Fourth Grade Science Tasks

Earth Science

S4E1.

A. Research, view, and model patterns of stars. Create a presentation depicting models of common constellations (such as the Big Dipper, Orion, etc.). Show the attributes of the stars such as magnitude, color, position/patterns, and number. Explain how the pattern of the stars in the constellation do not change but the position of the constellation changes position periodically throughout the year. For example you may notice how the Big Dipper pattern of stars seems to rotate around the North Star and is in a different position at different seasons of the year. You may want to read some of the stories and myths about the Big Dipper (Big Bear) constellation.

B. Compare the similarities and differences of planets to the stars in appearance, position, and number in the night sky. Explain why the pattern of stars in a constellation stays the same, but a planet can be seen in different locations relative to the constellations at different times.

C. Relate stars to the sun by comparing attributes of stars in the night sky to those of the sun. Attributes include color, apparent size, distance from Earth and absolute size.

D. Challenge activity: Compare circumpolar and equatorial constellations to understand the Earth's rotation.

Resources for constellation, star, and sky maps: Science and Children, NSTA journal, http://www.nasa.gov, Sky and Telescope magazine, newspapers

S4E2.

A. Use a sphere such as a tennis ball and a flashlight to show how the moon's appearance changes. Draw a diagram to explain how the moon's shadow changes according to the Earth's path around the sun. Show the position of the Earth, sun, and moon at the time of a full moon, quarter moon, and a new moon. Keep a chart of the moon's shape throughout the year to see how long it takes for the moon to complete a cycle.

B. Record, over a period of time, the position on the horizon where the Sun's apparent rising and setting occur. Make predictions using models to explain the position where these will occur at a future date and observe the accuracy of your prediction. Times of the sun rising and setting are available through weather reports and in the newspaper. For example, find a reference point in your yard, or locate a window where the sun shines through in the morning (an eastern view). If you look out of the window when you get up in the morning for a period of time, you will notice that the sun appears to be in different places. That movement is a pattern. The same is evident at the end of the day. You can look out and observe where the sun is setting in your yard or visible through a window (a western view). The pattern of the sun setting is also evident. Explain your observations of the rising and setting sun in terms of your reference point. "The sun was up and shining brightly through the window in my kitchen this morning. The sun set over the swing set in my back yard before we ate dinner last night."

C. Measure the shadows of fixed objects such as a flag pole or telephone poles at different times of the day and record the orientation relative to North position and length (metric) of the shadows. Periodically throughout the year, repeat the activity to note how the shadow lengths and orientation change during the school year. Use what you know to model how the change in the sun's position results in shadows of changing lengths and orientations.

D. Explain how the rotation of the earth results in the night-and-day cycle. Explain how scientists determined that the Earth is moving, but the sun is not.
E. Use a model or labeled diagram to explain the reason for seasonal changes as it relates to the tilt of the Earth on its axis of rotation.
F. Model the solar system including planets, Earth's moon, and the sun. Use the model to show the relative size of each planet and their order from the sun.
G. Obtain pictures of distant objects in the sky (such as planets, stars, etc.) as viewed through a telescope or binoculars and compare to the unaided views of distant objects in the night sky. If possible, use a telescope, planetarium, and/or observatory to view the difference. Telescopic views of the night sky can be found online and in reference books. (Refer to resources in previous tasks.)

S4E3.

A. Research different forms of precipitation and sky conditions to explain rain, snow, sleet, hail, clouds, and fog.
B. Demonstrate how water changes states from solid (ice) to liquid (water) to gas (vapor) and changes from gas to liquid to solid. Use a thermometer that can measure temperatures at each of the state changes (below 0° Celsius and above 100° Celsius) and record at what temperature liquid water becomes ice or vapor. Diagram the water cycle depicting different states of matter and temperature changes.
    - Evaporation
    - Condensation
    - Precipitation
C. Investigate how clouds are formed. Keep a record to match the kind of cloud with the weather conditions and predict weather by observing cloud types.
D. Write a story about the journey of a drop of water through the water cycle.
E. Wet a portion of a sidewalk or chalkboard with a wet paper towel. Observe changes in the surface as it dries. Repeat this and time how long it takes for the water to disappear or evaporate. Then fan the wet area or use a hair dryer to see if the water evaporates at a different rate.
F. Try other areas and conditions to observe the changes in evaporation when the weather is hotter. (The temperature is higher.)

Resources for weather include newspapers, media reports on television and radio, and online reports and information from sites such as the Weather Channel's http://www.weather.com.

S4E4.

A. Collect and chart weather data using weather instruments such as thermometer, wind vane, anemometer, barometer, and rain gauge. Compare data seasonally throughout the year to note changes of weather data. For example, you could graph the temperatures for a week in August or September, a week in November or December, a week in February or March, and a week in April or May and compare.
B. Use a wind sock, or make a wind speed detector. Tape strips of tissue paper to the end of a pencil. Hold it up to detect wind. A common wind speed instrument used to calculate wind speed is an anemometer. A common wind scale is Beaufort's Wind Scale.

C. Record the wind speed and direction for a period of time. Compare your data to the information given by weather forecasters in newspapers, radios, internet, and television reports.

D. Cut a circle (10 cm diameter) out of paper. Cut the circle into a spiral. Tie a piece of thread to the middle end of the spiral of paper. Hold it over a heat source such as a light bulb. Note the movement. Move the spiral away from the heat source. Note the movement. Relate this movement of heated and cooled air to explain wind patterns.

Resource information:

Beaufort Wind Scale: http://www.stormfax.com/beaufort.htm

How to make an anemometer: http://www.energyquest.ca.gov/projects/anemometer.html

E. Observe, record, and interpret weather conditions to predict weather patterns. Keep a class weather journal or class weather calendar periodically throughout the year:
   - Seasonal weather charts
   - Daily weather maps in a sequence to search for patterns
   - Data you collect from weather instruments (thermometer, wind vane, rain gauge)
   - Media weather reports (television, radio)
   - Events such as thunderstorms, tornadoes, hurricanes, blizzards, etc.

F. Use the information you collect about weather events to inform others about severe weather and steps to take in the event of severe weather.

G. Chart and graph the weather data you collect. Match your findings with the data on other weather reports.

H. Use your observations, journal entries, weather maps, and other data to make predictions about the weather. Explain what information you used to make your prediction. Compare the accuracy of your predictions to the predictions of weather forecasters. Explain the similarities and differences of the predictions in terms of accuracy.

I. Construct simple weather instruments to collect measurements. Compare your homemade instrument measurements with weather reports. Draw conclusions about the accuracy of your instruments and the measurements.

J. Invite a local weather forecaster or meteorologist to discuss weather data, weather maps, and/or weather forecasting.

K. Use the seasonal weather charts (temperature highs and lows; precipitation, etc.) to draw conclusions about weather patterns and seasonal changes in your region of Georgia compared to weather patterns and seasons in other parts of Georgia and other parts of the United States. Relate your conclusions about weather patterns and seasonal changes to the climate of your area. Explain the difference between weather and climate.

Physical Science

S4P1.

A. Use a mirror to catch a beam of light (flashlight, overhead projector, sunlight) and redirect it. Partner with another student with a mirror to reflect the beam from one mirror to the next mirror to a specific target on the wall. Challenge: See if the class can use mirrors to reflect the light from mirror to mirror from one location to a location down the hall.

B. Brainstorm a list of items that reflect light. Record their physical attributes.

C. Explain reflection using geometric terms such as angle, line, point. Use a mirror and a picture to show symmetrical patterns or locate a line of symmetry.

D. Observe and record the refractive differences between convex and concave lenses. Lenses are found in magnifiers, microscopes, telescopes, binoculars, reading glasses, cameras, etc.
E. Use a prism to see the colors in white light. Observe other ways that light is broken into colors such as oil on mud puddles, by raindrops creating a rainbow, diffraction gratings, etc.
F. Investigate the absorption of light using different colors of materials in sunlight. Fasten a piece of black paper to a piece of aluminum foil to create a pouch. Put your hand in the pouch and face each side to sunlight. Which one reflects the light? Explain what you notice about the temperature that you feel. Measure the temperature when different colors of construction paper (light to dark) are placed on a thermometer and left in sunlight. Graph the temperature readings according to the different colors of paper. Use the information to explain the difference between reflection and absorption.

S4P2.

A. Hold a ruler flat on a table so that part of it hangs off the side. While holding one end of the ruler, flip the other end and show how it vibrates to make a sound. Vary how much of the ruler is off the side of the table. Listen to the difference in pitch.
B. Begin a tuning fork vibrating and place the tines in a glass of water. See the waves produced by the vibrations. Use different sized tuning forks to discover how the vibrations vary.
C. Put a rubber band around a small glass so that it is over the open end. Pluck the rubber band to see it vibrate. Put water in the glass. Pluck the rubber band again to see the evidence of vibrations in the water.
D. Cover a pie plate with clear plastic wrap. Place grains of sand, sugar, or salt on the wrap. Talk or sing or cause sound directed to the top of the pie plate. The vibrations will cause the grains to move.
E. Hold a rubber band stretched between your teeth and a finger. Carefully pluck the rubber band to hear the sound and feel the vibrations.
F. In small groups, experiment with different lengths of string, glasses filled with different amounts of water, different sized bells, etc. in order to produce different sounds. Draw the pattern you notice about how the size of an instrument or depth of liquid affects the sound produced.
G. Put a rubber band over a cup or the open end of a small box such as an open milk carton. Pluck the rubber band. Stretch the rubber band and pluck it again. Notice how the pitch of the sound changed.
H. Flatten the end of a plastic straw. Cut the corners off of the flattened end. With practice, you can produce a sound by blowing into the straw. Clipping off the straw will make the pitch change.
I. Blow over a soda bottle to make a sound. Adding water to shorten the column of air causes the pitch to change.
J. Tap a glass of water. By adding or removing water, you can change the pitch. Make a scale of water glasses and try to play a tune.
K. Make classroom instruments out of unbreakable materials that vibrate—rubber bands, rulers, pencils tapping cups with different amounts of water, straws, wax paper on combs, voice box.
L. Manipulate the classroom instruments to change pitch (High pitched sounds have more vibrations than low pitched sounds.) Explain how the length of the instrument or depth of liquid determines the pitch of the sound.

M. Make tin can or shoe box guitars. Put a string tightly across the opening or use different sizes of rubber bands. Use a pencil as a bridge for the string or rubber band to vary the tension. Discuss how the pitch is affected by the length of the string, width of the rubber band, string tension, or size of the can or box.

N. Demonstrate how pitch can be made higher or lower depending on the length of the instrument or the length of the air column. Draw, illustrate or find pictures of different instruments and tell how they are used to vary the vibrations and sounds they make. For example, by covering more holes on the clarinet, saxophone, or flute, the air column is lengthened and the pitch is lower. The piano strings for lower pitches are longer and thicker than the higher pitched strings.

S4P3.

Teacher note: The use of mathematical formulas is not recommended in S4P3. Fourth grade students should carry out investigations to provide a foundation of concrete experience for the abstract understandings of physical science in upper grades.

Sample Tasks:

A. Investigate and demonstrate how force applies to various activities, such as batting a softball, kicking a soccer ball, hitting a golf ball, or throwing a tennis ball.

B. Roll a toy car or marble beside a meter stick along a smooth surface such as a desktop or table. Record how far it travels when you push it lightly and when you increase the force you apply. Use what you discover to explain what happens to the speed or direction of an object when a greater force than the initial one is applied.

C. Repeat the investigation using a long ramp and a toy car or marble. (Any small sphere can be used.) Measure the distance the car or marble travels when one end of the ramp is 10 centimeters from the floor. Create a graph to record how far the car or marble travels each time you raise one end of the ramp another 5 centimeters to increase the angle of the ramp. Use your graph to predict how far the car or marble will roll when the ramp is positioned at different angles. Test your predictions and write an explanation based on your data.

D. Repeat the investigation, but increase the mass of the toy car or use a heavier marble. Compare the distances. Explain what you found out.

E. Place a plastic cup on its side at the bottom of the ramp so that it will catch the rolling object. Mark the position of both the bottom of the ramp and the cup. Roll the toy car or marble down the ramp into the plastic cup. Measure and record the distance the cup moved. Change the angle of the ramp, roll the toy car, and note differences. Change the mass of the car/marble and note the difference. Remember to only do one change at a time. Gather data changing the angle or changing the mass, but don't do both at the same time. Each one of those will vary the results (variable). Only changing one thing at a time is called controlling the variables or what you vary to get your results. Make a graph of your findings to share with the class.

F. Use what you have learned to explain the difference between a car, a large truck, and a motorcycle rolling down a ramp. Use the terms force, speed, and motion in your explanation.

G. Research scientists in history who studied force and motion such as Sir Isaac Newton, Galileo, etc.

H. Investigate how people use simple machines to solve problems. Use what you know about force, mass, and the motion of objects to explain why simple machines help people do work more easily.
I. Observe, record, and describe the effect of gravity on the motion of an object by:
    - Rolling a ball up or down a hill
    - Rolling a ball down a ramp and changing the incline of the ramp
    - Throwing a ball
    - Dropping a ball
J. Draw a diagram to show how the objects in Task I are affected by the force of gravity.

Life Science

S4L1.

A. Brainstorm a list of organisms in three columns: producers (plants), consumers (plant eaters and animal eaters), and decomposers (fungi, beetles and other organisms). Discuss the roles they each hold in a community (ecosystem).
B. Choose a location on the school grounds to study a small community of organisms. Observe and keep a journal recording the kinds and numbers of organisms, their role in the community, and how they meet their needs. (Not all roles of the community may be found.) Predict how the mini-ecosystem would be affected by changes in
    - Light
    - Temperature
    - Soil composition
    - Nutrients and water
    - Number of organisms
    - An increase or decrease in consumers (plant or animal eaters)
C. Relate an ecosystem's capacity to support life according to the amount of food or solar energy available. Use cause and effect to predict what happens to an area if some of the plants or animals are scarce or if there are too many. For example, your school paves an area for a parking lot. The organisms that used the plants from that area for food and/or shelter will have to find another source of food and/or habitat or die. The cause is the paving of the parking lot took away the food source. The effect is that the organisms move or die.
D. Create a compost pile in a location on the school grounds. Record changes in the decaying organisms over time and the new organisms that appear.
E. Choose an organism and research its life cycle including how it gets energy and produces energy for other organisms.
F. Identify ways plants and animals are dependent on one another other than food, such as
    - Seed dispersal of plants
    - Pollination of plants (wind, water, insects, animals, etc.)
    - Shelter
    - Protection
G. Research each of these noting the organisms involved. Compile an illustrated booklet with the organisms showing examples of each.
H. Brainstorm a list of organisms in three columns: producers (plants), consumers (plant eaters and animal eaters), and decomposers (fungi, beetles and other organisms). Choose some organisms from each column and write their names on a strip of paper. Generate an energy

chain depicting the flow of energy (via the food chain) by linking the paper strips to show each step of the food chain in a paper chain. Use the paper chain to draw a diagram of how the energy flows from the sun through the food chain and label the organisms according to the role they play.

I. Refer to particular food chains and predict what would happen to other organisms if a link in the chain disappeared. Write a story about a year without plants and the products from plants (wood, bread, shade, rubber, etc.) to explain the importance of this energy source.

J. Use what you know about food chains and food webs to explain the energy cycle.

S4L2.

A. Research organisms that have external features such as camouflage of a fawn, protection such as poison or venom of a snake or spider, or behavior such as hibernation of a black bear that allow them to survive and reproduce better than organisms that don't have these features. Create a display to show how adaptation can affect the survival of an organism.

B. Choose a common organism in your area to observe. List how it is similar or different from other organisms of the same kind by the way it behaves or its external features.

C. Make a terrarium and observe the diversity of organisms that it supports. Design an experiment to determine the effect of changing the habitat to show benefits or harmful effects. Choose only one change to monitor. This is called controlling variables. When you vary one thing to get a new result, it is called a variable. Choose a varible such as change in temperature, addition of fertilizer, change in the amount of light, change in the number of organisms, change in the kind of organisms, change in the amount of water, etc. Keep a journal to record your observations. Share your findings with the class.

D. Use evidence (from fossils, reference materials and Internet) to research the geological record to identify factors that may have led to extinction of some organisms.

E. Discuss the conditions that lead to endangered and extinct organisms. Devise a plan to protect or publicize the protection of endangered organisms in your area.

F. Relate how the organisms that live in your area have external features adapted to survive using factors such as, but not limited to,

- Weather conditions (hot summers, cold winters, dry, wet)
- Light
- Food
- Shelter (Plants versus earth materials)
- Water (salt water versus fresh water)

G. Write a story about an organism that goes on vacation to another region. Explain what that organism would have to pack in its suitcase to survive.