specific Assessments

- Activity 2: Students will plan a hypothetical two-day meal calendar listing foods they plan to eat and which would correctly coincide with the food pyramid suggestions. Evaluation should include the correct listing of foods according to the food pyramid guide.

- Activity 3: Students should list the parts of the digestive system explaining the function of each part. Evaluate for accuracy.

- Activity 6**:** Students observe and record data using illustrations and descriptions of their observations. Students will then use these observations to plan an investigation of worms and their functions in the ecosystem.

- Activity 9: Students will record growth (or lack of growth) of the experimental plants by drawing and labeling pictures of their results along with a written explanation. A science learning log entry will be kept by each student with correct labels and dates. Points should be given for labeling, dating, accuracy in representation of the plant in drawings, and accuracy of explanation of results.

Grade 3
Science
Unit 6: The Solar System

Time Frame: Approximately 5 instructional periods of 45 minutes per period

Unit Description

This unit is focused on the observation and exploration of some of the objects in the sky and their describable characteristics. Students will model and diagram the rotation of Earth on its axis and the motion of Earth as it revolves around the Sun. The structure and composition of the solar system will be investigated, using various reference documents and models, as well as direct observations of visible bodies.

Student Understandings

Students will learn through drawing and observing body shadows, recording data, and describing changes that the Sun appears to change positions in the sky during the day. Students will create a model of the planets in our solar system. Students will do research reports on the planets and present them orally. Students will understand that day and night occur because of the rotation of Earth on its axis, and understand that seasons occur partly because of the revolution of Earth around the Sun, which takes one year to complete.

Guiding Questions

1. Can students explain why the Sun appears to be at different places in the sky during the day?
2. Can students explain why shadows get longer or shorter and change direction over time?
3. Can students name the planets in order from the Sun?
4. Can students explain how the rotation of Earth causes day and night?
5. Can students explain the results of the revolution of the Earth around the Sun?

Unit 6 Grade-Level Expectations (GLEs)

GLE #	GLE Text and Benchmarks
Science as Inquiry	
1.	Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1)
2.	Pose questions that can be answered by using students' own observations, scientific knowledge, and testable scientific investigations (SI-E-A1)
4.	Predict and anticipate possible outcomes (SI-E-A2)
5.	Use a variety of methods and materials and multiple trials to investigate ideas (observe, measure, accurately record data) (SI-E-A2)
9.	Express data in a variety of ways by constructing illustrations, graphs, charts, tables, concept maps, and oral and written explanations as appropriate (SI-E-A5) (SI-E-B4)
11.	Use a variety of appropriate formats to describe procedures and to express ideas about demonstrations or experiments (e.g., drawings, journals, reports, presentations, exhibitions, portfolios) (SI-E-A6)
Physical Science	
25.	Observe and analyze motion and position of objects over time (e.g., shadows, apparent path of the Sun across the sky) (PS-E-B3)
Earth and Space Science	
53.	Identify, in order, the planets of the solar system (ESS-E-B1)
54.	Describe the patterns of apparent change in the position of the Sun (ESS-E-B2)
55.	Explain the results of the rotation and revolution of Earth (e.g., day and night, year) (ESS-E-B4)
56.	Compare shadow direction and length at different times of day and year (ESS-E-B4)

Sample Activities

Activity 1: Sun and Shadows (GLEs: 1, 2, 4, 5, 9, 11, 25, 54, 56)

Materials List**:** colored chalk, clock, yard stick or ruler, meter stick, Shadows Data Sheet BLM, *My Shadow* by Louis Stevenson

Safety Note: Observe proper Sun protection practices when having students work outside.

Teacher Note: It is important that students keep the data collected in this activity so that seasonal observations can be recorded and compared throughout the year.

Background Knowledge: Objects on the ground create shadows as the Sun appears to be moving across the sky, but it is the rotation of the Earth that causes this apparent motion. A shadow that is cast to the west in the morning will be cast to the east in the evening.

When the Sun is directly above an object, like at noon, it will cast no shadow at all. An object's motion can be described by tracing and measuring its position over time.

Take students outside on a sunny day to begin this activity. Have students find their shadow and predict what their shadow would look like later in the day. Students should also be questioned about what causes shadows.

Students should pose questions about shadows and the Sun and also be guided so that their questions can be answered by observations and investigations.

1. Students will work with partners outside on a sunny day to draw and record shadow changes on a daily, weekly, and monthly basis using the Shadows Data Sheet BLM. Students can draw shadows of themselves and/or stationary objects. Different colored chalk should be used to draw on the pavement for the morning, noon, and afternoon so changes in position and length are more obvious.

2. Shadows should be measured using both standard and metric measurements. Predictions will be made as to what changes students think will occur in the shadows and position of the Sun. The students should record the date, season of the year, length of shadows, shadow changes, position of the Sun and explanations of these changes in their science *learning logs* (view literacy strategy descriptions).

3. Students should also be able to explain in writing that the shadow is changing in size and position and the Sun's position changes during the day. Keep the science *learning log* entries for reference and repeat this shadow activity and data collection several more times throughout the school year at various seasons. Compare the shadow pictures each time and discuss the position of the Sun when each shadow was made.

Read a story to the class such as *My Shadow* by Louis Stevenson or any other appropriate book to close this activity.

Discussion questions include the following:

- Where was the Sun in the morning drawings relative to your object? At noon? In the afternoon?
- Did the size or position of the shadows change? How did it change? Where was the Sun in relation to the shadows on the drawings?
- Were the shadows the same or different from previous drawings at other times of the day? Of the year?

Activity 2: Rotation and Revolution of Earth (GLEs: 1, 2, 5, 54, 55)

Materials List: lamp with open light bulb, mounted globe or inflatable globe, small sticker, science learning logs

Safety Note: Caution students to carefully hold the lamp from the base and not to touch the open bulb.

To begin the activity, students should generate questions they have about the movement of Earth based on the following *SQPL* (view literacy strategy descriptions) prompt. State the following: *We have night and day because the Earth is always moving.* Write this statement on the board or any other medium of choice as it is being said. Next, ask students to turn to a partner and think of one good question they have about the terms *rotation* and *revolution* based on this statement. As students respond, write their questions on the board or chart paper. If a question is asked more than once, the question should be marked with a smiley face to signify it is an important question. When students finish asking questions, contribute your own questions to the list, if necessary. As students are doing the following activity, have them record any answer that they may find on the board or chart paper next to the appropriate question.

Rotation

- Students will simulate the rotation of Earth by using a flashlight and a globe. Before beginning the activity place a sticker on Louisiana so that it is easier for students to denote when it is daylight in Louisiana and when it is dark.

- Direct one student to shine the flashlight on the globe and another student to hold the globe. The student holding the globe should slowly spin the globe counter-clock-wise while the person holding the flashlight shines it on the globe.

- As the globe is spinning and it is night in Louisiana, ask the students if it is night or day in China.

- Ask students how long they think that it takes Earth to make one complete turn on its axis? (24 hrs.). Explain that this is what causes night and day. Use the word *rotation* to describe the counter-clock-wise movement of the Earth on its axis.

Revolution

- Students will demonstrate the revolution of Earth around the Sun in a similar manner. To demonstrate a year, one student will use a lamp with an open bulb to represent the Sun while another student will hold a globe to represent Earth. The student representing the Sun will stand still in the center of the room holding the lamp above their head while another student representing Earth with a globe completes a turn (revolution) around the Sun.

- Place a sticker on the mounted globe on the state of Louisiana to serve as a reference point. The Sun student should shine a flashlight on the sticker that was positioned on the globe.

- The student with the globe should start to revolve very slowly counter-clockwise around the Sun, while rotating the globe counter-clockwise on its axis. Once this

student starts to rotate and revolve around the Sun, have another student stand in this spot to mark the starting point of the revolution. The teacher might need to assist the students as they rotate and revolve at the same time and monitor the position of the axis on the globe. This would also be a good time to further discuss the questions that students generated during the *SQPL* prompt regarding the terms *rotation* and *revolution* as they relate to night and day.

- When the Earth has traveled about one-fourth of a revolution around the Sun, night and day should occur many times as Earth continues around the Sun.
- When the revolution is one-half completed, Earth should be in front of the student standing in the spot where the revolution started. The student should continue on until he/she reaches the starting point of the revolution. Ask students how long do they think it takes Earth to make a complete revolution around the Sun. (365 ¼ days or one year)
- The procedure can be repeated with different students if they need more help in grasping the concept.

Activity 3: Make Model of the Solar System (GLEs: 1, 2, 5, 9, 11, 53)

Materials List: Planet Research Guide BLM, large beach ball, two green peas, two marbles, one grapefruit, one orange, two limes, planet name plates written on card stock, foam balls (optional), 4 or 5 white posters cut into fourths, glue, science learning logs

Students will make a model of the solar system to help them visualize the order of the planets.

1. Use the scale below to assemble the various objects in the classroom.

Planet	Representation	Distance from previous planet
Mercury	green pea	1 inch (from the Sun)
Venus	marble	1 inch
Earth	marble	0.5 inches
Mars	green pea	1.5 inches
Jupiter	grapefruit	9 inches
Saturn	orange	11 inches
Uranus	lime	24 inches
Neptune	lime	27 inches

2. Place the ball at one end of the classroom and place the various objects to represent the planets across the length of the room. Foam balls of the appropriate sizes may be substituted for the fruits and vegetables. Label the planets

accordingly so that students can walk around using their science *learning logs* (view literacy strategy descriptions) in which to record the name and order of the planets.

Teacher Note: These distances are approximately to scale. They may be doubled if this activity will be done outside instead of the classroom. It is also necessary to substitute a foot for an inch, if doing this activity outdoors. Therefore, a large area will be needed do this activity outside.

3. Share the following acronym with the class to help them remember the order of the planets: ***M***y ***V***ery ***E***ager ***M***other ***J***ust ***S***erved ***U***s ***N***achos.

4. Working in pairs or groups, students will use reference books, textbooks, or computer programs to research the eight planets and compile reports. The KidsAstronomy.com website located at http://www.kidsastronomy.com/solar_system.htm is an excellent interactive website that offers information on the solar system and is written on a level that is easily understandable for students at this age. (Teacher will use own discretion on how to assign planets to the students for the reports.) This National Geographic website, http://science.nationalgeographic.com/science/space/solar-system, is another excellent resource to assist students when researching the planets.

5. Reports should include a written description of the planet and a diagram and/or picture of the planet. Students should use the Planet Research Guide BLM when doing their research. Reports will be presented orally. The students could use their Planet Research Guide to create a Fact Poster which could be used to present to the class. Follow the steps below to create this very easy project.
    - Cut a white poster into fourths.
    - Students should then glue their research guide in the middle of the poster.
    - Students should completely illustrate the borders of the poster with pictures about their planet. This creates a nice visual that will be useful when presenting to the class. This poster looks best if the borders are completely illustrated and colored, leaving only the paper in the center with any white showing.

Sample Assessments

General Guidelines

Assessment techniques should include drawings/illustrations/models, laboratory investigations with reports, laboratory practicals (problem-solving and performance-based assessments), group discussion and journaling (reflective assessment), and paper-and-pencil tests (traditional summative assessments).

- Students should be monitored throughout the work on all activities via teacher observation of their work and lab notebook entries.
- All student-developed products should be evaluated as the unit continues.
- For some multiple-choice items on written tests, ask students to write a justification for their chosen response.

General Assessments

- The student will keep *science learning log* records with shadows drawn and position of the Sun noted during different time periods throughout the year.
- The student will use written or oral explanations of why shadows are different at different times of the day and year.
- The students will conduct a simulation of the rotation and revolution of Earth.
- Have students draw and label a scene from each of the four seasons in a particular city.
- Have student make models and write reports on the solar system.

Activity-Specific Assessments

- Activity 1: Students will make drawings of the shadows made outside in their science *learning log.* Each drawing should include the object, its shadow, and the Sun in the correct positions. Each drawing should be labeled with the time of day and the time of the year with respect to the horizon.

- Activity 2: Students will be able to explain how the rotation of Earth causes day and night and will describe the results of the Earth's revolution around the Sun..

- Activity 3: Students will complete a report on a planet. The report should include a written description of the planet as well as a diagram or drawing of the planet.

Grade 3
Science
Unit 7: The Environment

Time Frame: Approximately 5 instructional periods of 45 minutes per period

Unit Description

Characteristics of ecosystems and their relationship with the living and nonliving components within will be investigated in this unit, along with endangered species specific to Louisiana. Renewable and nonrenewable resources will also be explored.

Student Understandings

Students will develop an understanding of the environment as a complex arrangement of biotic and abiotic components, in terms of its composition, interactions, and balance by investigating and comparing various ecosystems (e.g., their schoolyard, an aquarium, and a terrarium). Students will identify some of the natural resources of Louisiana and the importance of conserving these resources.

Guiding Questions

1. Can students describe the interrelationships between the living and nonliving components of the environment?
2. Can students describe how changes to a habitat affect the organisms that live there?
3. Can students give both negative and positive changes in natural habitats that are caused by humans and how those changes affect animal and plant populations?
4. Can students list natural resources that are used to manufacture products?
5. Can students describe how renewable and nonrenewable resources can be replenished or depleted?

Unit 7 Grade-Level Benchmarks (GLEs)

GLE #	GLE Text and Benchmarks
Science as Inquiry	
1.	Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1)
2.	Pose questions that can be answered by using students' own observations, scientific knowledge, and testable scientific investigations (SI-E-A1)
3.	Use observations to design and conduct simple investigations or experiments to answer testable questions (SI-E-A2)
5.	Use a variety of methods and materials and multiple trials to investigate ideas (observe, measure, accurately record data) (SI-E-A2)
8.	Select and use developmentally appropriate equipment and tools (e.g., magnifying lenses, microscopes, graduated cylinders) and units of measurement to observe and collect data (SI-E-A4)
9.	Express data in a variety of ways by constructing illustrations, graphs, charts, tables, concept maps, and oral and written explanations as appropriate (SI-E-A5) (SI-E-B4)
10.	Combine information, data, and knowledge from one or more of the science content areas to reach a conclusion or make a prediction (SI-E-A5)
11.	Use a variety of appropriate formats to describe procedures and to express ideas about demonstrations or experiments (e.g., drawings, journals, reports, presentations, exhibitions, portfolios) (SI-E-A6)
12.	Identify and use appropriate safety procedures and equipment when conducting investigations (e.g., gloves, goggles, hair ties) (SI-E-A7)
15.	Recognize that a variety of tools can be used to examine objects at different degrees of magnification (e.g., hand lens, microscope) (SI-E-B3)
Science and the Environment	
57.	Describe the interrelationships of *living (biotic)* and *nonliving (abiotic)* components within various ecosystems (e.g., terrarium, swamp, backyard) (SE-E-A1)
58.	Describe how humans have had negative and positive effects on organisms and their environments (SE-E-A3) (SE-E-A5)
59.	Classify manufactured products according to the natural resources from which they are made (e.g., copper wire from copper ore, plastic from petroleum) (SE-E-A4)
60.	Explain how renewable and nonrenewable resources can be replenished or depleted (SE-E-A4)
61.	Explain how selected animals once classified as endangered have recovered (SE-E-A5)
62.	Identify animals in Louisiana that have recovered and that are no longer considered endangered (SE-E-A5)

Sample Activities

Activity 1: What's In Your Backyard? (GLEs: 1, 8, 9, 11, 12, 15, 57, 58)

Materials List**:** *Hula-Hoop*® or string, schoolyard map constructed by students, gloves, sandwich bags for soil sample, plastic spoon, magnifying lens or microscope, drawing paper, visuals of various ecosystems, science learning logs, Living and Non-Living Components BLM

Safety Note: Before moving into the schoolyard, have students generate safety precautions and issues that they should consider while on their walk. (There may be safety issues specific to a given school site.)

To introduce this lesson, hang visuals around the room illustrating various ecosystems (e.g., terrarium, swamp, and backyard) which students will use to generate questions about ecosystems. These can include drawings, posters, models, displays, mobiles, or other visuals. If available, a *PowerPoint*® could also be created to illustrate these various ecosystems.

The teacher will need to guide students to an understanding that an *ecosystem* is made up of a specific part of the environment and includes all the living and non-living components of that environment interacting with each other. The *habitat* is where the plant or animal lives. Using one of the visuals, help students to identify the living (biotic) and non-living (abiotic) components illustrated within the ecosystem. For example, if using a picture of a tropical rain forest, students might identify birds, monkeys, plants, etc. as living components and the rain, amount of sunlight (or lack of it), etc. as the non-living components. Ask students how they think the non-living components affect the living components and visa versa, and if their interactions will affect the ecosystem.

Backyard Walk:
Students will take a walking trip into the schoolyard. Students will note the many living things included in the area surrounding the school and will make notes on a student-constructed map of a specific area that they will investigate. The students will make references on their maps to the location of trees, bushes, flowerbeds, plants, etc. Students will generate questions about living things or non-living things observed on the trip for further inquiry.

- The students, in groups of four, will select a small area of the schoolyard (use a small Hula-Hoop® or string in the shape of a circle to mark different areas) to observe the living and non-living components there.

- Distribute a magnifying lens to students to help with observations. Students should construct a map in their science *learning logs (*view literacy strategy descriptions) which will be used to indicate where they find living and non-living things.

- Plastic spoons could be used to dig into the soil, uncover leaves, etc. for observation purposes. Students should wear protective gloves when handling soil. Students should observe as many things related to their identified ecosystem as possible, including water sources, amount of sunlight, etc.

- Upon returning to the classroom a teacher-facilitated discussion should include what may happen when people change the environment. Ask students to name some ways in which the environment at their school has been changed since they have been there (addition of a T-building, construction of a parking lot, adding a playground, new shrubs, a school sign, etc.). Then ask students to name some ways that man has changed the environment of their town and/or area surrounding it (building highways, bridges, malls, developments of new sub-divisions, etc.).

- Next ask students to name ways in which the actions of people have helped the environment at school, their town, etc. (e.g., using compost and other recycled materials, water conservation, protection of animals, etc.).

- Using the Living and Non-Living Components BLM, have students list some living components observed during the backyard walk in one column and list the non-living components in the second column. Using data from this BLM, direct each student to write a paragraph explaining how the components of an ecosystem depend on each other and explaining both negative and positive changes that take place when humans change the environment. Students should make a drawing of the area around their own homes and think of this as an ecosystem. The drawings should include any plant life such as trees, plants, bushes, etc. Ask students if they or their parents have made any changes to their home ecosystem and how those changes may have negatively and/or positively affected the plants and animals that live there. Students should write a paragraph describing their home ecosystem with its surroundings including any animal life and/or plant life found in that immediate area and any impact that change(s) have had on their home ecosystem. Note: This activity may require some parts to be done as homework

Class discussion questions include the following:

- What plants and animals might live in the forest around an old fallen tree? What might happen to the plants and animals around the tree if it were removed?
- What changes would occur if a road or a bridge were built in this area? What would happen to the animals and plants that lived there?
- How can people sometimes be a help to the environment and sometimes a hindrance to it?

Activity 2: Exploring Ecosystems (GLEs: 1, 3, 5, 9, 11, 57, 58)

Materials List**:**
For aquarium - classroom aquarium, 1 or 2 small fish, science learning logs (If a classroom aquarium is not available or already established, substitute with a small fish bowl filled with de-chlorinated tap water, water plants such as Elodea or duckweed, snails [optional].)

For terrariums (2 for class to observe) - two clear 2-liter soda bottles with the top cut off, gravel, sand, potting soil, 3-4 small plants (e.g., Swedish Ivy, English Ivy, Spider Plant, Prayer Plant, African Violet), water, plastic wrap, rubber band, spray bottle, science learning logs, Living and Non-Living Components BLM, Ecosystems Data Sheet BLM,

In this activity, students will observe and compare the living and non-living components of three ecosystems: the backyard (school yard) from Activity 1, a terrarium, and an aquarium. Students will participate in making a simple terrarium and encouraged to make a similar one at home with parents to observe during the year.

Part A: Introduce this lesson by directing students to the classroom aquarium or, if not available, set up a temporary one by adding de-chlorinated tap water to a small fishbowl and adding one or two small goldfish, aquarium plants, a snail, etc.

- Ask students to *brainstorm* (view literacy strategy descriptions) and identify the living and non-living components of the aquarium ecosystem. Students should also discuss how each of these components interact and/or affect one another. To assist students with *brainstorming* (view literacy strategy descriptions) about ecosystems, use a T-Chart *graphic organizer* (view literacy strategy descriptions). See the chart below for some examples of living and non-living components of an aquarium.

Aquarium Ecosystem	
Living Components	Non-Living Components
fish	water
snails	water temperature
plants	the glass
	gravel
	pump
	light

Part B: Prepare two terrariums for the class to observe. Terrariums are relatively easy to construct and maintain (more so than aquarium) and can provide students the opportunity to make a variety of observations.

- Place a layer of gravel on the bottom of each empty clear, two-liter bottle that has the top removed. Cover this with a layer of sand and then a layer of potting soil (potting soil works best, as it limits the contaminants that could be introduced by garden soil). Plant one to four small plants, depending upon their size, in each bottle and spray the plants with water.

- Cover the top of bottles with plastic wrap and secure in place with a rubber band. At this point, students should differentiate between the living and non-living components of this ecosystem model. Also, point out to students how the components interact and/or affect one another.

Terrarium Ecosystem	
Living Components	Non-Living Components
plants	water
	the bottle
	soil

- Place one terrarium in a sunny spot (or under a light) and the other terrarium in a dark place, such as a closet, for about a week.

- Observe the changes in the plants in the terrariums. The terrarium from the dark can be placed in sunlight after about a week to stimulate the growth of the plants.

- The plastic can be removed, and snails or small insects can be added to the terrarium for further explorations.

Part C: Comparing Ecosystems:
Direct students to record observations taken from their Living and Non-Living Components BLM completed in Activity 1 (backyard walk), the terrarium and the aquarium using the Ecosystems Data Sheet BLM. Students could also sketch pictures of their ecosystems in their science *learning logs* (view literacy strategy descriptions) along with the components of the three ecosystems. After several days of observations, students will compare and contrast their daily observations of the three ecosystems using their science *learning logs.*

- Discussion questions may include the following:
  - What makes up an ecosystem?
  - What is a habitat?
  - How is a habitat different from an ecosystem?

- What are some negative effects that humans may have on the environment? How could this specifically affect the plant or animal life?
- Could these have a negative effect on you?

Activity 3: From Resource to Product (GLEs: 5, 9, 10, 11, 59, 60)

Materials List: pictures of renewable and nonrenewable resources, tag board to glue pictures of resources, chart, index cards, Resourceful Reporter BLM, Renewable and Nonrenewable Resources Data Sheet BLM

Write the word *resource* on an index card and show it to the students. Ask students to define the word. Explain to the students that a resource is an aspect of the physical environment that people value and use. Ask students to give examples of important natural resources. If students do not include such natural resources as water, air, coal, crude oil, and soil, then the teacher should include these as they are very important natural resources. A *renewable resource* can be regenerated if used carefully. A *nonrenewable resource* cannot be replaced once it is used up.

Students will participate in a study to identify renewable and nonrenewable resources from a set of given pictures emphasizing those specific to Louisiana. Louisiana has an abundance of renewable resources including timber, sugarcane, seafood, cattle, rice, strawberries, cotton, etc. Nonrenewable resources in Louisiana include oil, salt, sulfur, and natural gas.

- Place pictures on tag board to make cards. The name of the resources should be written on the card also. Students will observe the resource cards and classify them as renewable or nonrenewable, discussing whether the resources can be depleted or replenished.

- Using the Renewable and Nonrenewable Resources Data Sheet BLM students will collectively help the teacher fill in the chart by putting an X in either the renewable or nonrenewable resource box for each resource listed. In the last column, students will tell why they think the resource is renewable or nonrenewable. Encourage students to look around the classroom and find a product made from a renewable and nonrenewable resource and add the information to the chart while the teacher is recording on the chart.

- Students will then match natural resources to products made from them when shown pictures of products and resources, using the same picture cards from earlier. Students are to chart their findings. Discussion questions include the following:
    - What are natural resources?
    - Do you know what products are made from these resources? Name some.

- Instruct students to bring samples of products from home as examples of renewable and nonrenewable resources. These can be matched to the picture cards made in the above activity.

- The following website is an interactive site that allows students to match raw materials with objects that are made from these materials.
  Go to http://www.epa.gov/epaoswer/osw/kids/, scroll down to *GAMES* and click on *Materials lineup.*

Working in groups, students will investigate to determine how materials are recycled in local areas to help preserve resources.. Students will then use the *RAFT writing* (view literacy strategy descriptions) to report their findings to their class. Using this strategy, students will write a persuasive article telling the importance of using renewable resources vs. nonrenewable resources. Provide students with The Resourceful Reporter BLM to complete this writing. This form of writing gives students the freedom to project themselves into unique roles and look at content from unique perspectives. It is the kind of writing that, when crafted appropriately, should be creative and informative.

Students should be assigned the following *RAFT* assignment using the Resourceful Reporter BLM to write their final copy.

R- Role (role of the writer- Newspaper Reporter*)*
A-Audience (to whom or what the RAFT is being written - Citizens of the Community or School)
F-Form (the form the writing will take, as in letter, song, etc. - Newspaper Article)
T- Topic (the subject focus of the writing - Importance of Using Renewable Resources vs. Nonrenewable Resources)

Once the writings are complete, students could present their news articles to their class, other classes, or the entire school. If available, the teacher could also record the students reading their articles and send copies home to parents.

Activity 4: Endangered Animals (GLEs: 1, 2, 9, 11, 61, 62)

Materials List**:** sources to locate previously classified endangered or threatened animals in Louisiana, poster board, Endangered Animals Report Rubric BLM, road map of Louisiana, yarn, four or five pieces of legal size paper folded into thirds to make a brochure

Teacher Note: This activity may take two instructional periods.

Write the words *endangered species* on the board. Have students *brainstorm* (view literacy strategy descriptions) what they think this means. Using a T-Chart *graphic organizer* (view literacy strategy descriptions), write students' ideas on the left-hand side. Read appropriate teacher selected material (book, article, Internet site, etc.) about

endangered species that have recovered. After reading the material, ask students to give a definition of *endangered species* and record responses on the right hand side of the T-Chart. Tell students that while some plants and animals are not considered endangered, it is likely that they may become endangered in the foreseeable future. These plants and animals are called "threatened" species.

Inform students that they will be researching an endangered animal that has recovered. Model how students are to gather resources and hand out the Endangered Animals Report Rubric BLM and explain what is expected. The following websites offer a wealth of information about endangered animals from all over the world; however, students should use those with a Louisiana connection: http://www.endangeredspecie.com/ and http://www.kidsplanet.org/factsheets/map.html.

For a specific list of endangered or threatened animals in Louisiana, visit the Louisiana Wildlife and Fisheries web site, http://www.wlf.state.la.us./experience/threatened. Once this homepage is opened, click on the Experience Wildlife tab which will take you to the Threatened and Endangered Wildlife in Louisiana. The following website has a *PowerPoint*® about endangered animals:

- http://www.fws.gov/endangered/kids/pdf/presentation.pdf

- Instruct students to use the Internet and/or printed materials such as books or magazines to locate examples of previously classified endangered or threatened animals that no longer have that designation.

- Compile a class list of student-generated questions that they would like answered on endangered animals. Focus on animals of Louisiana that have *recovered*.

- Form two- or three-member groups and direct students to develop a display using poster boards or display boards of a formerly endangered animal that is no longer endangered. Ask students to also explain why that animal is no longer endangered and/or some actions that may have caused them to recover. For example, strict laws protecting the bald eagle and changes in use of pesticides have contributed to this animal no longer being classified as endangered.

- The display should include a written report, pictures, and could include a map of Louisiana showing the area of the state where that particular animal is most frequently found.

- Include how technology advances have helped the recovery process. To avoid repetition, student groups should select an animal with teacher approval or the teacher should assign an animal to each group.

- Students will give a short oral report about their display to the class. The teacher should use these reports as a foundation for class discussion to ensure all major points are covered. Discussion questions include the following:

- What are some animals in Louisiana that have become endangered? Threatened?
- What has been done specifically in Louisiana to help these animals get off the endangered list?

If the teacher would like to give the groups of students a choice of making a poster or a brochure, a brochure about the animal could be made as well. All of the information that was to be included on the poster can be part of the brochure instead. After the presentations, a map of Louisiana could be displayed on a bulletin board. The student brochures can be placed around the map with a line made of yarn spanning from the brochure to the area on the map where the animal dwells.

Sample Assessments

General Guidelines

Assessment techniques should include drawings/illustrations/models, laboratory investigations with reports, laboratory practicals (problem-solving and performance-based assessments), group discussion and journaling (reflective assessment), and paper-and-pencil tests (traditional summative assessments).

- Students should be monitored throughout the work on all activities via teacher observation of their work and lab notebook entries.
- All student-developed products should be evaluated as the unit continues.
- Student investigations should be evaluated with a rubric.
- For some multiple-choice items on written tests, ask students to write a justification for their chosen response.

General Assessments

- The student will record daily science learning log entries of the terrarium, including some measuring of plant growth.
- The student will record daily science learning log entries of the aquarium, noting any changes.
- The student will identify ecosystems such as backyards, swamps, or streams.
- The student will provide drawings of schoolyard and home.
- The student will make a list of products made from renewable resources and from nonrenewable resources.
- The student will develop a chart listing examples of renewable and nonrenewable resources.

Activity-Specific Assessments

- Activity 2: Students will identify the living and nonliving components of the terrarium, aquarium and the backyard ecosystem and explain ways that the living and non-living components of each interact and affect the ecosystem in which they belong.

- Activity 3: Students should be able to correctly match natural resource cards with their product. Students should be able to identify renewable and nonrenewable resources and name those specific to Louisiana. Students should be able to explain the importance of using renewable resources vs. nonrenewable resources in the RAFT newspaper article.

- Activity 4: Student groups' posters or brochures on endangered animals should be complete and include an oral and written report. Use the Endangered Animals Report Rubric BLM for assessment.

Grade 3
Science
Unit 8: Weather Patterns

Time Frame: Approximately 10 instructional periods of 45 minutes per period

Unit Description

The unit focuses on the water cycle and the differences between weather and climate. Student-made weather instruments provide the opportunity for data collection and the recording of changes in the weather. Technological developments that assist in severe weather forecasting will be explored.

Student Understandings

Students will develop awareness of weather patterns through the study of local weather maps, observable weather changes, and the construction of weather instruments. Students will determine that weather is an everyday happening and that climate is based on weather over a long period of time. Activities are used for concept introduction and exploration as well as concept development through data collection and analysis.

Guiding Questions

1. Can students differentiate weather from climate?
2. Can students describe the processes in the water cycle?
3. Can students identify and construct simple weather instruments to record the changes in the weather?
4. Can students accurately read and record the information gathered by each weather instrument?

Unit 8 Grade-Level Expectations (GLEs)

GLE #	GLE Text and Benchmarks
Science as Inquiry	
1.	Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1)
2.	Pose questions that can be answered by using students' own observations, scientific knowledge, and testable scientific investigations (SI-E-A1)
3.	Use observations to design and conduct simple investigations or experiments to answer testable questions (SI-E-A2)

GLE #	GLE Text and Benchmarks
4.	Predict and anticipate possible outcomes (SI-E-A2)
5.	Use a variety of methods and materials and multiple trials to investigate ideas (observe, measure, accurately record data) (SI-E-A2)
7.	Measure and record length, temperature, mass, volume, and area in both metric system and U.S. system units (SI-E-A4)
8.	Select and use developmentally appropriate equipment and tools (e.g., magnifying lenses, microscopes, graduated cylinders) and units of measurement to observe and collect data (SI-E-A4)
9.	Express data in a variety of ways by constructing illustrations, graphs, charts, tables, concept maps, and oral and written explanations as appropriate (SI-E-A5) (SI-E-B4)
10.	Combine information, data, and knowledge from one or more of the science content areas to reach a conclusion or make a prediction (SI-E-A5)
11.	Use a variety of appropriate formats to describe procedures and to express ideas about demonstrations or experiments (e.g., drawings, journals, reports, presentations, exhibitions, portfolios) (SI-E-A6)
12.	Identify and use appropriate safety procedures and equipment when conducting investigations (e.g., gloves, goggles, hair ties) (SI-E-A7)
17.	Explain and give examples of how scientific discoveries have affected society (SI-E-B6)
Earth and Space Science	
47.	Describe the difference between weather and climate (ESS-E-A2)
48.	Identify examples of the processes of a water cycle (e.g., evaporation, condensation, precipitation, collection of runoff) (ESS-E-A3)
49.	Describe climate patterns from recorded weather conditions over a period of time (ESS-E-A4)

Sample Activities

Activity 1: Modeling the Water Cycle (GLEs: 1, 2, 4, 5, 9, 11, 48)

Materials List: plastic box (shoebox size), sand, soil, gravel, warm water, rubber band, frozen ice pack, water, plastic spoon, inflatable globe, science learning logs, plastic wrap, *The Water Cycle* by Joy Richardson or a similar book about the water cycle

Teacher Note: This activity may take two or more instructional periods.

Begin this activity by reading *The Water Cycle* by Joy Richardson or a similar book about the water cycle. This book discusses where water comes from, how the seas are filled, how water gets into our homes, and water conservation.

Using a *graphic organizer* (view literacy strategy descriptions) of choice, have students *brainstorm* (view literacy strategy descriptions) what they know and/or remember about

the water cycle from the activity done in Unit 1. Then, list the words *evaporation*, *condensation* and *precipitation* and ask students to *brainstorm* what they know about these words and how they relate to the water cycle. After *brainstorming* is complete, explain to students that the water cycle is the movement (evaporation) of water from Earth's surface into the air where it cools and condenses into clouds and then returns back to the surface again as precipitation.

Working in groups or independently, students will simulate the water cycle by making the model listed below.

- Fill a plastic box about one-third to one-fourth full with the soil mixture (sand, soil, and gravel). Using a plastic spoon, scrape the soil mixture to one end to form a slanted hillside.

- Pour two cups of warm water in the plastic box at the other end of the hillside. *Do not pour water on the soil.* Quickly cover the box with plastic wrap and secure with a rubber band.

- Place a frozen ice pack, such as those used for lunchboxes (or a plastic bag containing ice cubes) on the plastic wrap directly over the soil, or hillside. Instruct students to make predictions as to what they think will happen. Observe the changes that occur for approximately ten minutes. Condensation and then precipitation will occur. No heat lamp is needed.

- Remove plastic wrap to allow the water to evaporate. (This may take several days). Examine the box after all water has evaporated. Ask students what happened to the water they put in the box. Students should draw a simple illustration of the water cycle with labels and write an explanation in their science *learning logs* (view literacy strategy descriptions).

Collecting data about how much of Earth is covered with water.

- Using an inflatable globe of Earth, students will observe that approximately three-fourths of Earth is covered with water. Students should be placed in groups of four or five and then take turns doing the following investigation.

- One person in the group will need to be assigned the job of recorder and the other four will toss the globe.

- Instruct the group of students to stand in a circle. The recorder hands the globe to the first person, who will then gently toss it to another person in the circle.

- The catcher should catch the globe with open hands and check to see if his/her thumb on the right hand is on land or water. Repeat for a total of 20 tosses. The recorder should record this data.

- The remaining groups should repeat the procedure and record their data, as well.

- The groups should share their results and count how many times their thumbs landed on water and land. The teacher should lead a discussion in which the students conclude that their thumbs landed on water almost three times more often than on land. Ask students what this reveals about how much of the surface of the Earth is covered by water? (Earth's surface is covered by more water than land.)

Conclude this lesson with a *SPAWN* (view literacy strategy descriptions) prompt that asks students to reflect on or think more critically about what they have just learned. *SPAWN* is an acronym that stands for five categories of writing options (Special Powers, Problem Solving, Alternative Viewpoints, What If, and Next). This lesson will use the *What If* prompt. Write the following prompt on the board or media of choice: *What if there was no water on Earth?* Invite students to write a story about what life would be like without water on Earth. Remind students that Earth without water would also include the absence of all aspects of the water cycle.

The teacher should allow students to write their response in a reasonable period of time. Since this is not a formal writing, *SPAWN* writing should not be graded as such. This form of writing should be viewed as a tool students can use to reflect on and increase their developing disciplinary knowledge and critical thinking.

Activity 2: Weather Instruments (GLEs: 2, 4, 5, 7, 9, 12, 17)

Materials List: clear plastic jars or two or three liter empty drink bottles with the tops cut off, ruler with inches and centimeters, several large rubber bands, small plastic garbage bag, string, cardboard cut into arrow shape, straight pin, new pencils with erasers, Weather Instruments Data Sheet BLM

Teacher Notes: This activity may take two instructional periods.

Safety Note: After explaining to the students the procedure for making the various instruments, have them identify safety issues that should be addressed in each step. For example, students should use caution when using scissors and staples when creating the windsock and wind vane.

Based on the weather on the day this activity is introduced, begin the lesson by asking students why they did or did not wear a certain piece of clothing to school today (i.e., a jacket if it is cold, a sleeveless shirt if it is warm, etc.). Then ask students what helped them decide whether or not to wear the named piece of clothing. Explain to students that *weather* describes what is happening in the atmosphere or around us at a certain time, such as it is raining today, or it was unusually hot for this time of year yesterday. Direct students to *brainstorm* (view literacy strategy descriptions) what instruments meteorologists use to help them study and predict the weather. Explain to students that they are going to construct a rain gauge, a wind sock, and a wind vane to help them better understand how to study the weather.

Making the rain gauge:
This part of the activity could be done in groups and the constructed gauges placed at various locations around the school yard. Before making the rain gauge, ask students to *brainstorm* how the amount of rainfall can be measured and why it might be important to know this information.

- To make the rain gauge, use clear plastic jars or two- or three-liter empty drink bottles with the tops cut off. Secure a plastic ruler with inch and centimeter markings onto the outside of the bottle using several large rubber bands, making sure the zero end of the ruler is even with the bottom of the bottle.

- Place the bottle in an undisturbed open area, such as in the schoolyard. Check the amount daily and record the results using the Weather Instruments Data Sheet BLM.

- Empty any precipitation after each recording. The teacher determines the number of days to observe.

Making the wind sock:
Instruct students to *brainstorm* ideas of how wind movement could be measured. Ask: How could the wind movement be determined here at school? How could knowing the wind speed be important in their everyday life?

- A windsock can be made from a small plastic garbage bag. Two windsocks can be made from one bag by cutting it in half length-ways and cutting off the solid end.

- Make a cylinder shape out of the bag by overlapping the edges. Tape or staple overlapping edges. Using scissors, cut up about four or five inches every inch or so around the bottom of the cylinder to make a fringe.

- Attach a piece of string to the top to hang the windsock in an area at school that can be checked easily and that will allow the wind to blow it freely. Students should record wind descriptions using the Weather Instruments Data Sheet BLM. A wind scale, such as provided below, will be analyzed to determine the best wind speed for certain activities (e.g., kite flying, picnic).

Wind Scale			
Speed (km/h)	**Description**	**Objects Affected**	**Windsock Position**
0	No breeze	No movement of wind	Sock hangs down
6-19	Light breeze	Leaves rustle, wind vanes move, wind felt on face	Sock blows slightly
20-38	Moderate breeze	Dust and paper blow, small branches sway	Sock extended 2/3 of way
39-49	Strong breeze	Umbrellas hard to stay open, large branches sway	Sock straight out

Making a wind vane:
Before making the wind vane, ask students to *brainstorm* ideas of how to determine the direction of the wind blowing and why it would be useful to a meteorologist.

- To make a wind vane take a piece of cardboard and cut out an arrow shape. Be sure that the tail end of the arrow is wider than the pointed end. Insert a straight pin through the middle of the arrow. Push the pin through the eraser end of a new pencil.

- Take the vane outdoors and hold it up into the air. The arrow will turn around in the wind. The arrow will point into the wind meaning this is the direction from which the wind is blowing. If the arrow points to the north, the wind is coming from the north. It is a north wind. (The end that is pointed turns into the wind and the end that is wider catches the breeze.)

Students should record the wind direction on the Weather Instruments Data Sheet BLM. Students should make predictions about the direction of the wind by observations of surroundings such as trees, bushes, etc. prior to collecting data. Asks students how meteorologist use this data they collect. If students do not conclude that meteorologists use the data they collect to make predictions about the weather and to inform the public about the current weather, this should be explained to students at this time. Students should use the data collected over several days or weeks to describe the weather in the area and to make predictions about weather patterns.

Activity 3: Weather Patterns to Climate (GLEs: 3, 5, 8, 10, 11, 47, 49)

Materials List: weather maps from local newspaper, class/student calendar, thermometers, access to weather reports on television or the Internet

Part A:
Use the website http://epa.gov/climatechange/kids/climateweather.html to review and re-introduce the terms *weather* and *climate.* After a class discussion about these terms, use a Venn diagram *graphic organizer* (view literacy strategy descriptions) to record the differences between weather and climate. Randomly call on students to assist in completing the Venn diagram. The teacher should emphasize that weather patterns over a long period of time for any given location make up the *climate* of that region and would be established by records over several years.

Part B:
In this part of the investigation, student groups will describe and compare the climate patterns where they live to that of a selected city that has a distinctly different climate from Louisiana.

Begin this activity by telling students that they are going to plan a July vacation and that they should pick a destination, somewhere in North America, that is cooler in July than the area of the state in which they live. Students should first research, agree, and then record the climate patterns for their particular region of the state during the month of July. This can be determined from an Internet search, local weather documentation, etc. Schools should use data from the closest larger city or region in Louisiana if data from their exact town is not available. The following websites offer information about Louisiana's climates:
http://www.wordtravels.com/Travelguide/Provinces/Louisiana/Climate/
http://www.worldbook.com/wb/Students?content_spotlight/climates/north_american_climate_louisiana

Have students use information and data collected to make a conclusive statement of the climate of the area in which they live.

Next, in small groups, students should determine the climate of their chosen vacation destination. In addition to the website listed above, an Internet search of a major city along with the word "climate" should yield ample information, e.g., Anchorage, Alaska's climate. Travel guides from AAA and other sources can also be used if Internet access is not available. Students should record their researched data for the month of July and compare that to their part of the state for the month of July.

Once the data has been collected, the teacher should direct the class to create a class graph using data collected from both locations. This should be done using a bar graph and graphing both locations in different colors side by side so that students can clearly observe the results.

Student groups should then determine from their data what type of clothing they should take on their trip, i.e., rain gear, heavy jackets, light jackets, etc. At the completion of this investigation, student groups should share their chosen destinations with the entire class, comparing the climate of the vacation spot to that of their part of the state.

Discussion questions may include:

- What is the value of knowing climate patterns for various parts of the country?
- How is the data that is found on the websites and travel books determined? How accurate do you think it is?
- How would weather forecasting and developing technology help us as citizens prepare for natural disasters such as hurricanes or tornadoes?
- What other resources could weather forecasters use to gather weather information? (satellites, weather balloons, hurricane watchers, etc.)

Activity 4: Severe Weather (GLEs: 1, 2, 3, 5, 8, 9, 10, 17)

Materials List: Internet access or other research materials on weather

Teacher Note: This activity may take 2 instructional class periods to complete.

Introduce this lesson by asking students to *brainstorm* (view literacy strategy descriptions) what instruments or forms of technology they think meteorologists use to gather data about severe weather such as hurricanes and tornadoes. The following websites offer information about hurricanes and tornadoes that is written in a student friendly manner:
http://skydiary.com/kids/hurricanes.html,
http://kids.earth.nasa.gov/archive/hurricane/index.html
http://www.hurricanehunters.com/index.html.

Working in groups of three or four, students should research different scientific discoveries (satellites, more accurate weather instruments, radar, etc.) that have helped society become better prepared for all types of severe weather including storms, tornadoes, flooding, etc. Have student groups write an essay about scientific discoveries which includes information about how satellites have helped society and how weather instruments are used to collect data for weather reports and help protect us from severe weather like hurricanes and tornadoes.

The following website offers information about satellites:
http://www.spacetoday.org/Satellites.html.

The following websites offer information about weather instruments and satellites:
http://www.weatherwizkids.com/wxinstruments.htm
http://www.ghcc.msfc.nasa.gov/GOES/
http://www.nhc.noaa.gov.

After completing the activity, students should prepare a severe weather checklist to share with peers and family members. The following website offers safety tips that could be used to create a severe weather checklist for both hurricanes and tornadoes:
http://www.weatherwizkids.com/hurricane1.htm.

The National Hurricane Center's website at www.nhc.noaa.gov can be accessed to obtain a list of suggested steps to take in preparing for a hurricane.

Sample Assessments

General Guidelines

Assessment techniques should include drawings/illustrations/models, laboratory investigations with reports, laboratory practicals (problem-solving and performance-based assessments), group discussion and journaling (reflective assessment), and paper-and-pencil tests (traditional summative assessments).

- Students should be monitored throughout the work on all activities via teacher observation of their work and lab notebook entries.
- All student-developed products should be evaluated as the unit continues.
- Student investigations should be evaluated with a rubric.
- For some multiple-choice items on written tests, ask students to write a justification for their chosen response.

General Assessments

- The student will simulate the water cycle by developing a model of land and ocean in a plastic box.
- The student will record in journals the role oceans play in our water cycle.
- The student will make rain gauges to measure precipitation, windsocks to measure wind speed, and wind vanes to show direction of wind.
- The student will record precipitation, wind direction, and wind speed in journals.
- The student will explain the difference between weather and climate.
- The student will record weather data in journals.

Activity-Specific Assessments

- Activity 1: Students will correctly draw and label a simple illustration of the water cycle using terminology including but not limited to *evaporation*, *condensation*, and *precipitation*.

- Activity 2: Have students record daily entries of weather conditions in their science learning logs. Students' entries will be checked daily for a specified amount of time. Award points for making daily entries that would include recording all the required information. Students will write science learning log entries predicting the weather for the next day. (Points should not be taken away for not correctly predicting the weather but should be given for a practical explanation of what the student thinks will happen with the weather.)

- Activity 3: Students should be able to write a brief paragraph explaining the difference between weather and climate with examples.