Georgia Performance Standards Framework

**Energy Unit:**
(Approximately 5 weeks)

**OVERVIEW:**
This unit focuses on students identifying sources, and describing uses, of light, heat, and motion energy. Energy is the ability of matter to move other matter or to produce a chemical change in other matter. If matter is in a “stationary” position its energy is potential. Energy. The movement of energy from one place to another is called radiation and, when matter moves, its energy is kinetic. There are six major forms of kinetic energy: wave (light), thermal (heat), mechanical (movement) along with electrical, chemical, and nuclear. Students should learn that all moving bodies produce mechanical energy or energy of motion, that heat energy results from an increase in motion, and light energy results from a decrease in energy. Energy, itself, cannot be seen, however its’ presence and transfer can be sensed and measured. For example our eyes detect the presence of light energy and if there is either too little we cannot see objects, or if there is too much we close our eyes. Similarly, our skin can detect heat and its amount. We can detect motion energy by pushing and pulling, or by observing the change in position of objects. In science we have tools and instruments that can be used to measure forms and amounts of energy such as light meters, thermometers, and scales. In their explorations, students should become familiar with how scientists can use their senses, tools, and instruments to make observations and collect data, And, through communication including reading, writing, and speaking students should experience science as scientists in sharing with others what they learn.

**STANDARDS ADDRESSED IN THIS UNIT**

**Focus Standard:**

S2P1. Students will identify sources of energy and how the energy is used.
   a. Identify sources of light energy, heat energy, and energy of motion.
   b. Describe how light, heat, and motion energy are used.
RELATED STANDARDS ADDRESSED IN THIS UNIT

S2CS2. Students will have the computation and estimation skills necessary for analyzing data and following scientific explanations.
   a. Use whole numbers in ordering, counting, identifying, measuring, and describing things and experiences.
   b. Readily give the sums and difference of single-digit numbers in ordinary, practical contexts and judge the reasonableness of the answer.
   c. Give rough estimates of numerical answers to problems before doing them formally.
   d. Make quantitative estimates of familiar lengths, weights, and time intervals, and check them by measuring.

S2CS3. Students will use tools and instruments for observing, measuring, and manipulating objects in scientific activities.
   a. Use ordinary hand tools and instruments to construct, measure, and look at objects.

S2CS4. Students will use the ideas of system, model, change, and scale in exploring scientific and technological matters.
   c. Describe changes in the size, weight, color, or movement of things, and note which of their other qualities remain the same during a specific change.
   d. Compare very different sizes, weights, ages (baby/adult), and speeds (fast/slow) of both human made and natural things.

S2CS5. Students will communicate scientific ideas and activities clearly.
   a. Describe and compare things in terms of number, shape, texture, size, weight, color, and motion.
   b. Draw pictures (grade level appropriate) that correctly portray features of the thing being described.
   c. Use simple pictographs and bar graphs to communicate data.

S2CS6. Students will be familiar with the character of scientific knowledge and how it is achieved. Students will recognize that:
   a. When a science investigation is done the way it was done before, we expect to get a similar result.
   b. Science involves collecting data and testing hypotheses.
   c. Scientists often repeat experiments multiple times and subject their ideas to criticism by other scientists who may disagree with them and do further tests.
   d. All different kinds of people can be and are scientists.

S2CS7. Students will understand important features of the process of scientific inquiry.
   Students will apply the following to inquiry learning practices:
   a. Scientists use a common language with precise definitions of terms to make it easier to communicate their observations to each other.
   b. In doing science, it is often helpful to work as a team. All team members should reach their own individual conclusions and share their understandings with other members of the team in order to develop a consensus.
**ENDURING UNDERSTANDINGS**

- The Sun warms the Earth’s land, water, and air. The Sun also provides much of Earth’s light.
- Evidence of energy of motion can be observed when an object moves from one place to another.
- Heat can be produced when two things are rubbed together.

**ESSENTIAL QUESTIONS:**

- Where do light, heat, and motion energy come from?
- How can we detect the presence of light energy?
- How can we detect the presence of heat energy?
- How can we detect the presence of motion energy?
- How do we use the energy of motion, heat, and light?

<table>
<thead>
<tr>
<th>MISCONCEPTIONS</th>
<th>PROPER CONCEPTIONS</th>
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<tbody>
<tr>
<td>• Heat only comes from a heater.</td>
<td>• Heat can be produced by rubbing two objects together or it can come from the Sun.</td>
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<tr>
<td>• Warm clothes are a source of heat.</td>
<td>• Warm clothes help us keep some of the heat produced by our bodies.</td>
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<tr>
<td>• Energy and energy sources are the same.</td>
<td>• An energy source such as a battery can be depleted, but energy itself is only transferred from one form to another. It is never “used up.”</td>
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### Culminating Activity

**By the conclusion of this unit, students should be able to demonstrate the following competencies:**

#### Culminating Activity:
Students will produce a working model of a real life object (ramp, roller coaster, bridge, etc.) and use it to demonstrate energy transfer with toy cars, marbles, or balls.

#### GRASPS

**Goal:** Your group will construct a model of an object that includes at least one ramp such as a highway on ramp or roller coaster. You will use this to demonstrate your knowledge of how energy is transferred from one object to another.

**Role:** Engineer

**Audience:** Role play: "Engineers" will demonstrate their model for the "city council" (classmates).

**Scenario:** You have been asked by your local government to design a project. The project can either be for recreation (roller coaster) or transportation (highway ramp).

**Product:** The product will include the model constructed by the students, as well as the presentation to the class (how their description and demonstration provide evidence of understanding).
## TASKS

The collection of the following tasks represents the level of depth, rigor and complexity expected of all students to demonstrate evidence of learning.

### TASK 1- Evidence of Energy? (Introduction to Energy)

**Essential Question:** How can we detect the presence of motion energy?

**Hook & Attention Getter:** Discrepant Event – move objects in room while kids are out. For example, slide a chair across the floor or tip over a small piece of furniture (gently). You may need to ask for help from another teacher or custodian to have this done while you are out of the classroom with the students.

**Description:** Ask the students to make a list of all the possible causes of the room being in disarray. Students should record their observations considering how they know something has happened in the room (What is the evidence?). Ask students to share aloud some of their possible explanations. Demonstrate some other examples of energy of motion. 1) Blow up a balloon without tying it. Ask students if it has any energy, then let it go after their response. 2) Stretch a rubber band and do the same (be sure to aim away from students). Give students some manipulative objects with which they can experiment. Examples might be small rubber balls, toy cars, etc. Ask students to work in pairs to demonstrate energy of motion.

**Resources:** Teacher Book - Stop Faking It: Energy by William C. Robertson

**Check for Understanding/Assessment:** Circulate around the room and have each pair show you their example of energy of motion. Students may use a graphic organizer to record their observations and conclusions.

### TASK 2- Evidence of Light & Heat Energy

**Essential Question:** How can we detect the presence of light energy? How can we detect the presence of heat energy?

**Hook & Attention Getter:** If your school has a set of solar powered calculators, use them for this lesson. Give the students a math problem for which they can use the calculator. As the get into working on it, ask them to use their fingers to completely cover the photo cells where the calculator collects light as its energy source. If the calculator does not have a back up battery, this should make the numbers on the screen disappear. Ask for several students to share an explanation of what happened.

**Description:** Students should have the opportunity to gather evidence of heat and light energy in the school or outdoors. Some examples of evidence would be feeling the heat of the sun in the bricks on the side of the building, solar powered objects that are working, food or beverage heated by a microwave oven, etc. They can record the examples and evidence on a T-chart graphic organizer or with a digital camera. Students should take turns reporting their evidence to the class. This may be done in a multimedia presentation if the students recorded their answers with a digital camera. Students may also post their T-charts and use highlighters to mark examples that are repeated.

**Check for Understanding/Assessment:** Did students report accurate evidence of heat and light energy?
**TASK 3- Energy of Motion**

**Essential Question:** How can we detect the presence of motion energy?

**Hook & Attention Getter:** Use marbles to demonstrate the fact that energy from one moving object can be transferred to another object making it move. If students have not played with marbles, they may have seen someone play pool, or they may have gone bowling.

**Description:** Students should have the opportunity to move one object and observe it moving another. Use a book to make a simple ramp by propping it up on another book. Students may roll a marble or small ball down the book/ramp and knock over a paper cup. Another way to do this would be to use toy cars and let one roll down hitting another. Students can use a ruler or tape measure to record how far the second object moved from its original spot.

**Check for Understanding/Assessment:** Students should be able to explain verbally or in a science journal entry that the motion of one object moving caused the other object to move.

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**Teacher Information and Resources**

**Children’s Literature:**
I Fall Down by Vicki Cobb
Flicker Flash by Joan Bransfield Graham

**Teacher Resource Books:**
Stop Faking It: Energy by William C. Robertson
Early Bird Energy: Light by Sally Walker
Early Bird Energy: Heat by Sally Walker
Dazzling Science Projects With Light & Color by Robert Gardner

**Websites:**
# T-Chart – Evidence of Heat & Light Energy

<table>
<thead>
<tr>
<th>HEAT Energy</th>
<th>LIGHT Energy</th>
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<tbody>
<tr>
<td>List the evidence you can find and the source of heat energy below.</td>
<td>List the evidence you can find and the source of light energy below.</td>
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</table>

(Example – Warm bricks on side of building Heat source is the sun.)