Year 1 Lessons

Visit 1

Child’s Assent Statement

Dr./Mr./Ms.____________________ has explained to me the research study called:

Sun Protection for Florida School Children

I agree to be in this study.

______________________________	______________________________	____________
Signature of Child	Printed Name of Child	Date
______________________________	______________________________	____________
Signature of Investigator	Printed Name of Investigator	Date
______________________________	______________________________	____________
Signature of Witness	Printed Name of Witness	Date

IRB#_________

Rev 9/99

Year 1 Lessons

Visit 2

Wide-brimmed hat distribution, decorating, and storage

(approximate duration: 45 – 60 mins)

The activity for visit 2 in year 1 consisted of distributing the wide-brimmed hats to the students and teachers and allowing the students to personalized one of the two Sun Protection for Florida's Children hats. The hat that was decorated was the hat that would stay at school in the classrooms.

Tips for hat distribution:

- Our hats came in three (3) sizes, small, medium, and large. Each student had to be fitted for their hat before decorating.
        - Our hats also had a drawstring to help the hats stay on even if they were not an exact fit for each child.
    - Plastic shower caps can be used so that each student can try on each size to find the appropriate sized hat.
    - A string can be used to measure each student's head to ensure the proper sized hat is given.
    - A tape measure can be used to properly measure each students head before distributing hats.
- As one facilitator is measuring students, one facilitator can distribute the appropriate hats to the students.
    - Before the hat is distributed to the student, the facilitator will write the student's name on the inside of both hats with a permanent marker.
- Once students have their hats, one facilitator can begin assisting with decorating the students' hats.

Tips for hat decoration:

- To keep things simple, glitter was not allowed with the hat decoration, but was strictly a situational preference.
- To decorate the hats, the following supplies were used:
    - Fabric paint
    - Markers

- Hat should dry in a location where there is not much, if any, traffic so that they can dry properly.

Tips for hat storage:

- Each classroom at each school that participated in the project was given plastic storage containers that held each student's hat that would stay at school.
    - Each drawer held specific letters of the alphabet
        - i.e. drawer 1: A – H, drawer 2: I – P, drawer 3: Q - Z

- Each hat was also kept in an individual storage bag (such as Zip Loc bags) to keep each hat free from contamination.

Overall tips for hats:

- Write name on inside of hat
- Don't share hats with other students
- Store hats in Zip Loc bag within the classroom storage units
- Don't wear hats when indoors
- Wear hats when outdoors at school
- Take second hat home and wear when outdoors at times other than school

Year 1 Lessons

Visit 3

Sun Lessons Fact Sheet: everything you need to sound like a NASA scientist

- The Sun as a Star
  - Our Sun is an average star,
    - Some stars are bigger and brighter others are smaller and dimmer.
    - Not all stars are the same color either. Red, blue-white, and brown stars are also visible.
  - Layers of the Sun
    - Corona
      - This could be called the sun's atmosphere. It is a layer of plasma around the sun. Flares can often be observed in this layer. Like earth's atmosphere, the corona has it's own weather than includes solar flares, explosions, and tornado-like storms.
    - Chromosphere
      - Between the Corona and photosphere. It is extremely hot and red in color, but not as luminescent as the photosphere which is why we can't see it.
    - Photosphere
      - This layer is basically the outside of the solar envelope. It is not as hot as the rest of the sun, but it is extremely bright, therefore it is the part of the sun that we can see.
    - Solar envelope
      - This is actually two separate layers; the radiative zone and the convection zone. For the purpose of this lesson the students only need to know that energy from the core travels slowly through the solar envelope.
        - It takes about 170 thousand years for radiation to travel through the dense plasma of the radiative zone.
        - Plasma in the convection zone is too cool to allow for radiation, as a result convection currents form and hot plasma bubbles up to the surface. (like boiling water)
    - Core
      - The core of the sun, or any star is a giant nuclear fusion furnace.
        - The temperature in the core is about 15 million K or 27 million F.
        - Pressure from gravity in the core is strong enough to cause hydrogen atoms to fuse together to form helium. The sun's energy comes from this nuclear fusion reaction. Eventually some of that energy radiates down to earth and is absorbed as light by plants which are in turn eaten by humans and the animals that humans eat.

  - Stars form from the left over elements from past stars.
    - This means that stars often form fairly close together.

- It also means that each generation of stars forms from richer material than the last generation.

- Solar Wind
  - Solar winds are particles/elements that explode away from the sun in clouds of plasma. Some of these particles reach the earth's atmosphere. Once in the gravitational pull of the earth the particles collect at the north and south poles forming what we know as the northern and southern lights or the aurora borealis.

- A star the size of our sun can be expected to live for about 9 billion years.
  - Larger stars will have shorter lives, because they burn their fuel more quickly.
  - "Living" is a less technical way to describe the process by which a star fuses the atoms it has into heavier elements.
    - Currently our sun is about 4.5 billion years old
    - Our sun is currently fusing Hydrogen into Helium.
    - When the Hydrogen is gone it will become a red giant star.
      - Gravity will become weaker and the sun will turn red in color (due to weak radiation) and expand past the earth's orbit.
      - In about 200 million years the sun will get too hot for life on earth. The oceans will boil off and surface dirt will turn into glass.
      - It will fuse the Helium into Carbon for about 1 million years before there is no Helium left in the core at which point it will become a white dwarf star.
        - A white dwarf is similar to a huge diamond one teaspoon of white dwarf would way two tons here on earth.

- The sun has an 11 year cycle between maximum and minimum activity.
  - The last solar maximum was in 2001.
  - During a maximum we can expect to see more sun spots which means a brighter sun and more radiation.
    - Sun spots are cooler areas on the surface of the sun but because the area around them is brighter more of them means a brighter sun overall.

- SOHO
  - The picture of the sun is from a satellite called SOHO.
    - SOHO orbits around the sun and takes pictures and monitoring the sun using special cameras and other equipment.
    - SOHO stands for Solar and Heliospheric Obserservatory.
    - It is a joint project between NASA and the European Space Agency.
    - The satellite was launched in 1995. It was supposed to stay in orbit for three years, but the project was so successful that the mission was extended until 2007, allowing SOHO to observe an entire solar cycle.

- Constellations and Other Stars
  - Orion the constellation
    - Orion is especially interesting as a constellation because it is easily visible and contains stars in a line, a formation that is visibly not a single object, and stars which are at some points the brightest and largest single objects visible in the sky.
  - Orion the myth
    - There are many variations on the Orion myth. The basic story is more or less the same.
      - Orion is a hunter who brings the wrath of the gods on him because he boasted about being able to kill any beast on earth and/or because he left/scorned Eos to pursue Artemis. The gods/mother earth sent a giant scorpion to kill him. Orion tried to fight the scorpion but couldn't and tried to get away to Delos Island (where Eos would protect him in some versions). As he was swimming to the island Artemis and Apollo where already there on the shore. Apollo disapproved of his sister's relationship with Orion so he challenged her to hit the tiny speck far off in the water. Artemis hit the speck which was actually Orion. When she realized what she had done she put him up in the stars along with his dogs, which we see as two constellations beside him. The scorpion was also put in the stars as the constellation scorpio, which follows behind on Orion's heels, never catching up.

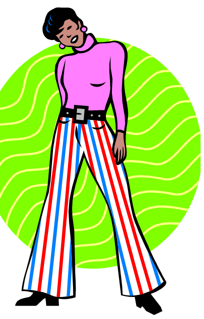
  - Orion's stars
    - Betelgeuse
      - This is the alpha star in the constellation, found at Orion's right shoulder. It is not the brightest but it is the closest and the biggest. Betelgeuse is a red giant 500-900 times larger in diameter than the sun, but it lacks the fuel to burn as hot or as bright as stars that have more fuel. It expands and contracts in a 6 year cycle. At points in the cycle it can get brighter than Rigel and during certain times of the year it is the largest single object visible in the night sky.
    - Rigel
      - This is the beta star of the constellation, found at Orion's left foot. It is smaller and further away than Betelgeuse but it is a huge, hot, blue-white star. During part of the year Rigel appears to be the brightest star in the sky. It is 40,000 times more luminous than the sun. Since it is such a massive star it is not likely to live as long as smaller stars and will likely die in a supernova that will result in a black hole.
    - Orion's dagger
      - Orion's dagger is actually formed of multiple stars and cloud formations that are visible with a small telescope. It is one of the most intense regions of stellar formation visible in our galaxy.

- Prisms
  - Prisms disperse or bend light.
    - White light is made up of light of all colors of the rainbow. Each color has a different frequency which means it gets bent at a different rate. As white light passes through the prism each color is visible because each color is bent through the glass at its own rate.
    - We see red, orange, yellow, green, blue, indigo, and violet, but that is because color past violet is impossible for us to see unaided. The sun also gives off ultra-violet light, or light that would be past violet on the spectrum. This light is dangerous for our eyes and skin and can cause skin cancer.

- Absorbing heat energy
  - This experiment works because white reflects heat and black absorbs it.
    - There is a connection here with solar energy.
      - Solar panels are black so they can absorb and store heat better.

You should always protect your skin when outside!

1. Wear a wide brimmed hat



2. Wear sun protective clothing

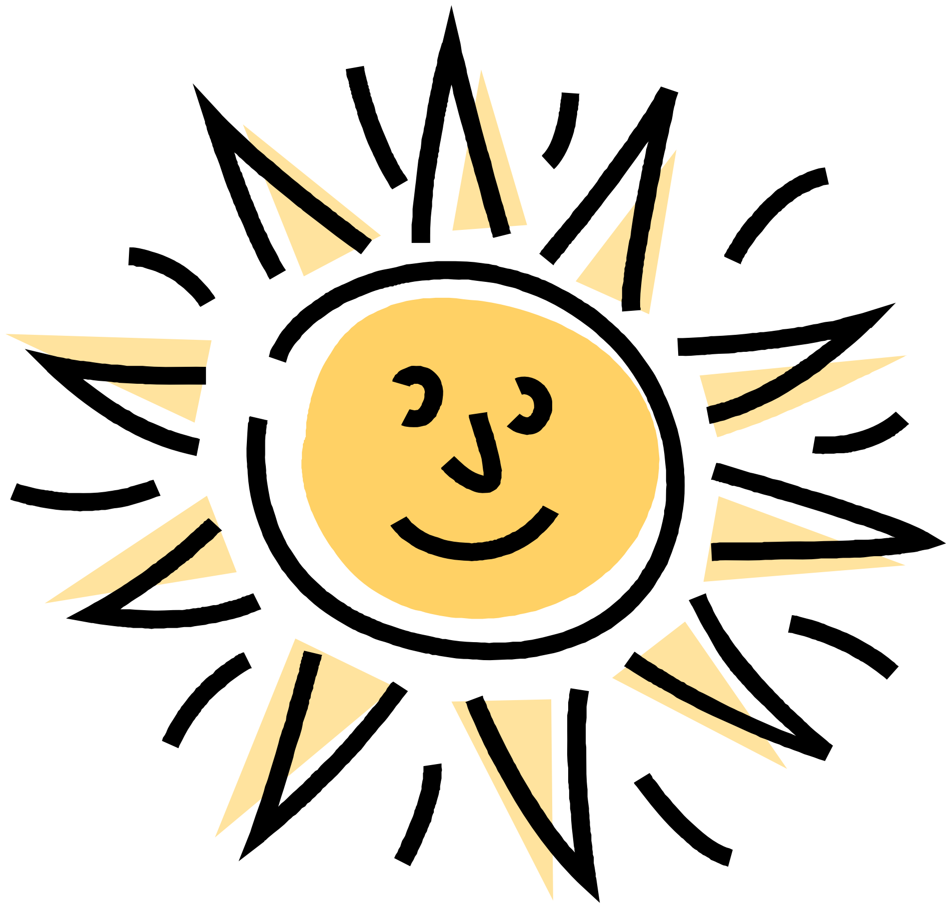
3. Use sunscreen with SPF 15 or higher

4. Wear sunglasses

5. Seek shade

Getting to Know Our Sun

Name: ___________________________



1. The sun is a ___________ .

2. The sun provides _______ and _______ for the _________ . Without the sun there would be no _________ on Earth.

3. The sun is a _________ sized ________ . Some other _______ are ___________ and some are smaller.

4. The sun is the closest ________ to Earth . That is why it looks ___________ than other _________ .

Year 1 Lessons

Visit 4

Getting to Know Our Sun

Purpose:
The purpose of this lesson is to introduce the students to basic information about the sun. They will also learn how to use the scientific method to answer a question. Students should learn the key steps in conducting an experiment including recording activities. Secondarily, students should learn that black absorbs heat faster than white.

Objectives: SWBAT

- Explain that the sun provides heat and light for Earth, without which there would be no life on this planet.
- Follow the scientific method to conduct an experiment.
- Draw conclusions about the effect of color on the efficiency of absorbing heat energy.
- Describe ways to capture and use energy from the sun.

Key Concepts:

- Stars
- Relationship between the Sun and Earth
- Energy
- Hypothesis
- Variable
- Coincidence

Standards Addressed:
SC.E.1.2.3, SC.E.2.2.1, SC.H.1.2.5, LA.D.2.2.5, LA.C.2.2.1, SC.H.1.2.1, SC.H.1.2.2, SC.B.1.2.3, SC.B.1.2.4

Materials:

- 1 large laminated color SOHO picture of Sun with wide view of the sky
- chalk/marker and board or large paper and marker
- CD player and "Why Does the Sun Shine?" CD
- Two small bottles one painted white and one painted black
- Two balloons of the same size and color
- Scientific Method Poster
- Chalk/white Board and chalk/dry erase marker
- Small heater if the weather is bad.

Activities:

1. Introduce yourself and the project.
2. Ask students to brainstorm everything they know about the sun.
3. Play "Why Does the Sun Shine?" for the students.
4. Fill in any important information missing from the list of Sun Facts.
5. Show them the SOHO picture of the sun.
6. Introduce the concept of energy.
7. Explain the experiment.
8. Discuss coincidence and the importance of recording your activities as a scientist.
9. Formulate questions and a hypothesis and record them on the poster.
10. Discuss the procedure for the experiment and have the students record the steps on the handout.
11. Conduct the experiment.
12. Bring the students back to the classroom to record findings and discuss the conclusions that they can draw from the experiment.
13. Sum up key concepts to be found from the experiment.
14. Review key concepts.

Terms to Learn:

- Energy
- Coincidence
- Hypothesis
- Conclusions
- Procedure
- Effects of heat on air
    - Also review attached Sun Facts sheet

Introduction:

1. Introduce yourself and the project.

A. My name is **__________** and I will be visiting your class several times over the course of the year. I am a researcher from the College of Medicine at the University of South Florida. My colleagues and I are doing research on the Sun and its relationship to people here on Earth. Today we are going to be working with you to learn more about the sun and how it affects us. We are going to be using the scientific method to answer questions about one of the two very important things the sun gives us. Does anyone know what those two things are?

2. Ask students to brainstorm everything they know about the sun.

A. Let's begin by making a list of everything you know about the sun already.

1. Write "SUN FACTS" on the board as a title to the list and write the answers they give under the title.

3. Play "Why Does the Sun Shine?" for the students.

A. I have a song about the sun that I am going to play for you. If you listen carefully to the words in the song you should pick up a few more facts about the sun or you may want to change some of the things that are on our list.

B. Don't about trying to understand everything in the song just try to remember as much as you can.

a. Play "Why Does the Sun Shine?" for the class.

C. Is there any information from the song that you want to add to the list or anything on the list that you want to change?

If applicable ask the students if anything they learned in the song contradicts anything in their original list. Change any incorrect information.

4. Fill in any important information missing from the list of Sun Facts.

2. Add any of the following to the list if they are not there and briefly explain each item:

Star *(our sun is an average star in that there are countless other stars some of which are brighter and larger and others are dimmer and smaller)*
Much larger than Earth *(it would take 110 Earths next to each other in a row to equal the diameter across the sun)*
Very far away (93 million miles away) *(this varies depending on where the Earth is on its elliptical orbit)*

Extremely hot *(the Sun is about 10,000 degrees F at its coolest point and about 27 million degrees F at its hottest point)*
Closest star to the Earth *(the Sun appears to be so much larger than other stars because it is much closer to us)*
Provides heat and Light for the Earth *(without heat and light from the sun there could be no life on earth).*

5. **Show the SOHO picture of the Sun.**

   A. Last time we were here we showed you this picture of the sun. Many of you were surprised because it does not look like the sun that we can see from here. This picture can give us clues about why the sun is able to provide us with the heat and light energy we need for life on Earth.

   B. What are some things that you see in this picture that you can't usually see? (solar flares look like explosions, comet, other stars, red color, etc.)

   C. We can see from this picture that the sun extremely active. It is so hot that its heat reaches the earth and it is so bright between solar flares, like the explosions you see in the picture, and its normal brightness that it lights up the day for us.

6. **Introduce the concept of energy.**

   A. We've been talking about the heat and light the sun provide, but we could also say the sun provides us energy in the form of heat and light.

      1. Energy can be defined as power to do work, or to change the quality something. Raising temperature and increasing brightness are two ways the energy from the sun does work for us on earth.

   B. Raise your hand if you have ever eaten something cold, like ice cream or a popsicle, outside on a sunny day. What happened to your cold food?

      1. (it melted, got hot/warm)

   C. That's because energy from the Sun in the form of heat, or heat energy changed your cold food to warm food.

   D. Can anyone give an example of another time when you observed energy from the sun changing something?

7. Explain the experiment.

A. Heat energy from the sun is so important to us that we have found ways to store it so that we can use it when we want to. Today we are going to do an experiment to see the how we can use heat energy from the Sun.

B. I have two empty bottles, one is black and one is white, and I also have two balloons. In a few minutes we are going to put the balloons over the tops of the bottles and put them outside in the sunlight (or in front of the heater). What do you think will happen?

1. Allow for a few student answers.

C. We are going to conduct this experiment like real scientists using the scientific method.

1. Show the students the Scientific Method poster.

8. Discuss coincidence and the importance of recording your activities as a scientist.

A. Scientists have to be very careful to record everything that they do so that their work can be tested by others to make sure they did not make any mistakes and to make sure that their findings are not just a coincidence.

2. Ask for a volunteer to define coincidence. This may be a new word.

(coincidence- something that seems to happen for a reason but is actually an accident.)

B. For example, if we put the bottles in the sun today and the balloons expand but tomorrow we do the same thing and they don't expand we might think that something other than the sun caused the balloons to expand.

C. This is exactly what scientists do only on a bigger scale. They need to be able to repeat each other's experiments to be certain of their findings. So it is very important that they record what they do.

D. If we are going to conduct this experiment like scientists we need to start with a question that we want to answer and record the steps that we take.

9. **Formulate questions and a hypothesis and record them on the poster.**

   A. Air expands when it is heated up. If the air in the bottles is heated up it will cause the balloons to inflate. What we want to know is what will happen when we expose a white bottle and black bottle to heat. Can anyone rephrase that into a question?

      i. Write the question on the poster.
      (e.g. does a black or white bottle collect energy from the sun faster/better/hold it longer?)

10. **Discuss the procedure for the experiment and have the students record the steps on the handout.**

   A. The Procedure tells what you are going to do and how you are going to do it. I put the procedure on the poster before I came in today.

      1. Read the procedure aloud for the class

   B. A hypothesis is your guess about what's going to happen when you conduct the experiment. Raise your hand if you have a guess about what will happen.

      1. Take 2 or 3 answers then let the students vote on which they most agree with and write this one as the hypothesis on the poster.

11. **Conduct the bottle experiment.**

      i. Now let's take the bottles outside/put them in front of the heater and see what happens.

      1. The balloons should both start to expand in just a few minutes but the students should be able to easily see that the balloon on the black bottle expands faster and when they are removed from the heat the black bottle will keep the balloon expanded longer.

12. **Bring the students back to the classroom to record findings and discuss the conclusions that they can draw from the experiment.**

      i. Your findings are what you saw happen when you conducted the experiment. What did you see?

      1. Write the answer on the poster

      ii. We observed energy from the Sun heating the bottles which in turn made the balloon expand. Let's come up with some ideas about why the balloons expanded and why the balloon on the black bottle expanded faster.

      1. Allow for several different theories about what might have happened.

C. Now it is time to decide on and record our conclusions. Conclusions are statements we can make based on what we found.

1. Guide the students through a discussion of the following questions:

   i. Why do you think the balloon on the black bottle expanded (faster)?

   ii. Does a black object get warmer in the sun than a white object?

   iii. Why might the balloon on the black bottle have stayed expanded longer?

2. Use as many of the students words from the discussion as possibly and write a conclusion statement on the poster. It should generally say "black objects get hot faster and stay hotter longer than white objects."

Conclusion:

13. Sum up key concepts to be found from the experiment.

i. State the Following: The black bottle will absorb the Sun's energy while the white bottle reflects most of the Sun's energy away. As the bottles absorb energy, the air inside the bottle expands making the balloons fill with air. Both bottles will absorb some heat energy but the black bottle will absorb considerably more than the white bottle.

14. Review Key Concepts:

1. If you wanted to use heat energy from the sun to warm up water would you rather put the water in a white container or a black container? Why?
2. What happens to air as it heats up?
   It expands
3. What does the Sun give us here on Earth?
   Heat and light (energy)

Appendix

Sun Facts:
Everything You Need to Know to Sound Like a NASA Scientist.

- **The Sun is a Star**
  - Our Sun is an average star,
    - Some stars are bigger and brighter others are smaller and dimmer.
    - Not all stars are the same color either. Red, blue-white, and brown stars are also visible.
  - **Layers of the Sun**
    - Corona
      - This could be called the sun's atmosphere. It is a layer of plasma around the sun. Flares can often be observed in this layer. Like earth's atmosphere, the corona has it's own weather than includes solar flares, explosions, and tornado-like storms.
    - Chromosphere
      - Between the Corona and photosphere. It is extremely hot and red in color, but not as luminescent as the photosphere which is why we can't see it.
    - Photosphere
      - This layer is basically the outside of the solar envelope. It is not as hot as the rest of the sun, but it is extremely bright, therefore it is the part of the sun that we can see.
    - Solar envelope
      - This is actually two separate layers; the radiative zone and the convection zone. For the purpose of this lesson the students only need to know that energy from the core travels slowly through the solar envelope.
        - It takes about 170 thousand years for radiation to travel through the dense plasma of the radiative zone.
        - Plasma in the convection zone is too cool to allow for radiation, as a result convection currents form and hot plasma bubbles up to the surface. (like boiling water)
    - Core
      - The core of the sun, or any star is a giant nuclear fusion furnace.
        - The temperature in the core is about 15 million K or 27 million F.
        - Pressure from gravity in the core is strong enough to cause hydrogen atoms to fuse together to form helium. The sun's energy comes from this nuclear fusion reaction. Eventually some of that energy radiates down to earth and is absorbed as light by plants

which are in turn eaten by humans and the animals that humans eat.

- **Stars form from the left over elements from past stars.**
  - This means that stars often form fairly close together.
  - It also means that each generation of stars forms from richer material than the last generation.

- **Solar Wind**
  - Solar winds are particles/elements that explode away from the sun in clouds of plasma. Some of these particles reach the earth's atmosphere. Once in the gravitational pull of the earth the particles collect at the north and south poles forming what we know as the northern and southern lights or the aurora borealis.

- **Solar Flares**
  - Solar flares are rapid, sudden, intense variations in the sun's brightness. They are actually a sudden release of magnetic energy. Solar flares shoot out from the sun into the corona with the force of 100 hydrogen bombs exploding at the same time. The temperature of a soar flare can reach up to 100 million Kelvin or 460 million Fahrenheit. We can't actually see them from here because the photosphere is already so bright it over powers them.

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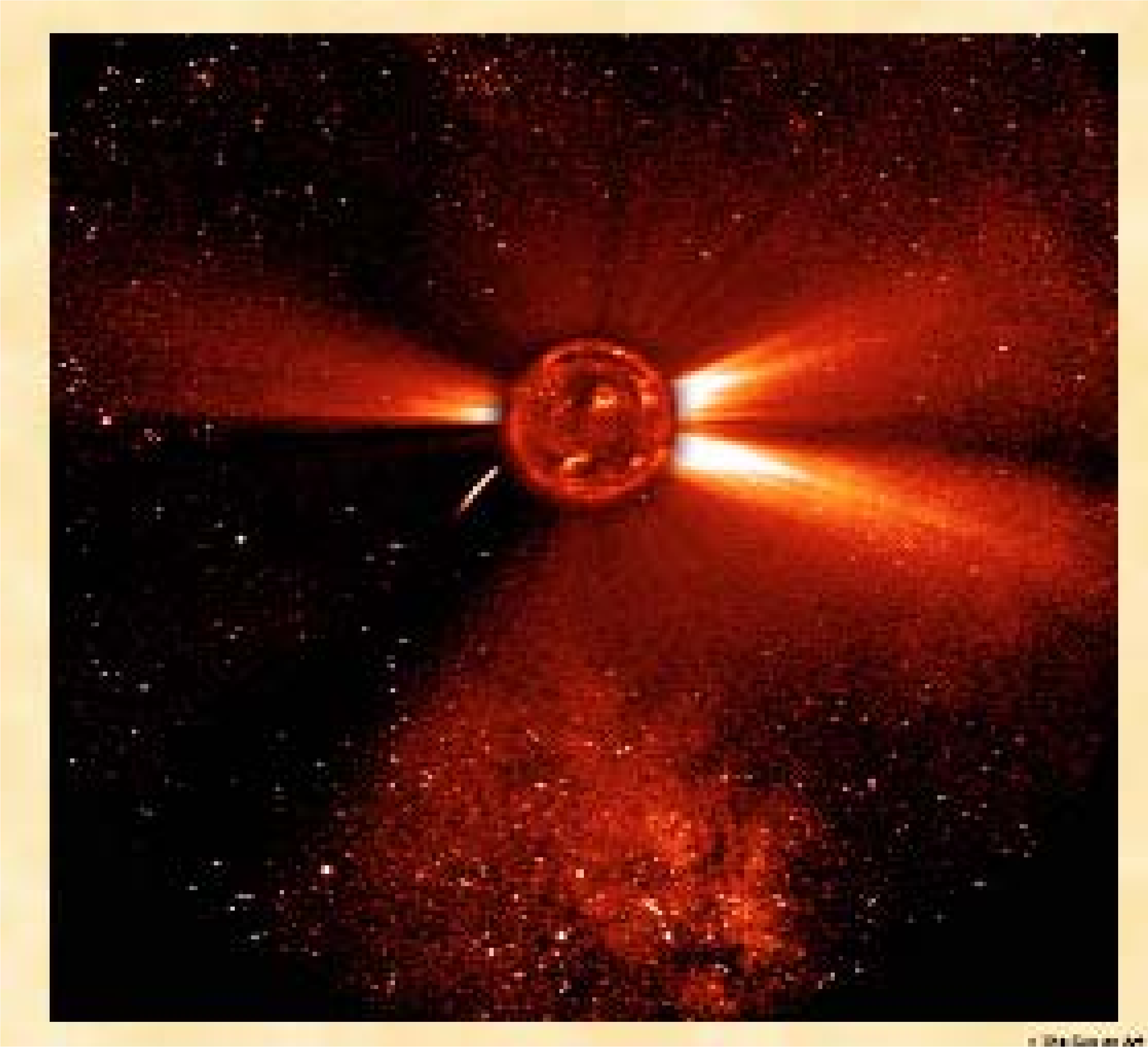
Other questions that might come up.

Why is the sun red in the picture?

The sun's photosphere, or the outside bright part is so bright that all we can see is white light, but underneath the photosphere the sun is actually red sort of like lava or a burning coal. The photosphere is so bright that we can't even see these big explosions without special cameras.

Will the sun's explosions hurt us? Why can't we see them?

Explosions like these happen often. The sun has an 11 year cycle of maximum and minimum activity. When the sun is at its maximum there are more solar flares. They are massive explosions by our standards, but don't even compare to the normal heat and light energy of the sun, and are too far away to hurt us. The only affect these flares have on us here is that they make the sun appear brighter than usual. The photosphere is so bright that we can't even see these big explosions without special cameras.



Scientific Method

Question

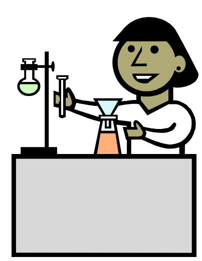
Hypothesis

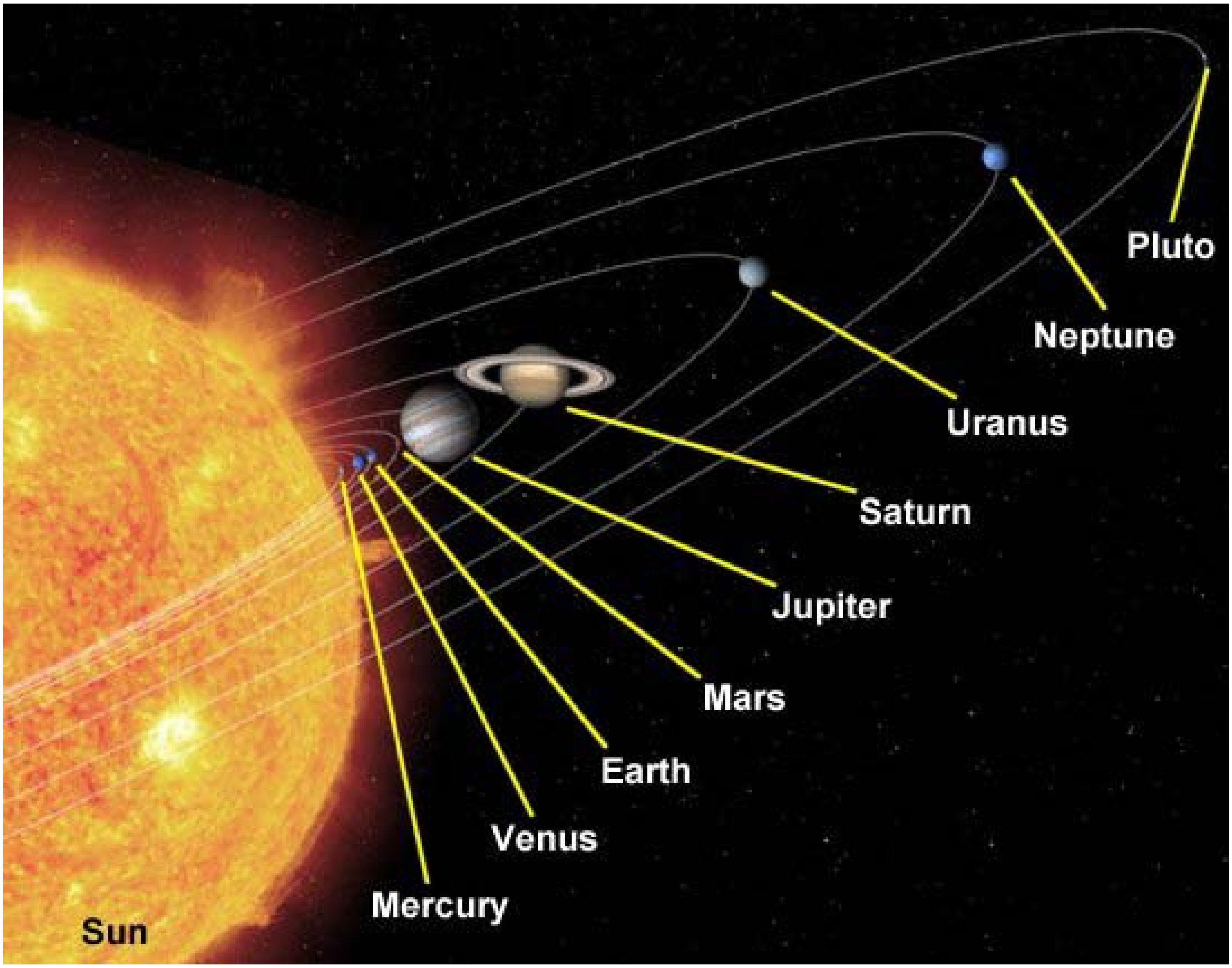
Procedure

1. Cover one empty water bottle with black tape and another with white tape.
2. Place the end of a balloon over the top of each bottle.
3. Place both bottles in sunlight or in front of the heater and watch.

Findings

Conclusions




Pluto
Neptune
Uranus
Saturn
Jupiter
Mars
Earth
Venus
Mercury
Sun

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  - It also means that each generation of stars forms from richer material than the last generation.

- Solar Wind
  - Solar winds are particles/elements that explode away from the sun in clouds of plasma. Some of these particles reach the earth's atmosphere. Once in the gravitational pull of the earth the particles collect at the north and south poles forming what we know as the northern and southern lights or the aurora borealis.

- A star the size of our sun can be expected to live for about 9 billion years.
  - Larger stars will have shorter lives, because they burn their fuel more quickly.
  - "Living" is a less technical way to describe the process by which a star fuses the atoms it has into heavier elements.
    - Currently our sun is about 4.5 billion years old
    - Our sun is currently fusing Hydrogen into Helium.
    - When the Hydrogen is gone it will become a red giant star.
      - Gravity will become weaker and the sun will turn red in color (due to weak radiation) and expand past the earth's orbit.
      - In about 200 million years the sun will get too hot for life on earth. The oceans will boil off and surface dirt will turn into glass.
      - It will fuse the Helium into Carbon for about 1 million years before there is no Helium left in the core at which point it will become a white dwarf star.
        - A white dwarf is similar to a huge diamond one teaspoon of white dwarf would way two tons here on earth.

- The sun has an 11 year cycle between maximum and minimum activity.
  - The last solar maximum was in 2001.
  - During a maximum we can expect to see more sun spots which means a brighter sun and more radiation.
    - Sun spots are cooler areas on the surface of the sun but because the area around them is brighter more of them means a brighter sun overall.

- SOHO
  - The picture of the sun is from a satellite called SOHO.
    - SOHO orbits around the sun and takes pictures and monitoring the sun using special cameras and other equipment.
    - SOHO stands for Solar and Heliospheric Obserservatory.
    - It is a joint project between NASA and the European Space Agency.
    - The satellite was launched in 1995. It was supposed to stay in orbit for three years, but the project was so successful that the mission was extended until 2007, allowing SOHO to observe an entire solar cycle.

- Constellations and Other Stars
  - Orion the constellation
    - Orion is especially interesting as a constellation because it is easily visible and contains stars in a line, a formation that is visibly not a single object, and stars which are at some points the brightest and largest single objects visible in the sky.
  - Orion the myth
    - There are many variations on the Orion myth. The basic story is more or less the same.
      - Orion is a hunter who brings the wrath of the gods on him because he boasted about being able to kill any beast on earth and/or because he left/scorned Eos to pursue Artemis. The gods/mother earth sent a giant scorpion to kill him. Orion tried to fight the scorpion but couldn't and tried to get away to Delos Island (where Eos would protect him in some versions). As he was swimming to the island Artemis and Apollo where already there on the shore. Apollo disapproved of his sister's relationship with Orion so he challenged her to hit the tiny speck far off in the water. Artemis hit the speck which was actually Orion. When she realized what she had done she put him up in the stars along with his dogs, which we see as two constellations beside him. The scorpion was also put in the stars as the constellation scorpio, which follows behind on Orion's heels, never catching up.

  - Orion's stars
    - Betelgeuse
      - This is the alpha star in the constellation, found at Orion's right shoulder. It is not the brightest but it is the closest and the biggest. Betelgeuse is a red giant 500-900 times larger in diameter than the sun, but it lacks the fuel to burn as hot or as bright as stars that have more fuel. It expands and contracts in a 6 year cycle. At points in the cycle it can get brighter than Rigel and during certain times of the year it is the largest single object visible in the night sky.
    - Rigel
      - This is the beta star of the constellation, found at Orion's left foot. It is smaller and further away than Betelgeuse but it is a huge, hot, blue-white star. During part of the year Rigel appears to be the brightest star in the sky. It is 40,000 times more luminous than the sun. Since it is such a massive star it is not likely to live as long as smaller stars and will likely die in a supernova that will result in a black hole.
    - Orion's dagger
      - Orion's dagger is actually formed of multiple stars and cloud formations that are visible with a small telescope. It is one of the most intense regions of stellar formation visible in our galaxy.

- Prisms
  - Prisms disperse or bend light.
    - White light is made up of light of all colors of the rainbow. Each color has a different frequency which means it gets bent at a different rate. As white light passes through the prism each color is visible because each color is bent through the glass at its own rate.
    - We see red, orange, yellow, green, blue, indigo, and violet, but that is because color past violet is impossible for us to see unaided. The sun also gives off ultra-violet light, or light that would be past violet on the spectrum. This light is dangerous for our eyes and skin and can cause skin cancer.

- Absorbing heat energy
  - This experiment works because white reflects heat and black absorbs it.
    - There is a connection here with solar energy.
      - Solar panels are black so they can absorb and store heat better.

by Lou Singer and Hy Zaret, 1959

The sun is a mass of incandescent gas
A gigantic nuclear furnace
Where **Hydrogen is built into Helium**
At a temperature of millions of degrees

The sun is hot, the sun is not
A place where we could live
But here on Earth there'd be no life
Without the light it gives

We need its light, we need its heat
The sun light that we seek
The sun light comes from our own sun's
Atomic energy

The sun is a mass of incandescent gas
A gigantic nuclear furnace
Where Hydrogen is built into Helium
At a temperature of millions of degrees

The sun is hot...

The sun is so hot that **everything on it is a gas**
Aluminum, Copper, Iron, and many others

The sun is large...

If the sun were hollow, a **million Earth's would fit inside**
And yet, it is only a **middle size star**

The sun is far away...

About **93,000,000 miles away**
And that's why it looks so small

But even when it's out of sight
The **sun shines night and day**

We need its heat, we need its light
The sun light that we seek
The sun light comes from our own sun's
Atomic energy

Scientists have found that the sun is a huge atom smashing machine
The **heat and light of the sun are caused by nuclear reactions between**
Hydrogen, Nitrogen, Carbon, and Helium

The sun is a mass of incandescent gas
A gigantic nuclear furnace
Where Hydrogen is built into Helium
At a temperature of millions of degrees

Year 1 Lessons

Visit 5

Visit 5

- During the 5th visit to the schools, researchers distributed surveys for the students to complete.
- The facilitators and students had an open discussion about the sun and how to protect themselves when out in the sun.
    - At this time, the “Sun Song” would also be replayed.
- At the conclusion of the discussion, students were given a sun puzzle to complete.

Sun Protection for Florida's Children

Unscramble each of the clue words.
Copy the letters in the numbered cells to other cells with the same number.

IEDW REBDIMM TAH	☐☐☐☐(8) ☐☐☐☐☐☐☐ ☐☐☐(11)
NUSRESNEC FPS 15+	☐(5)☐(15)☐☐(14)☐☐☐☐☐ ☐☐☐(7) 1 5 +
TEIPERCOTV HTGOINCL	☐☐☐☐☐☐☐☐(9)☐☐ ☐☐☐☐☐☐☐☐
SEKE DASHE	☐☐☐☐ ☐(1)☐☐☐☐
SESNAGSUSL	☐☐☐☐☐☐(3)☐☐☐(13)☐
AEPK ROHSU 10 AM - 2 PM	☐☐☐☐ ☐(12)☐☐☐☐ 1 0 ☐☐ - 2 ☐☐
NURNSBU	☐☐☐(16)☐☐☐☐(10)
HASWOD RLUE	☐☐☐(6)☐☐☐ ☐☐☐☐
AOVIELTLRTU	☐☐☐☐☐☐☐☐☐☐☐(2)
ZEONO RAELY	☐☐☐☐☐ ☐☐☐(4)☐☐

☐(1)☐(2)☐(3)☐(4) ☐(5)☐(6)☐(7)☐(8) ☐(9)☐(10) ☐(11)☐(12)☐(13) ☐(14)☐(15)☐(16)!

Year 1 Lessons

Visit 6

End of the year hat pick-up

- During the last session of year 1, the facilitators would go to each school to pick up each classroom containing which held the students' hats.
- Each hat would then be washed and returned the following school year.

Field Day Activities

Warm-Up Stretches:

Have the students make a large circle standing next to each other with instructors/coaches in the middle.
Lead the students through some basic stretches (arms, legs or ask PE coaches for help)
End stretches with students seated on the ground to begin the first activity

Game: Earth Orbiting the Sun (warm up/ activity)
Large group game (best if done with all students at a school)
Supplies: stop watch (optional)

Have all the students cross their right leg over their left so that their right foot is flat on the ground and their right knee is bent over their left leg.

Ask if anyone knows why we have seasons.
Tell the kids that part of the reason we have seasons is because the earth is actually moving around the sun. We call this movement the earth's orbit. Today we are going to do an activity so they can get an idea of what that orbit is like.

Pick a student to start. What they need to do is switch their crossed legs very quickly one after another and they will be able to watch this move around the circle. Tell them to stop when it gets back to the person who started. It looks very impressive when it is done quickly by a large group. (Think of THE WAVE.)

You can have them do this a few times and time them to see how fast they can go. You can also have them go around more than once, or reverse directions once it gets back to the first person.

Game: Space Explorers
Can be done with any group of 4+ students
Supplies: none

This is a variation of "Rock, Tree, Bridge" or "Indian Sprints"

Students need to start in a line. The first person will take a few steps and crouch down on their knees with their heads and shoulders tucked down.

This first person is the launching pad.

The next person will jump over the first person (taking off in their rocket), then take a few steps and stand still; they are now a distant planet.

The third student will take off the launching pad, then circle around the distant plan before taking a few steps and making a portal by putting their hands on the ground and holding their body up so that others can get underneath.
The next student will take off from the launching pad, orbit the distant plant go through the intergalactic portal before returning to earth and becoming launching for the next student.

When there is no one left in line to start the person at the back (the first launching pad) should get up and go through the line.

This can go on until the students cross an agreed upon finish line. If there are enough students you can split them up into teams and have them race to the finish line.

Game: Escape the U.V. Rays (intervention)
Escape the Solar Energy (control)
Can be done with large or small groups
Supplies: 4 cones, or a playing field with pre-drawn lines

Set up a playing field appropriate to the number of students. It needs to have clearly marked lines on two sides.

Pick a few students and have them stand in the middle of the field (the number will vary based on the size of the group).
Have all the others stand on the line on one side of the field.

Explain that the students in the middle are going to be UV rays (intervention), or Solar Energy. Be as dramatic about it as you want. The control students on the side can be space explorers if you like.

The students on the side have to run across the field to the other side without getting tagged by the UV rays or Solar Energy. If they do they have to stay in the middle (you can have them pretend to melt or explode for effect if you like) and they will join the UV rays or Solar Energy on the next round. This will continue until everyone has been tagged.

Game: Sun Ball
Can be done with large or small group
Supplies: 4 cones or markers; 1 big beach ball

Mark out a playing field appropriate for the size of the group.

Explain to the students that the big beach ball is the sun and they have to keep it from touching the ground or everyone will melt. They can't catch the ball, they can only hit it. They have to keep it in the playing field. If you like, you can have them fall to the ground and pretend to melt if the ball hits the ground.
To make the game more competitive you might want to challenge them to reach a certain number of touches, go for a certain amount of time, or break the group into two teams and have them compete against each other.

Game: Sun Protection Spelling Scramble
Supplies: Cardstock with letters

Suggested control school words:
Heat energy
Color spectrum
Hot air expands
Dark colors absorb