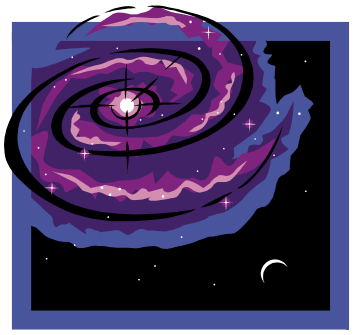
Discovery Lesson

TEACHER ENRICHMENT RESOURCE PACKET

What's Out There? Exploring Our Universe



December 12, 2009 - February 22, 2010

Contrary to its name, space is not empty! Investigate the planets and other objects in our solar system and find out what lies beyond. Follow the lead of astronauts and astonomers by exploring the wonders of space and the complexity of our universe.

Learning Objectives:
Learning objectives provide a broad overall guide to what students will begin to experience and understand through this TERP and through participation in Explorit's "What's Out There?" *Discovery Lesson*.

- Understand the relationship between planetary orbits around the Sun and our measure of time
- Learn some strategies that early humans used to protect themselves from the sun's harmful effects
- Understand the distances between planets and the sun
- Discover that earth is one of several planets that orbit our sun, an average star
- Explore telescopes which magnify the appearance of distant objects in the sky
- Learn that objects in the sky move in regular and predictable patterns resulting in the four week lunar cycle and the earth's seasons

Think it.
Try it.
Explorit.

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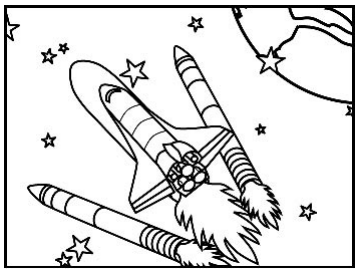
Background Information "What's Out There? Exploring Our Universe"

Thank you for choosing Explorit Science Center's *Discovery Lesson* program to supplement your ongoing science curriculum. Whether you use the program to kick off a new unit, wrap up a nearly completed unit, or purely to excite and interest your students in the wonderful world of science, advance preparation and follow up with your students are critical to achieving the greatest educational benefit from this unique science experience.

Explorit provides two resources to help prepare you and your students for the *Discovery Lesson*. First, simple logistics of the program are detailed in the confirmation letter. Second, this Teacher Enrichment Resource Packet outlines appropriate science content and processes to help you:

- successfully prepare your students prior to visiting Explorit;
- participate fully in the *Discovery Lesson* yourself; and
- follow-up with your students back in the classroom.



Astronomy is the study of celestial bodies. Astronomers and astronauts have only just begun to discover what's out there, as there is so much more to discover. Studying astronomy, like all sciences, is a way of solving problems and discovering why things happen the way they do. For instance, in the 16th century Niclaus Copernicus, in opposition to the belief of the time, discovered that the Earth circles the Sun using his observation of other planets. Much information has been gathered about space, but we have barely scratched the surface of knowledge yet to be uncovered. Just like there are areas of our own oceans that we have not yet explored, there are also areas of our own infinite universe that have yet to be discovered.

In our solar system alone there are eight amazing planets and inumerous celestial phenomena in which to explore and increase human knowledge. The recent, exciting discovery of the evidence of water on the moon could result in the construction of future lunar bases which would lead to increased awareness of our universe. Every year new things are discovered in our universe such as new planets, galaxies and masses of interstellar matter. From these discoveries, questions arise such as, "How did the universe begin? How old is it? How did life arise on planet Earth? Does life exist elsewhere in the universe?" Humans are a talented species; we observe our surrounding, process what we discover, formulate experiments and concoct ideas based on what we notice. These skills are fundamental to the scientific process and they are key in helping scientists to further our understanding of how the universe works.

Ever since Galileo Galilei first looked through a telescope at the heavens, astronomy has been booming. Technology for searching deeper and deeper into our solar system, galaxy and universe has changed to improve our understanding of the

formation of stars, planets and other celestial bodies. Probing the planets began in the 1960s including human visits to the moon and robot and satellite missions sent to other planets to collect surface samples, such as rock and air. Now there are permanent space stations orbiting the Earth to accomplish more space research on a long term basis.

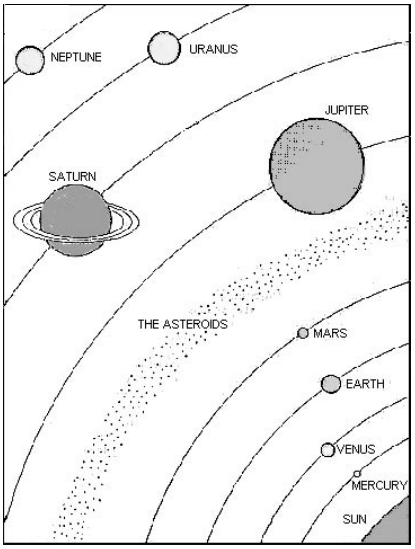
Whether you are an astronaut engaging in a space shuttle mission, or an astronomer studying galaxies through an observatory telescope, or a second grader looking through a constellation book as he observes the night sky in his backyard, you are open to a wide expanse of undiscovered territory in the heavens. This TERP is designed to provide information and fun experiments that teach known astronomy concepts.

For additional information on the universe go to:
NASA's Home Page - www.nasa.gov
Astronomy for Kids - www.kidsastronomy.com

Classroom Activity #1

ACTIVITY #1 How Old Are You?

Background:
There are eight planets in our solar system. They vary in size, composition and distance from the Sun. The four inner planets closest to the Sun are considered Terrestrial because they have rocky surfaces. They are separated from the other four gas giants which lie farther out by an asteroid belt.



Planets move in two ways. Each planet travels along its own path (orbit around the Sun. The orbit is not a perfect circle; it is like an ellipse. At different point in each planet's orbit it is closer or father away from the Sun. The time it takes for a planet to make one revolution, or orbit, around the Sun is one year. Planets also spin on their own axes like a top. This is called rotation. The time it takes for a planet to rotate on its axis is one day. For example, Earth completes one rotation in 24 hours while a day on Neptune is only 18 hours.

On Earth, your age is actually calculated as the number of times the Earth has gone around the Sun since you were born. For each trip around the Sun we add on another year to our age. How "old" are you on the other eight planets in our solar system?

Procedure:
1. How many days old are you on earth? (your age x 365)

2. To calculate your age on the "terrestrial planets" divide your age in Earth days by the number of Earth days in the planet's year. The product would be your age on that planet.

Example for Mercury - for a person 10 years old on Earth
10 x 365 = 3650 Earth days old
3650/88 (Earth days in Mercury's year) = 41 years old on Mercury

3. For the outer planets, calculate the number of Earth days in each planet's year. Then divide your age in days by the number of Earth days in that planet's year. The answer is your age on that planet.

Example for Jupiter - for a person 10 years old on Earth
10 x 365 = 3650 Earth days old
12 Earth years x 365 Earth days/year = 4380 Earth days in one Jupiter year.
3650/4380= .8 years old on Jupiter!!!

Follow up: Follow the examples and fill in the blanks in the "New" Age Chart.

"NEW" AGE CHART

Terrestrial Planets	Approximate Length of Year	Your New Age
Mercury	88 Earth Days	
Venus	225 Earth Days	
Earth	365 Earth Days	
Mars	687 Earth Days	

Outer Planets	Aproximate Lenth of Year	Your New Age
Jupiter	12 Earth Years	
Saturn	29.5 Earth Years	
Uranus	84 Earth Years	
Neptune	165 Earth Years	
Pluto	248 Earth Years	

Classroom Activity #2

ACTIVITY #2 Cool Sunglasses

Background:
If you are in a place where the sky is clear and it is really dark at night, you will be able to see about 2,000 stars with your naked eye. Stars look like bright pinpoints of light in the night sky, however they are really gigantic hot balls of whirling gases. They are trillions of miles away from the Earth. Our Sun is a star, similar to the ones we see in the night sky, but it is so close that is outshines the other stars. Our Sun is an average sized, yellow star measuring about 500,000 miles across. If the Sun were hollow, about 1 million Earths would fit inside of it. The Sun's temperature at the core is hotter than 15 million degrees. Nuclear reactions occur there which produce heat and light that pour into space. This energy sustains life on Earth; however, this same energy can be extremely harmful.

Early Eskimos, also known an Inuits, are known to have used a kind of homemade sunglasses to protect their eyes from sunlight. In the Artic region sunlight reflects off snow, ice and water and can easily blind you if you're not protected. Inuits made early versions of sunglasses from natural, available materials such as antlers, wood, and bone. Carving these materials they were able to make coverings for their eyes that allowed only a small portion of light to come in through a narrow slit. Modern sunglasses with colored lenses work by filtering the light so that only some of the light reaches your eyes.

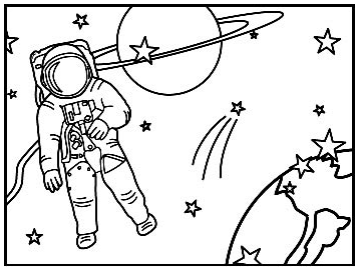
Materials:
Scissors, 2-inch Square piece of black construction paper, Pencil, Desk lamp

Procedure:
1. Cut a 2 inch wide circle out of the black construction paper.
2. Use the pencil to make a tiny hole in the center of the paper.
3. With the light off, turn the lamp so that it faces you.
4. With your face 2 feet from the bulb, hold the black circle over one eye and close your other eye.
5. Now, turn on the lamp. Look at the bulb through the tiny hole in the paper and note how bright the light is.
6. Remove the paper and look at the light. Again note how bright the light is.

Results:
The light looks less bright when it is viewed through the small hole. When you look at the light through the small hole, most of it is blocked by the paper. Only a small amount of light passes through the hole into your eye, simliar to the way the Inuits' sunglasses worked.

More fun:
Design sunglasses like those made by the Inuits. Use materials such as poster board and string. Draw glasses on a piece of poster board, then cut them out. Cut out small horizontal eye slits. Use a paper punch to make holes in each end of your glasses. Tie a string through each hole. Decorate your glasses with crayons or makers, then put the glasses on and tie the strings behind your head. (See picture to the left.)

Classroom Activity #3



ACTIVITY #3 Toilet Paper Planets

Background:
There are eight planets and one sun in our solar system. There are enormous distances between the sun and each planet. Astronomers have measured the distances and if these numbers were written out for you they would be so large that they probably wouldn't mean much. In this activity we have reduced these numbers using the proportions of a square of toilet paper.

Materials:
Pencil, paper, planet distance chart, marking pen, ten 3x5 inch index cards, roll of toilet paper.

Procedure:
NOTE: Procedure should be performed outdoors in a large, flat area.
1. Using a marking pen, write the name of each planet on the index cards. Make a card for the Sun.
2. Go outside and begin to unroll the toilet paper. Place the card for the Sun at the starting end of the paper.
3. Using the Planet Distance Chart below, place the cards at the appropriate toilet paper square. Mercury will be placed on the fourth square of toilet paper.
4. Continue to unroll the toilet paper, placing each planet's cards on the square of toilet paper that corresponds to that planet's number on the chart.

Inquiry:
1. Are the planets evenly spaced in the solar system?
2. Where are most of them located?
3. Did you find that the planets were farther away from each other than you had expected?

Planet Distance Chart

Planet	Miles From the Sun	TP Squares From The Sun
Mercury	36,000,000 mi	4
Venus	68,400,000 mi	7
Earth	92,700,000 mi	10
Mars	147,600,000 mi	28
Jupiter	504,000,000 mi	52
Saturn	936,000,000 mi	95
Uranus	1,836,000,000 mi	192
Neptune	2,880,000,000 mi	301

Science Standards

CA STANDARDS
Physical Science (K-1a; 2-1ab; 3-1bcdg; 4-1ag; 5-1af)
Life Science (K-2c; 1-2d; 3-3ae)
Earth Science (2-3d; 3-4a)
Investigation and Experimentation (K-4a-e;1-4a-e; 2-4a-c,f; 3-5a-e; 4-6abcdf; 5-6ah; 6-7abeg)

NATIONAL STANDARDS
K-4: A, B, C, D, E, F, G

Explorit Programs for Schools and Groups

At Explorit's Sites

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Nature Safaris & Labs Fall and Spring visits to Explorit's outdoor spaces at Mace Ranch Park

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Health in Your World Learn about keeping your body and the world healthy and safe
Science in Your World The ultimate family science night
Science Assembly A multi-media presentation for the whole school

Reservations required.
For information please call
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