

SOLAR SYSTEM

Theme: earth and space science
Grade Level: third
Best Time to Plan Trip: winter

Unit Rationale

Mastery of certain concepts about the solar system is critical to 3rd grade students. They will be required to build on this knowledge in 4th grade and must be able to answer questions on state exams related to the solar system and space.

As light pollution increases dramatically each year in the southeast, National Parks become one of the most successful places for students to visually encounter the universe. Newfound Gap, Clingmans Dome, Look Rock on the Foothills Parkway, and even Sugarlands are wonderful places in Great Smoky Mountains National Park to introduce space science and amateur astronomy to students with the help of local astronomy clubs. Students will prepare for a park-related experience by participating in a number of pre-site activities and by visiting the East Tennessee Discovery Center where they can view the solar system in a planetarium. Guest speakers with professional or amateur background in astronomy can also enhance park experiences.

State Education Standards

Grade Level Expectations

Embedded Technology and Engineering

- Describe how tools, technology, and inventions help to answer questions and solve problems 0307.T/E.1
- Recognize the connection between scientific advances, new knowledge, and the availability of new tools and technologies 0307.T/E.4

Earth and Space Science

- Identify and compare the major components of the solar system 0307.6.1
- //2009 standards//

North Carolina Standards

Competency Goal 3: The learner will make observations and use appropriate technology to build an understanding of the earth/moon/sun system.

3.02 Observe that objects in the sky have patterns of movement including: Sun/Moon/Stars.

3.04 Use appropriate tools to make observations of the moon.

3.05 Observe and record the change in the apparent shape of the moon from day to day over several months and describe the pattern of changes.

3.06 Observe that patterns of stars in the sky stay the same, although they appear to move across the sky nightly.

//2004 standards//

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PLANNING A SUCCESSFUL TRIP SOLAR SYSTEM

Schedule for a day of activities in Great Smoky Mountains National Park

Present Pre-Site Activities

Optional trip to East Tennessee
Discovery Center for planetarium tour
and program in Knoxville, Tn

Present a Star Party (on a different date).
This can take place at Sugarlands Visitor
Center or Newfound Gap in the evening
hours.

Post Site Service Learning Extension

Planning a Successful Trip

- Call East Tennessee Discovery Center for reservations at (865) 594-1494; request a “Planet Talk” Program
- Call Great Smoky Mountains National Park to obtain permission to use the overflow parking lot at Sugarlands Visitor Center after the Visitor Center closes.
- Chaperones are required to manage the group at East Tennessee Discovery Center
- Parents are responsible for transporting and joining their children in the star party taking place in evening hours at the overflow parking lot at Sugarlands Visitor Center.
- During the star party, bathrooms are located at Sugarlands Visitor Center

SOLAR SYSTEM SAFETY CONSIDERATIONS AND OTHER IMPORTANT INFORMATION

•Park Rules and Regulations

Great Smoky Mountains National Park is a federally protected public use area. Certain activities are prohibited by visitors. Be sure to read the rules and regulations of the National Park found in the appendix of this lesson. For further information or questions, you may contact the National Park at 865-436-1713. Please use common sense and appropriate planning whenever you participate in outdoor activities.

•Dressing for the Weather

Please remind your students to wear appropriate footwear and clothing for an extended outdoor program. Short pants, flip flops, or sandals aren't recommended. Temperatures in the mountains can be 10-15 degrees colder than at your school. You may wish to alter portions of the program should inclement weather appear.

•Restrooms and Water

•Flush toilets and sinks are located at Mynatt city park. The pavilion is on a reservation system. You may reserve it by calling the Parks and Recreation department at 865-436-4990 (free for Sevier County organizations), or, if another group is using it, you may eat at the creek side picnic tables and still access the restrooms.

•Packing Lunches

Lunches will be eaten at picnic tables in the picnic area of Mynatt park. Lunches may be packed in a box with drink coolers and kept on the bus until lunch time.

•Group Size

The locations for the on-site activities and parking lot at these area can accommodate a large group (several classes). For safety and enjoyment of the lessons, we recommend a group of no more than 50 students.

•Cell Phones and Emergency Contacts

Within the National Park, cell phones are not always reliable. Be sure to stick to your agenda. Cell phones will pick up in Gatlinburg. In case of emergency call 911. For non-emergencies within the National Park, contact park rangers at 865-436-1294. If you do not have phone reception in the National Park, contact the nearest park employee and they can assist using the park's radio communication system.

PRE-SITE TEST

Name _____

Pre Score: _____

Post Score: _____

Solar System

- 1) What is a constellation?
 - (a) The position of satellites in orbit.
 - (b) Star patterns that resemble people and animals.
 - (c) A large storage can on the space shuttle.

- 2) What is one of the most common constellations in the winter sky?
 - (a) Ortho's Horse
 - (b) Orion's Belt
 - (c) Hercules sword

- 3) What can be used to see stars and planets if a telescope is not available?
 - (a) Magnifying glass
 - (b) Microscope
 - (c) Binoculars

- 4) What causes serious problems for star gazers in the south?
 - (a) Light pollution
 - (b) Airplane Exhaust
 - (c) Cold temperatures

- 5) Great Smoky Mountains National Park is a good place to look at the night sky because _____.
 - (a) no airplanes fly over the Park.
 - (b) there are no street lights and house lights in the Park.
 - (c) there are more stars in the skies above the Park.

- 6) You can see the most stars _____.
 - (a) when there are a lot of streetlights lighting up the sky.
 - (b) from downtown Gatlinburg because it's in the mountains.
 - (c) from a dark place with no artificial lights.

PRE-SITE TEST

(Teachers: Administer this test once before teaching the pre-visit activities and once after the post site activities for comparable results of comprehension and retention)

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PRE-SITE ACTIVITY

LIGHTS AT NIGHT

Duration: 20 minutes

Class Size: any

Materials: mini flashlight, paper plate, pie tin, a photocopied page from any book.

Procedure:

Explain to students that Great Smoky Mountains National Park protects more than just plants, animals, and history. The Park also produces things we can't always see like the air, water quality, and even our night sky. Because of light pollution, only 1/3 of all Americans can see the Milky Way from their backyard. Ask students why light pollution is a problem? (nocturnal animals, foraging patterns, protection from predation, migration, breeding patterns) Light pollution also makes it harder for astronomers to see objects in the night sky and learn about our solar system. Without light pollution, the human eye can see up to 14,000 stars. Under our current sky conditions, we can see 2,500 stars. In a typical suburb, we can see only 300 hundred stars.

Instructions for Activity

Have the students gather around a small table. Stand a mini flashlight up on the table facing upwards. Place the photocopied page on the table. Turn off the lights and turn on the flashlight. Ask the students how clearly they can read the text on the paper. Experiment with different shields and ask the students how the shields affect their ability to read the text (use your hands, paper plate, tin pie pan). You can also turn the flashlight and aim directly at the text to illustrate the optimum situation.

Conclusion

Once again, describe the issue of light pollution. Ask student for ideas of how to solve this environmental problem. Answers might include:
Don't waste light!
Evaluate outdoor lighting needs – are lights

necessary?

Aim outdoor lights down, not at the sky.

Put visors on floodlights to direct light.

Use timers, dimmers, or motion lights.

ON-SITE ACTIVITY

STAR PARTY

Duration: As needed

Class Size: Unlimited

Materials: Guest Speaker, Telescope

Background Information for the Teacher

Invite community and families to participate in a star party. You may wish to look up local universities or stargazing clubs for a guest expert. Often they can bring high powered telescopes for students to look through. Find a good star viewing area and have the students sit on blankets. Newfound gap overlook in Great Smoky Mountains National Park is a nice, dark viewing spot. Point out several constellations to students. Tell the students the story of Orion.

Orion – The Great Hunter

The ancient Greeks saw the figure of the Greek myth Orion in the nighttime sky. There are several different stories about the birth of Orion.

According to one version of the myth, Orion was the son of a poor shepherd called Hyrieus. Once, Zeus, Hermes, and Poseidon stopped by Hyrieus' house. Hyrieus was so generous with his guests that he killed the only animal he had - an ox.

Hyrieus was not aware that his guests were gods.

The gods wanted to reward Hyrieus' generosity by granting him a wish. Hyrieus' biggest desire was to have a child. The gods told him to bury the hide of the bull he had sacrificed to them and to pee on it.

After nine months, a boy was born in that place.

The child became a very handsome and strong man. He was such a good hunter that he was hired by the king Oenopion to kill the ferocious beasts that were terrifying the habitants of the island Chios. Happy for his success, Orion said he would kill all the wild animals on the earth. But, the earth goddess Gaia, who was the mother of all animals, was not pleased with Orion's intention.

Then, Gaia set an enormous scorpion on Orion.

Orion soon realized that his strength and sword were useless against that mighty beast. He tried to

escape, but the scorpion stung him to death. As a reward, Gaia placed the scorpion in the sky as a constellation which appears to be constantly chasing after Orion whose figure was also placed among the stars.

Have adult volunteers at 2-3 telescopes (depending on group size) to help students locate night sky objects. Give students a Star Scavenger Hunt sheet (following page) and allow them to use binoculars to find the objects.

Resources and References

Orion Mythology. <http://www.globe.gov/GaN/student.html>, (9 January, 2008).

Star Scavenger Hunt

___ Sirius

Hint: Canis Major - The brightest star in the sky.

___ Orion's Belt

Hint: Look for 3 stars forming a belt.

___ Betelgeuse

Hint: Orion - One of the largest red supergiant stars known

___ Rigel

Hint: The brightest star in Orion.

___ Taurus

Hint: Large V-shaped cluster.

___ The Seven Sisters

Hint: Spectacular cluster of 7 stars (can see more through binoculars).

___ Orion Nebulae

Hint: You will need a telescope.

___ Mars

Hint: Look for little green men.

POST-SITE ACTIVITY

SERVICE LEARNING EXTENSION

SOLAR SYSTEM

Duration: unlimited

Class Size: any

Materials: glow in the dark stickers or stars, black paper

Activity Instructions

Have students pick their favorite constellation.

Using glow in the dark stickers, students may recreate the constellation and include the Greek Mythology describing it.

Take the constellations to a nearby nursing home to share with special people who may not be able to go outside due to their age or health.

Place the constellations on a wall or a table.

“Charge” the glow in the dark materials under a lamp, then turn the lights off. Enjoy the “night sky”!

POST-SITE ACTIVITY

EXPLORE YOUR NATIONAL PARKS

Duration: 30 minutes

Class Size: any

Materials: internet access

The Great Smoky Mountains are world renowned for their diversity of plant and animal species. This great variety makes the park an exemplary outdoor laboratory for the study of relatively undisturbed native flora, fauna, physical environs and processes of the Southern Appalachians. The park is the largest federally preserved and protected upland area east of the Mississippi River offering park visitors a refuge from the stresses of everyday life.

You and your students can learn more about this special place as well as participate in on-line activities to further your knowledge of the National Park Service and other federally protected lands.

Please check out the following web addresses:

Especially for Kids

To become a web ranger for the National Park Service, got to:

www.nps.gov/webrangers

To become a Junior Park Ranger at Great Smoky Mountains National Park or other parks, go to:

www.nps.gov/learn/juniorranger.htm

Especially for Teachers

For a comprehensive understanding of the background and development of the National Park Service that is perfect for teachers and others those who need the maximum amount of accurate information in the minimum amount of time, go to:

<http://wwwParkTraining.org>

The U.S. Department of Education is pleased to announce the newly remodeled and updated Federal Resources for Education Excellence (FREE) website. It now provides richer, more expansive resources to teachers and students alike. There are over 1500 resources to take advantage of at FREE, ranging from primary historical documents, lesson plans, science visualizations, math simulations and online challenges, paintings, photos, mapping tools, and more. This easily accessible information is provided by federal organizations and agencies such as the Library of Congress, National Archives, NEH, National Gallery of Art, National Park Service, Smithsonian, NSF, and NASA. Go to: <http://www.free.ed.gov/>

APPENDIX A

PARK ESSENTIALS TO KNOW BEFORE YOU GO

Traffic and Travel Tips

Restrictions on Large Vehicles

Trailers, RVs, and buses are prohibited on some secondary roads in the park, including Balsam Mountain Road, Greenbrier Road past the ranger station, Heintooga Ridge Road, Rich Mountain Road, Roaring Fork Motor Nature Trail, and the road exiting the park at Metcalf Bottoms Picnic Area. Caution is also advised when traveling on Little River Road between the Townsend entrance to the park and Elkmont Campground, and on the road leading into Cataloochee Valley.

Overheated Engines and Brakes

When traveling uphill on hot days, watch your engine temperature carefully to make sure it is not overheating. If overheating occurs, stop at a pullout to allow your vehicle to cool down before continuing.

When driving downhill on steep mountain roads, it is important that you shift to a lower gear to use the braking power of your engine to prevent your brakes from overheating and failing. If your vehicle has an automatic transmission, use “L” or “2.” (Overheated brakes smoke and give off an acrid smell.) Keep an extra cushion of distance between you and the vehicle in front of you as protection against sudden stops.

Avoid Collisions with Animals

Watch for animals crossing roads, especially at night. Scores of bears and other animals are killed by motorists every year. Following posted speed limits will reduce your chances of hitting wildlife.

Use Pullouts if Driving Slowly

As a courtesy to other park visitors, slow moving vehicles should use pullouts to let other cars pass. Pullouts are located every mile or so on most park roads.

Gas Stations

There are no gas stations or other related services available in the park. Complete services are available in Cherokee, NC, Gatlinburg, TN, and Townsend, TN.

Emergency Number

In the event of an emergency, call 911. For non-emergency calls to park headquarters, dial (865) 436-1200.

Pets

Dogs are allowed in campgrounds, picnic areas, and along roads, but must be kept on a leash at all times. The leash must not exceed 6 feet in length. Dogs are only allowed on two short walking paths—the Gatlinburg Trail and the Oconaluftee River Trail. Pets are not allowed on any other park trails. Pet excrement must be immediately collected by the pet handler and disposed of in a trash receptacle. Pets should not be left unattended in vehicles or RVs. Large national parks that have extensive backcountry areas as a rule do not allow dogs on trails. These include parks such as Yellowstone, Yosemite, Grand Canyon, Glacier, Rocky Mountains, and several others. Great Smoky Mountains National Park has prohibited dogs in the backcountry since the park was first established in the 1930s.

Hiking Safety

You are responsible for your own safety! Travel in Great Smoky Mountains backcountry areas has inherent risks and hikers assume complete responsibility for their own safety. Rescue is not a certainty! Carry a current park trail map and know how to read it.

- Carry 2 small flashlights or headlamps—even on a day hike. If you have trouble on the trail, darkness

APPENDIX A CONTINUED

PARK ESSENTIALS TO KNOW BEFORE YOU GO

may fall before you can finish your hike.

Take adequate water—minimum 2 quarts per person per day. All water obtained from the backcountry should be treated either by filtering or boiling.

- Carry a small first aid kit.
- Check the current weather forecast and be prepared for quickly changing conditions.
- Wear shoes or boots that provide good ankle support.
- Avoid hypothermia (the dangerous lowering of body temperature) by keeping dry. Avoid cotton clothing. Dress in layers that can be easily removed or added as you heat up or cool down. Always carry a wind-resistant jacket and rain gear—even on sunny days!
- Don't attempt to cross rain-swollen streams; they will recede rapidly after precipitation stops and the wait may save your life! When crossing any stream more than ankle-deep: unbuckle the waist strap of your pack, wear shoes, and use a staff to steady yourself.

Ice and Wet Leaves

In winter, most trails at high elevation will be covered with ice. Use crampons or other traction devices for your boots. In autumn, loose, slick leaves on the trail cause many hikers to fracture their ankles. Be certain to wear ankle supporting boots.

Safety Around Wildlife

•Encounters With Bears

Bears in the park are wild and their behavior is unpredictable. Although extremely rare, attacks on humans have occurred, inflicting serious injuries and death. Treat bear encounters with extreme caution.

•Venomous Snakes

Two species of poisonous snakes live in the Smokies, the northern copperhead and timber rattlesnake. Although very few snake bites occur here, visitors should be cautious where they place their hands and feet, especially around old buildings

and stone fences. No fatalities from snakebites have ever been recorded in the park.

•Insects

Yellow jacket wasps are the insects of greatest concern. They build nests in the ground along trails and streams and are aggressive when disturbed. Avoid perfume, powder, and scented deodorants which may attract yellow jackets. Stings cause local swelling and can lead to severe allergic reactions in a few sensitive individuals. Such persons should carry epinephrine kits.

APPENDIX B

WHAT TO CARRY/ HOW TO PACK FOR YOUR TRIP

The following information is recommended to assist students in packing for their trip.

From experience it has been found that students will often bring too many items on a class trip, or not enough of the right items.

For the **Solar Systems** trip,

Students should wear:

- Sturdy walking shoes. Hiking boots are not necessary, but flip flops or slip on shoes are not appropriate for the walking portion of this trip.
- Long pants are suggested any time you visit the National Park. This is the best precaution against cool temperatures, bee stings and ticks.

Students should bring:

A lunch which includes water to drink, and healthy meal to provide them with energy for extended periods of walking and learning.

Lunches should be packed in boxes and kept on the bus until lunchtime.

Other reminders:

Students will not need anything except the materials that the teacher provides. iPods or other electronic devices (if permitted on the bus) should not be brought off the bus during any part of the program.

- Cameras are recommended to preserve memories of the trip and to share with family members.

APPENDIX C

RESOURCES AND REFERENCES

East Tennessee Discovery Center. Knoxville, Tennessee. 865.594.1494

Orion Mythology. <http://www.globe.gov/GaN/student.html>, (9 January, 2008).