

Effects of the Sun on Our Planet

Supplemental science materials

for grades 2 - 4



These supplemental curriculum materials are sponsored by the Stanford SOLAR (Solar On-Line Activity Resources) Center. In conjunction with NASA and the Learning Technologies Channel.









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Table of Contents

Teacher Overview

Objectives
Science Concepts
Correlation to the National Science Standards
Segment Content/On-line Component Review
Materials List

Explorations

Science Explorations

- Sunlight and Plant Life
- Life in a Greenhouse
- Evaporation: How fast?
- Now We're Cookin'!

Career Explorations

Solar Scientist

Answer Keys

- Student Reading: Sunlight for Our Life
- Student Worksheet: Sunlight for Our Life
- Science Exploration Guidesheet: Sunlight and Plant Life
- Science Exploration Guidesheet: Life in a Greenhouse
- Science Exploration Guidesheet: Evaporation: How fast?
- Science Exploration Guidesheet: Now We're Cookin'!

Student Handouts

- Student Reading: Sunlight for Our Life
- Student Worksheet: Sunlight for Our Life
- Science Exploration Guidesheet: (Generic form)
- Career Exploration Guidesheet: What does a solar scientist do?

Appendix

- Solar Glossary
- Web Work





- Objectives
- Science Concepts
- Correlation to the National Science Standards
- Segment Content/On-line Component Review
- Materials List



Objectives

- Students will observe how technology (through a greenhouse and photovoltaic cells) can enhance the solar energy Earth receives.
- Students will observe how the sun's radiant energy causes evaporation.
- Students will develop an understanding of the role evaporation plays in the weather cycle.
- Students will determine through observation that the sun's energy provides what plants need for growth.

Science Concepts

- Energy from the sun provides Earth with light, heat, changes in the atmosphere and evaporation.
- Solar energy can be converted to other forms of energy such as electricity and food.
- The sun's heat affects our weather cycle through the process of evaporation.
- We can control the amount of the sun's heat through a greenhouse.
- A solar scientist studies the effects of the sun's energy on the Earth.



Correlation to the National Science Standards

This segment of the Webcast All About the Sun, "Effects of the Sun on Our Planet", is brought to you by a correlation to the National Science Standards for grades 2-4 as delineated below.

Grades 2 -4

Unifying Concepts and Processes

- Systems, order and organization
- Evidence, models and explanation
- Change, constancy and measurement

Science as Inquiry

- Abilities necessary to do scientific inquiry
 - Ask a question about objects, organisms, and events in the environment
 - Plan and conduct a simple investigation
 - Employ simple equipment and tools to gather data and extend the senses
 - Use data to construct a reasonable explanation
 - Communicate investigations and explanations
- Understandings about scientific inquiry

Physical Science

- Properties of objects and materials
- Light, heat, and electricity

Life Science

- The characteristics of organisms
- Organisms and environments

Earth and Space Science

- Properties of earth materials
- Objects in the sky
- Changes in the earth and sky

Science and Technology

- Abilities of technological design
 - Identify a simple problem
 - Propose a solution
 - Implementing proposed solutions
 - Evaluate a product or design
 - Communicate a problem, design and solution



Correlation to the National Science Standards (continued)

Science in Personal and Social Perspectives

- Types of resources
- Changes in environment
- Science and technology in local challenges

History and Nature of Science

• Science as a human endeavor





Segment Content/On-line Component Review



Teacher Overview

Materials List

Science Exploration

• Sunlight and Plant Life

- 3 6 identical small plants (per group)
- 2 5 boxes (large enough to cover plants, per group)
- camera and film for class (optional)
- observation chart (one per group)

• Life in a Greenhouse

Note: Materials listed are per group. Exploration can be accomplished with two jars: one with a clump of moist grass and the other empty. Place one air temperature thermometer outside jars for temperature reading and then one inside each jar. Or it can become more complex using one empty and one grass clump jar placed in each location.

- 2 4 clumps of grass
- 4 8 identical glass jars with lids that screw on tightly
- 3 9 air temperature thermometers
- observation chart

• Evaporation: How fast?

Note: Materials listed are per class. The number of containers used is dependent upon the number of places the class wishes to observe.

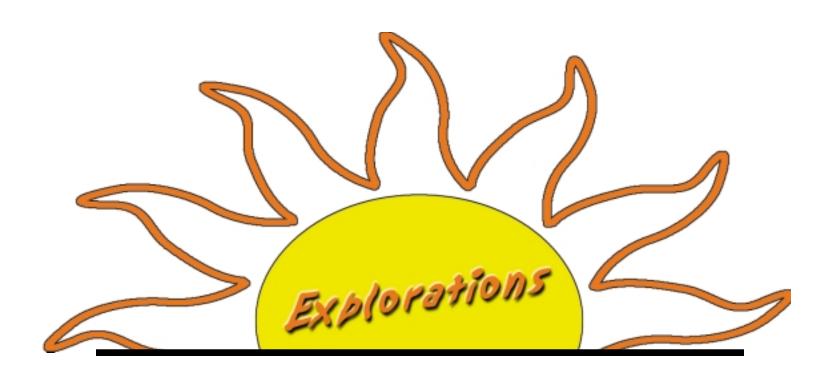
- # of water containers (about the size of a standard glass or clear, plastic cup)
- # of thermometers (dependent upon the number of places the class wishes to place)
- pen (to mark water level on containers)
- observation chart

Now We're Cookin'!

Note: The materials listed need to be gathered per group.

- aluminum foil
- 4 paper cups (not waxed)
- white paper
- black paper
- scissors
- newspaper
- apple slices
- 2 thermometers
- tape
- plastic wrap





Science Explorations

- Sunlight and Plant Life
- Life in a Greenhouse
- Evaporation: How fast?
- Now We're Cookin'!

Career Explorations

- Solar Scientist
- Solar Astronomer



Science Explorations

Sunlight and Plant Life

Purpose: Students design a classroom experiment to determine in which kind of light it is best

for plants to grow. Students will observe the effects of different types of light upon

plant growth.

Activity description:

Engage the students in a discussion about what plants provide humans and how important plant life is to our basic needs. Move from there to discussing what plants need for survival (water, nutrients and light). Have them consider the importance of light to plants by sharing observations they have previously made about light, plants and their growth. Lead them to entertain the idea of what kind of light is best for plants. Guide them through the process of designing an experiment to test their ideas (see the Student Handout "Sunlight and Plant Life Guidesheet"). Encourage them to think of all different types of light (fluorescent, full spectrum lightbulbs, blacklights, lasers, sunlight, no light, different wattage of household lightbulbs, different colored lightbulbs).

Set up as many different test sites as possible to test each type of light using large boxes, small identical plants, different types of lighting. Assign a small group or partners to each test site and have that team observe, record and report their observations. Run the experiment for as long as necessary in order for the students to observe a change in the plants' growth. Take photos every other day for comparison. Measure the size of the leaves and/or stems, or measure the height of each plant every other day. Have the students create charts or graphs displaying the information and at the end of the test draw conclusions about the effects of sunlight and artificial light on plant growth.

Life in a Greenhouse

Purpose: Students create 2 mini-greenhouses one with plant life and one without, measure

the temperature inside and outside of each, and compare the readings. Students

will observe what a "greenhouse effect" is.



Science Explorations (continued)

Life in a Greenhouse (continued)

Activity description:

Using large, clear glass jars with lids that firmly screw on, punch a hole in the top of each lid. For a variation to this use two glass jars made of brown or green glass. Make sure that the hole is just large enough through which to slide an air temperature thermometer. Wrap a piece of clear tape a few times around the thermometer at its halfway point and it will keep the thermometer from accidently slipping all the way through the hole when taking a reading. Using 2 long strands of tape secure the air temperature thermometer to each lid. Note: Students may choose to substitute smaller size jars, an aquarium, a terrarium or a well-sealed, clear plastic cup.

Using the 2 identical jars, place a clump of very moist dirt with grass in one jar (make sure that the jar is not more than one-third to one-half full) and leave the other one empty. Screw on the lids tightly and insert an air temperature thermometer into each hole making sure that the thermometers are safely secured. Place tape around the hole to seal the hole as much as possible. Set the two jars in the windowsill where sunlight can reach them or place them in direct sunlight outside during the day (make sure they are brought in at night). Next to the 2 jars place another air temperature thermometer. During the week (whether it is sunny or not) take hourly readings and record the temperatures of all 3 thermometers. Also, record any observations regarding the weather, type of sunlight reaching the jars as well as the appearance of the inside of each jar. Record these observations on large chart paper.

At the week's end have the students make a graph depicting each thermometer's readings per day noting the highest temperature and the lowest temperature recorded per day. Or have a daily graph that shows all 3 thermometer readings noting the highs and lows.

At the week's end discuss the following points with the class as the exploration's conclusions are being drawn:

- Compare the temperatures:
 - Which thermometer recorded the highest temperatures?
 - Which thermometer recorded the most consistent temperature throughout each day?
 - Which thermometer recorded the greatest difference between high and low readings each day?
 - How was the appearance of dirt and grass jar different from that of the empty jar?
 - What do you think caused that difference in appearance?
 - Why do you think the glass jars had higher temperatures than the outside thermometer?
 - If the lid on the jars had another hole that was not blocked, do you think the temperature inside the jar would be higher or lower? Why?
 - In your own words describe the effect that happens inside a greenhouse.



Science Explorations (continued)

Evaporation: How fast?

Purpose: Students will observe the rate at which water evaporates in different environments and at different temperatures.

Activity description:

Using 4 identical, clear beakers or glasses, pour the same amount of water into each container (Record the amount of water used) and mark on the container the water's level by vertically sticking a piece of masking tape to the outside. Place the containers as indicated below:



- container #1 in the refrigerator (uncovered)
- container #2 in the classroom (uncovered and not in direct sunlight)
- container #3 outside in direct sunlight (uncovered, but not left exposed to precipitation on days of inclement weather)
- container #4 in a "mini-greenhouse" or terrarium environment

During the course of the next week or two, at the same time each day observe the water level in each container and record the level by marking the water's level directly on the container. After the last day, measure the amount of water remaining in each container and record.

Add an air temperature thermometer next to each beaker and record the daily temperature at each station.

Have students create a graph or chart that depicts the changes in the water level for each container. Use the *Science Exploration Guidesheet: Evaporation: How Fast?* from the **Answer Keys** section as students process through this exploration.

• Now We're Cookin'!

Purpose: Students will use the process of technological design to create a "solar-powered" method to cook a small slice of apple. Students will also develop an understanding for how the technological design process works to solve problems and affect our lives in a positive way.

Activity description:

Given the materials listed below, students will build a "solar cooker" that will cook a slice of apple in about 2 – 4 hours. Use the *Science Exploration Guidesheet: Now We're Cookin'!* from the **Answer Keys** section for the procedure. Follow-up with the discussion prompts given below.



Science Explorations (continued)

Now We're Cookin' (continued)

Activity description (continued)

- Observe the apple slices from each cooker after each hour and determine which solar cooker is cooking the apple slice in the shortest amount of time. Discuss why this might be happening.
- Why did we use aluminum foil in the cooker? (To reflect and concentrate the heat.)
- Have the students graph the temperature changes during the cooking process.



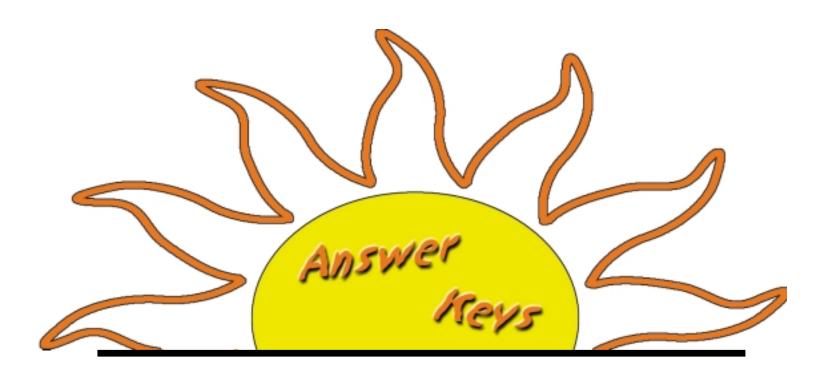
Career Explorations

Web site review
 Have the students read the brief biographies found on the Web site

http://solar-center.stanford.edu/webcast/bio/solar

to become more familiar with solar scientists and their work.

 Web cast review
 After the students view the Web cast on-line or participate in an on-line question and answer session, have them complete the Career Exploration Guidesheet: What does a solar scientist do?



- Student Reading: Sunlight for Our Life
- Student Worksheet: Sunlight for Our Life
- Science Exploration Guidesheet: Sunlight and Plant Life
- Science Exploration Guidesheet: Life in a Greenhouse
- Science Exploration Guidesheet: Evaporation: How fast?
- Science Exploration Guidesheet: Now We're Cookin'!



Sunlight for Our Life - Key

We need the



 $\underline{e} \underline{n} \underline{e} \underline{r} \underline{g} \underline{y}$ we get from the



 $\underline{s} \underline{u} \underline{n}$. Solar energy is used by



 $p \underline{l} \underline{a} \underline{n} \underline{t}$ s to grow. Heat from the



s u n makes the air move around. The sun's radiant



<u>е n e r g y</u> also causes evaporation.

Scientists have learned how to collect the sun's



 $\underline{e} \underline{n} \underline{e} \underline{r} \underline{g} \underline{y}$ and change it into



electricity.

Most plants need



<u>s</u> <u>u</u> <u>n</u> light to grow.





Using a special process called photosynthesis,





plant changes the



s <u>u</u> <u>n</u> light into



food that helps the



plant to

grow. People and animals use plants for





Without the sun's $\left| \underbrace{e \, n \, e \, r \, g \, y} \right|$ plants would not

grow. We would not have



 $\underline{f} \underline{o} \underline{o} \underline{d}$ to eat without

the sun's energy.

All around the



e <u>a r t h</u> is a layer of air called

the atmosphere. During the day heat from the

Student Reading



 $\underline{s} \underline{u} \underline{n}$ warms the Earth's



 $\underline{a} \underline{t} \underline{m} \underline{o} \underline{s} \underline{p} \underline{h} \underline{e} \underline{r} \underline{e}$. This makes the air move around. When

air moves we call that



 $\underline{w} \underline{i} \underline{n} \underline{d}$. People have used

the power of the



 $\underline{w} \underline{i} \underline{n} \underline{d}$ to move ships on the



ocean.

We also use the wind to turn giant wind machines that

make



<u>electricity</u> and to fly kites.

The



<u>s u n</u> also warms the



<u>water</u>

in our oceans and lakes. This causes the



<u>water</u>





to evaporate. That means that a liquid

changes into a gas. The



<u>water</u> is a liquid. As

the



<u>s</u> <u>u</u> <u>n</u> warms the water,

it turns into water vapor (a gas) and rises into the



 $\underline{a} \underline{t} \underline{m} \underline{o} \underline{s} \underline{p} \underline{h} \underline{e} \underline{r} \underline{e}$. Later the water vapor cools. It falls

back down to the



<u>e a r t h</u> as



<u>rain</u>

or



<u>s n o w</u> .

Scientists have learned how to turn sunlight into



e lectricity. We use special technology





called



 $\underline{s} \underline{o} \underline{l} \underline{a} \underline{r}$ cells to collect the sun's



 $\underline{e} \ \underline{n} \ \underline{e} \ \underline{r} \ \underline{g} \ \underline{y}$. The cells then change the energy into



electricity for power to run

many things.



<u>s o l a r</u> cells placed in special

panels called arrays. We can heat water for our homes and swimming pools using these solar panels. Solar



 $\underline{a} \underline{r} \underline{r} \underline{a} \underline{y} \underline{s}$ are used in space as well as on



<u>e a r t h</u> . Space stations turn solar energy into



<u>e l e c t r i c i t y</u> that powers the space station.



We depend on the



e n e r g y from the



 $\underline{s} \underline{\upsilon} \underline{n}$ in many different ways. The sun's

energy gives us food, heat, weather and



electricity.

Student Worksheet

Sunlight for Our Life - Key

Directions: Fill in each blank to complete the sentence. Use the reading Sunlight for Our Life to help you find the correct answer.

- 1. Energy from the sun is called **RADIANT** energy.
- 2. Solar panels are also called solar ARRAYS.
- 3. A plant changes the sunlight into energy using a special process called PHOTOSYNTHESIS.
- 4. People and animals use plants for FOOD.
- 5. The layer of air that surrounds the Earth is called the ATMOSPHERE.
- 6. The sun warms the Earth's atmosphere and causes the WIND.
- 7. The sun causes the water on Earth to **EVAPORATE**.
- 8. Solar cells can change the sun's energy into **ELECTRICITY**.

Sunlight and Plant Life - Key

Directions: Decide how you and your partner or group will explore the effects of light on plant

growth by answering each question below.

Teacher's note: Below is simply a general idea of the kind of responses you would be looking

for as students work through this exploration.

1. What science idea does your class want explore?

The effect of sunlight or light on plant growth.

2. What question or questions do you want answered by this science exploration?

- What kind of light do plants grow best in?
- Is there a difference between sunlight (natural light) and other kinds of light (artificial light) on plant growth?
- Can plants grow in light other than sunlight?
- Do plants need light to grow?

3. Describe in general how your class will answer this question or explore this idea?

We will take the same kinds of plants and put them under different types of light and no light and observe their growth over a certain amount of time.

4. List step-by-step how you will answer this question.

- Gather materials (see list below)
- Decide what we will observe and measure
- Set up each test station the same way and be clear on how many minutes of light each plant will get
- Make and record observations at the same time each day (or at a pre-determined interval)
- Share and discuss findings

5. List the materials you or your group will need to follow those steps.

- # of identical plants
- #same number from above for light sources
- same number as above for boxes (with the exception of the direct sunlight plant)
- Observation charts for recording

Sunlight and Plant Life - Key (continued)

- 6. What kind of observations will you make during this science exploration?
 - Measure the height of the plant (What units will you measure with?)
 - Color of the plant's leaves and stems
 - Size of the plant's leaves
 - Length of each plant's stem
 - Take photos
- 7. What kind of measurements will you make during this science exploration?
 - Measure the height of the plant (What units will you measure with?)
 - Size of the plant's leaves
 - Length of each plant's stem
- 8. On a separate sheet of paper create a chart which you will use to record your observations. See next page for a sample.
 - Record your observations on the chart and report your findings to the class.
 - At the end of the science exploration create a special report to give to the class. Follow the form your teacher gives you.

See sample next page.

What did you learn from this science exploration?

That plants grow best in sunlight or natural light. That artificial light does not seem to give the plants all that sunlight gives. That plants need light to grow because without light this plant dies.

- Does this lead you to any other questions? Write down one or two of your questions below.
 - Does sunlight have something special that plants need and that artificial light does not have?
 - Will a plant grow more if it gets more sunlight?
 - Is direct sunlight better than indirect sunlight for plant growth?

Plant Observation Chart

| Type of Light: | | | | | |
|---|---------------|--------------|---------|--|--|
| Type of plant: | | | | | |
| Question to be answ | ered: | | | | |
| | | | | | |
| Starting measuremen | nts and data: | | | | |
| Plant height: | | Plant width: | | | |
| Leaf sizes: | Leaf #1 | Leaf #2 | Leaf #3 | | |
| Stem lengths: | Stem #1 | Stem #2 | Stem #3 | | |
| Description of overall condition of plant: Photo of plant: | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| Date/Day # of Test measurements description photo Time (same as above) of plant condition | | | | | |

Special Report Form

Show the plant photos of each observation and briefly give a description of the plant's overall condition.

Create a chart or graph that shows the growth of the plant (height, width, stem/leaf size, color)

Give a conclusion based upon your data and answer the question from this science exploration.

Life in a Greenhouse - Key

Directions: Decide how you and your partner or group will explore the effects of light on plant

growth by answering each question below.

1. What science idea does your class want explore?

A greenhouse is used to grow plants and it has something to do with the sun.

2. What question or questions do you want answered by this science exploration?

- Why is a greenhouse used to grow plants?
- What makes a greenhouse different from my house?
- What's so special about a greenhouse?
- Is there a relationship between the sun and a greenhouse and plants?

3. Describe in general how your class will answer the question(s) or explore this idea.

Our class will visit a greenhouse, talk to people who grow plants, and do some other kinds of research about greenhouses. We will build a model of a greenhouse and observe what happens inside it.

4. List step-by-step how you will answer the question(s).

- Gather materials (see list below)
- Decide what we will observe and measure
- Set up our greenhouses
- Place them in different settings around the classroom or outside
- Make and record observations at the same time each day or at pre-determined intervals
- Share and discuss findings

Life in a Greenhouse - Key (continued)

- 5. List the materials you or your group will need to follow those steps.
 - # of identical clumps of moist dirt with grass
 - # (twice the amount of grass clumps) of glass jars (or whatever the students choose as a substitute)
 - 3 thermometers per group (1 per mini-greenhouse and one for outside of the greenhouses)
 - observation chart for recording
- 6. What kind of observations will you make during this science exploration?
 - Appearance of inside and outside of jar
 - Temperature inside both mini-greenhouses and outside
- 7. What kind of measurements will you make during this science exploration?
 - Temperature inside both mini-greenhouses and outside of each

Life in a Greenhouse - Key (continued)

8. On a separate sheet of paper create a chart which you will use to record your observations.

See next page for a sample.

- 9. Record your observations and report your findings to the class.
- 10. At the end of the science exploration create a special report to give to the class. Follow the form your teacher gives you.

See next page for a sample.

11. What did you learn from this science exploration?

That the temperature of a greenhouse is warmer inside than the outside air temperature whether the sun is shining or not. The heat from the sun must get trapped in the greenhouse and that is why it stays warmer inside than outside. The mini-greenhouse with plants had moisture inside the mini-greenhouse (condensation on glass), but not the empty mini-greenhouse. The plants must have an effect on moisture in the mini-greenhouse.

- 12. Does this lead you to any other questions? Write down one or two of your questions below.
 - Will darker glass on the greenhouse make it cooler or warmer inside?
 - If the greenhouse is in darkness will it still be warmer inside than outside?
 - Is there a way to increase the amount of heat the greenhouse could keep in to make it even hotter?

Evaporation: How fast? - Key

Directions: Decide how you and your partner or group will explore the effects of the sun's

energy on water.

1. What science idea does your class want explore?

Evaporation

2. What question or questions do you want answered by this science exploration?

- Does water evaporate at different rates?
- What factors effect the evaporation rate of water?
- Does the environment have an effect on how fast water evaporates?
- Does the air temperature have an effect on how fast water evaporates?
- Does the amount of sunlight have an effect on how fast water evaporates?

3. Describe in general how your class will answer the question(s) or explore this idea.

We will pour the same amount of water in the same kind of container, mark the water level and place the containers in different areas in the classroom and outside. Some of the containers will be in the sun and some will be in shade. Some of the containers will be in cold places some in warm places. We will mark the change in the water level each day at the same time.

4. List step-by-step how you will answer the question(s).

- Gather materials (see list below)
- Decide the location of each container (list those)
- Decide how long
- Measure and pour the same amount of water into each container (give the amount)
- Record the beginning amount of water and the location of each container on your observation chart
- Mark on each container the beginning water level
- Place each container at its location and next to each container place an air temperature thermometer (if this information will assist in answering the question)
- Observe each container at the same time each day (give the time)
- Mark the water level on each container during those observations
- Note the temperature reading on the thermometer
- Note any other observations (amount of sunlight or type of sunlight)

Evaporation: How fast? - Key (continued)

- 4. List step-by-step how you will answer the question(s).
 - Record your observations
 - At the end of the exploration, measure the remaining amount of water in each container and record
 - Discuss the results
- 5. List the materials you or your group will need to follow those steps.
 - # of containers (dependent upon # of places the class wishes to place)
 - # of thermometers (dependent upon # of places the class wishes to place)
 - pen (to mark water level)
 - observation chart
- 6. What kind of observations will you make during this science exploration?
 - Type of day
 - Amount of sunlight
 - Air temperature
 - Water level
- 7. What kind of measurements will you make during this science exploration?
 - Air temperature
 - Water level
- 8. On a separate sheet of paper create a chart which you will use to record your observations.

See sample below.

- 9. Record your observations and report your findings to the class.
- 10. At the end of the science exploration create a special report to give to the class. Follow the form your teacher gives you.



Evaporation: How fast? - Key (continued)

11. What did you learn from this science exploration?

- The warmer the air the faster the evaporation rate
- The drier the air the faster the evaporation rate
- The more moisture in the air the slower the evaporation rate
- The more direct sunlight the faster the evaporation rate

12. Does this lead you to any other questions? Write down one or two of your questions below.

- Does the surface area of the water effect the rate of evaporation?
- Does the type of direct sunlight effect the rate of evaporation?
- Which has a greater effect on the evaporation rate, direct sunlight or heat?

Sample Observation Form

| Note: | Use one observation form per container and have each group or partner monitor one container. |
|--------|--|
| Conta | iner # |
| Locati | on: |
| Questi | on to be answered by this exploration: |

| Day # | Daily Observation | Air Temperature | Water Level Start | Water Level End |
|-------|-------------------|--------------------|----------------------|--------------------|
| | | | | |
| | | | | |
| | | | | |

Now We're Cookin'! - Key

Directions: Decide how you and your partner or group will explore ways in which the sun's

energy can be used to do things like cook food by answering each question below.

1. What science idea does your class want to explore?

The sun's energy can be used to perform work for us. We can use it to cook our food.

2. What question or questions do you want answered by this science exploration? How can the sun's energy be used to cook food?

3. Describe in general how your class will answer the question(s) or explore this idea.

The class will research information about the sun's energy and materials that can be used to construct a solar cooker. We will then make a solar cooker that uses the sun's energy to cook a slice of apple.

- 4. List step-by-step how you will answer the question(s).
 - Research information about the sun's energy (radiant energy)
 - Research information about solar cookers and materials that are used to harness the sun's radiant energy.
 - Gather materials (see list below)
 - Line the inside of 2 cups with black paper and place a slice of apple in each one.
 - Cover the tops of the 2 cups with plastic wrap.
 - Wrap each cone around a cup with the apple slices inside.
 - Cover the bottom of each cup and cone with another cup to hold it in place.
 - Crumple newspaper around the bases of the outside cups. This serves as an insulator.
 - Aim the cookers at the sun.
 - Lower the thermometers into the cones. Record temperatures each hour or half-hour during the cooking process.
 - Cook until the apples are done (approximately 2 4 hours).

Now We're Cookin'! - Key (continued)

- 5. List the materials you or your group will need to follow those steps.
 - aluminum foil
 - 4 paper cups (not waxed)
 - white paper
 - black paper
 - scissors
 - newspaper
 - apple slices
 - 2 thermometers
 - tape
 - plastic wrap
- 6. What kind of observations will you make during this science exploration?

 Test the cooker for generation of heat, thoroughness of cooking process, and total cooking time.
- 7. What kind of measurements will you make during this science exploration?

 Heat temperature, time the cooking process
- 8. On a separate sheet of paper create a chart which you will use to record your observations. Students should be encouraged as part of the technology design process to devise their own observation or prototype test data sheet.
- 9. Record your observations and report your findings to the class.

 Students results will vary dependent upon their technological design.
- 10. At the end of the science exploration create a special report to give to the class. Follow the form your teacher gives you.
- 11. What did you learn from this science exploration?
 - How are commercially-made solar cookers constructed?
 - In what other ways is solar energy harnesssed for our use?
 - How do scientists and researchers envision that solar energy will be used in our future?
- 12. Does this lead you to any other questions? Write down one or two of your questions below.



Grades 2 - 4

- Student Reading: Sunlight for Our Life
- Student Worksheet: Sunlight for Our Life
- Science Exploration Guidesheet
 (Generic Guidesheet for use with all explorations)
- Career Exploration Guidesheet: What does a solar scientist do?

Student Reading

Sunlight for Our Life

Directions: Use the picture in the box next to each word to help you as you read. Write in the

missing words as you read about the sun.

energy



atmosphere



sun



wind



plant



ocean



Earth



water



food



arrays



rain



electricity



snow



solar



Sunlight for Our Life

We need the





___. Solar energy is used by



_ _ _ _ s to grow. Heat from the



makes the air move around. The sun's radiant



____ also causes evaporation.

Scientists have learned how to collect the sun's



____ and change it into 🖰 🔠 _ _ _ _ _ _ .







Student Reading

Using a special process called photosynthesis,



____ changes the ____ light into





____ that helps the | 🍇 | ____ to grow.



People and animals use plants for ____. Without





the sun's | | | ____ plants would not grow.



We would not have ____ to eat without the

sun's energy.

All around the



____ is a layer of air called

the atmosphere. During the day heat from the

Student Reading



___ warms the Earth's



_ _ _ _ _ . This makes the air move around. When



air moves we call that ____. People have used



the power of the ____ to move ships on the



We also use the wind to turn giant wind machines that

make



_____ and to fly kites.

The



___ also warms the



in our oceans and lakes. This causes the

Student Reading



____ to evaporate. That means that a liquid



changes into a gas. The | 🍒 | ____ is a liquid. As

the



___ warms the water,

it turns into water vapor (a gas) and rises into the



_____ . Later the water vapor cools. It falls

back down to the Signal ____ as Signal ____





or



Scientists have learned how to turn sunlight into



____. We use special technology





____ cells to collect the sun's called _ _ _ . The cells then change the energy into ____. We use this electricity for power to run many things. ___ cells placed in special panels called arrays. We can heat water for our homes and swimming pools using these solar panels. Solar ____ are used in space as well as on _ _ _ . Space stations turn solar energy into

____ that powers the space station.



Student Worksheet

We depend on the



 $____$ from the



___ in many different ways. The sun's

energy gives us food, heat, weather and



Science Exploration Guidesheet

Sunlight for Our Life

| Dir | ections: | Fill in each blank to complete the sentence. Use the reading <i>Sunlight for Our Life</i> to help you find the correct answer. |
|-----|----------|--|
| 1. | Energy | from the sun is called energy. |
| 2. | Solar p | oanels are also called solar |
| 3. | A plant | changes the sunlight into energy using a special process called |
| | | · |
| 4. | People (| and animals use plants for |
| 5. | The laye | er of air that surrounds the Earth is called the |
| 6. | The sun | warms the Earth's atmosphere and causes the |
| 7. | The sun | causes the water on Earth to |
| 8. | Solar ce | ells can change the sun's energy into . |

Science Exploration Guidesheet

| Science Exploration: | | |
|--|--|--|
| Directions : Decide how you and your partner or group will explore the effects of light on plant growth by answering each question below. | | |
| 1. What science idea does your class want to explore? | | |
| 2. What question or questions do you want answered by this science exploration? | | |
| 3. Describe in general how your class will answer the question(s) or how your class will explore this idea. | | |
| 4. List step-by-step how you will answer the question(s). | | |

Career Exploration Guidesheet

5. List the materials you or your group will need to follow those steps.

6. What kind of observations will you make during this science exploration?

7. What kind of measurements will you make during this science exploration?

Career Exploration Guidesheet

| Science Exploration: |
|---|
| 8. On a separate sheet of paper create a chart which you will use to record your observations. |
| 9. Record your observations and report your findings to the class. |
| 10. At the end of the science exploration create a special report to give to the class. Follow the form your teacher gives you. |
| 11. What did you learn from this science exploration? |
| |

12. Does this lead you to any other questions? Write down one or two of your questions below.

Career Exploration Guidesheet

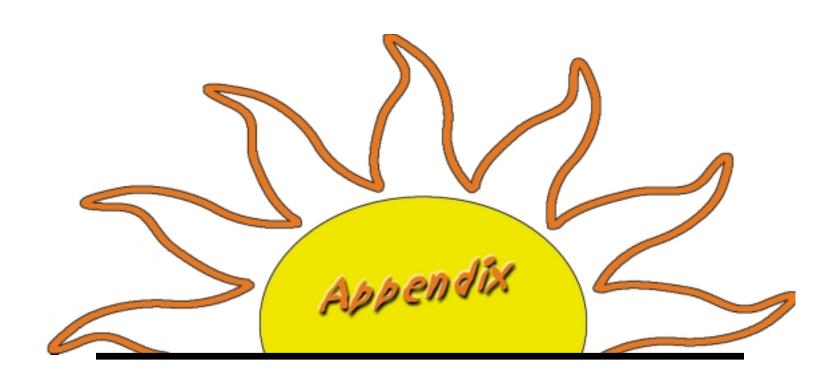
What Does a Solar Scientist Do?

Directions: After listening to the broadcast or visiting the Web site to learn about the work of a solar scientist, answer the questions below.

1. Tell about one thing you are good at that a solar scientist needs to know how to do.

2. Tell one thing about what a solar scientist does that you think is interesting. Explain why that is interesting to you.

- 3. If you were a solar scientist what would you want to learn more about?
- 4. If you could ask the solar scientist one question about his/her job, what would you want to know?



- Solar glossary
- Web Work



Solar Glossary

Directions: An interactive vocabulary crossword puzzle can be found on

the Web site http://solar-center.stanford.edu using the follow-

ing words and their definitions.

atmosphere The layer of air that surrounds the Earth.

energy The power of a certain force in nature (like the sun) to do

work.

evaporation To change a liquid (such as water) into a vapor or gas.

greenhouse A heated building with glass sides and a glass roof that is

used for growing plants.

heat Having great warmth or being hot.

radiant energy Energy (moving in waves) from the sun that we can see

(visible) and cannot see (invisible)

solar array Solar cells put together in a large group and used to collect

the sun's energy and convert (change) it into electricity.

solar cell A container that holds metal or carbon pieces in a special

liquid that converts or changes the sun's energy into elec-

tricity by chemical action.

vapor The gas formed when certain solids or liquids are heated.

wind Moving air that is caused by the sun's radiant energy heat-

ing the Earth's atmosphere.



Web Work

http://solar-center.stanford.edu

This site contains an interactive vocabulary crossword puzzle and word search using the solar glossary words. It also has interviews with a solar scientist that can be used to complete the Career Exploration Guidesheet: What does a solar scientist do? from the **Student Handouts** section of these materials.

http://station.nasa.gov

This NASA Web site contains information about the international space station and discusses how the solar arrays on the space station will generate electricity and how it will be distributed.

http://solarcooking.org

Great site for teachers who would like a little more information about the history of solar cooking, how solar cookers work and the principles behind solar energy for cooking. Check out the FAQ subsection, the Plans section and the multimedia section.

http://www.passporttoknowledge.com/sun/sun.html

Topics include the sun as a star, how the sun works and the sun-earth connection. Also includes teacher lesson plans and broadcast information.

http://www.wykeham.havering.sch.uk.seclipse.htm

View video simulations of the solar eclipse from August 11, 1999 as seen from England.

http://hea-www.harvard.edu.scied/SUN/SunActivitiesIntro.html

Includes resources for educators and students, informational readings for students and excellent easy to do student activities.