Earth, Moon & Sun

Classroom Activities

MOREHEAD
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EARTH, MOON & SUN
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INTRODUCTION

The *Earth, Moon & Sun* planetarium show is an immersive learning experience that involves students in looking, listening, contemplating, and inquiring. As a teacher, you can build on this experience by continuing with related discussions in your classroom—and extending these to reading, writing, and hands-on learning activities. In the following pages are some examples of approaches you can take.

Morehead Planetarium and Science Center created *Earth, Moon & Sun* to help children explore the relationship between our home planet and its most familiar neighbors. Children are helped in their exploration by Coyote, a character adapted from Native American oral traditions. Native American stories woven throughout the show illustrate how we have long sought to understand our planet and the skies above us.

In this show, Coyote proves to be an amusing guide because he has so many misconceptions about space. Coyote's confusion brings scientific facts to light and helps students think about how Earth, Moon, and Sun work together as a system. Students learn why the Sun rises and sets and the basics of fusion and solar energy. They examine the Moon's orbit, craters, phases, and eclipses. The show also describes past and future space travel to our Moon and beyond.

The *Earth, Moon & Sun* show and related classroom activities connect to a range of standards-based science and non-science content, while also responding to children's varied interests and learning styles. Viewers of all ages can appreciate *Earth, Moon & Sun*, but students in Grades 2–5 will especially enjoy and benefit from this engaging exploration of the Earth-Moon-Sun system. ☼

LESSON PLANNING

This curriculum guide describes a variety of activities that build on content referred to in the *Earth, Moon & Sun* show. Because writing is such an important skill to develop throughout a child's school years, many of the activities emphasize language arts. Science, social studies, and information skills are also addressed. The activities can be conducted during class periods after students see *Earth, Moon & Sun*. Some of the activities can also be used to prepare students for the experience of seeing the show. (Training and materials for additional activities—including many connected to *Earth, Moon & Sun*'s astronomy and math content—are included in the Morehead's *A Peek at PLANETS* teacher workshops.)

The following **sample lesson plan** uses activities selected from the *Earth, Moon & Sun* classroom activities guide.

TEACHER'S GUIDE: BEFORE THE SHOW

Part 1. Review "About Coyotes: Information for Teachers" (pp. 17–18) and "Write from Your Research: Prompt A" (p. 4). Let students know that a coyote plays an important part in the planetarium show they will be seeing. To get ready, they're going to find out about coyotes. Ask students to (individually or in groups) prepare short factual reports on coyotes. In a class discussion, first explore what students may already know about coyotes. Follow with a web quest or research in books from the school's media center. Students can draw pictures to accompany their writing.

Part 2. Review "About the Sun: Information for Teachers" (pp. 19–20) and "Coyote and Sun: Learning about Food Chains" (pp. 1–2). Using their research about coyotes, students can create food chains in which coyotes are links. They can also create paper-bag puppets of the Sun, Coyote, and other organisms in their food chains and present simple skits illustrating the transfer of energy within their chosen ecosystems.

TEACHER'S GUIDE: AFTER THE SHOW

Part 1. Lead students through the pre-writing steps described in the first part of "Write Away: Learning to Use Experiences to Develop Writing" (pp. 3–4). Assign one of the "Write from Your Experience" prompts (p. 4) or develop a prompt to help students translate their experience of the *Earth, Moon & Sun* show into writing and discussion.

Part 2. Review "About Navajo Story-Telling Traditions: Information for Teachers" (pp. 15–16) and "Stories that Teach Us: Learning about Fables" (pp. 5–6). Use *Earth, Moon & Sun* to spark discussion about story-telling traditions, including fables. Discuss "Coyote and Crow." Ask your students to write their own fables about Coyote and other animals that can be found together in ecosystems. Ask them to include some of the words listed on the board during pre-writing. Students can create paper-bag puppets (or use those they created earlier) and team up with other student-authors to act out their fables for the class. ☼

COYOTE AND SUN

LEARNING ABOUT FOOD CHAINS

One of the most colorful and whimsical segments of the *Earth, Moon & Sun* show illustrates how the flora and fauna on our planet are nourished by the Sun. Trees, flowers, frogs, elephants, dogs, and shrimp appear across the planetarium dome. All these organisms and more depend upon the Sun—as do your students themselves!

A discussion of this segment and an activity such as those described in "Coyote and Sun" can be grade-appropriate ways to explore why the Sun is so important, how the Sun's energy flows through an ecosystem, and what a food chain is.

TEACHER'S GUIDE

You can begin class discussion by asking students what would happen if we did not have the Sun. Yes, we would feel cold, and we would be in the dark, but we also wouldn't have energy to do things!

You can provide a simple explanation of the Sun's heat and light as sources of energy, and then explain that we receive the Sun's energy as it flows to us from other organisms in our environment. This is why we can't just stand in the sunlight in order to soak up energy (we need to eat regular meals) and also why we must make sure that the animals, plants, and environments we and they rely on in this cycle of energy are well cared for.

In order to explore other life-science content in the *Earth, Moon & Sun* show, you may wish to ask your students to learn more about coyotes and construct food chains that include this animal.

1. Research Coyotes. Students can do a web quest or look at books from the media center to find out about coyotes in North Carolina and other states, noting the different plants and animals they can include in food chains for each ecosystem.

Students can even investigate "Coyote and Crow" (p. 7), the Navajo tale included in this guide, for examples of organisms that live in the Southwestern United States. The illustration that accompanies "Coyote and Crow" is by Andrew Tsihnahjinnie (1916–2000), an important Navajo artist. This provides some additional clues as to the organisms students may include in their food chains. You can also discuss which of the characters in the tale are "prey" and which are "predators."

2. Put on a Puppet Show! The food chain assignment can become a group project. Once their research is completed, each group of students can put on a puppet show to illustrate the flow of energy through their food chain.

Each group member can create a simple paper-bag puppet to represent a link in the chain. (Remind students to be sure to include the Sun!) Instructions for making inexpensive paper-bag puppets are located here: http://www.enchantedlearning.com/crafts/puppets/paperbag/.

Groups can then come to the front of the classroom to act out the flow of energy with a simple script. For instance: "I am Sun, and my rays give energy." "I am Berry Bush, and I get energy from Sun." "I am Bluebird, and I get energy from Berry Bush." "I am Coyote, and I get energy from Bluebird."

Examples of food chains for which your students can create puppet shows include:

- sun →sage brush →quail →coyote
- sun →cactus →rabbit →coyote
- sun →cactus →grasshopper →roadrunner →coyote
- sun →grass →grasshopper →gopher →badger →coyote
- sun →shrub →lizard →roadrunner →coyote
- sun →berry bush →blue bird →coyote

In *Earth, Moon & Sun*, we see Coyote being pursued by a hungry dinosaur. Of course, a dinosaur would not really be the coyote's natural predator! Some of the coyote's predators are bears, wolves, mountain lions, and even humans. If you wish, you can ask your students to include the coyote's predators as additional "characters" in their food-chain puppet shows. ☼

WRITE AWAY

LEARNING TO USE EXPERIENCES TO DEVELOP WRITING

The *Earth, Moon & Sun* show provides your students with a rich experience you can draw upon to build vocabulary they will be able to call upon throughout their school years. The show can also serve as a basis for multiple types of writing assignments.

When giving any of the writing prompts described here, assign the length depending upon the time available and your students' level of writing skill. All of the assignments can be accompanied by pictures you ask the students to draw. The pre-writing steps can be used with the suggested writing prompts or with prompts that you create.

TEACHER'S GUIDE: PRE-WRITING

A glossary of key scientific terms connected to *Earth, Moon & Sun* is included at the end of this guide (pp. 21–22). These are all useful words you may wish to review with your students and include in class discussions and writing assignments. However, in responding to some aspects of the show, your students may choose to convey memories and ideas that require them to learn additional vocabulary.

Students may already know some of the words they need, but not know how to spell them. Or they may need to learn new words in order to discuss and describe the new experience that the planetarium show is for them. The following steps will help students build their vocabularies.

1. Remembering. Ask your students to close their eyes for a little while and remember all the things they saw when they were in the planetarium. Guide them with queries, such as "Do you remember walking into the planetarium? What shape was it? Was it dark or light? What happened when the show came on?" And so on.

2. Discussing. Ask your students to open their eyes and say out loud some of the things they remember. You can give every child the chance to mention one thing she or he remembers. You can make a rule that they must try to mention things that no one has talked about before. Use topics that are mentioned to discuss content you wish to cover.

3. Recording. Write vocabulary words on the board as they are mentioned so that students can see how they are spelled. Students can look at the board and draw from this vocabulary as they respond to the writing prompt you assign.

4. Telling. Keeping an audience in mind can be a complicated task, but you may wish to discuss this with students old enough to consider it as they write. Writing is a great opportunity to tell about an experience, an idea, or something else the writer wants others to know about. Ask your students to think about the person or people to whom they are going to "talk" as they write—possibly a parent or guardian at home, or someone at school, like the principal or a friend.

5. Organizing. If your students are old enough to write a long paragraph or an essay of multiple paragraphs, remind them that organization is important because it helps the person they're telling follow along and not get confused. You can mention that a good way to organize writing about an experience is to write about it in the order that things happened. Another good way for them to organize is by choosing some things to focus on (which they can do in a prewriting or brainstorming phase), rather than trying to write about everything all at once!

WRITE FROM YOUR EXPERIENCE

Prompt A. Describe *Earth, Moon & Sun* to someone who did not get to see the show.

Prompt B. Tell someone who did not get to see *Earth, Moon & Sun* about the most interesting, important, or surprising thing you learned from the show. Tell why you think it was an interesting, important, or surprising thing to learn.

Prompt C. Based on what you learned in *Earth, Moon & Sun* and what you know about living on Earth, write about which place would be your favorite place to live: Earth, Moon, or Sun? Explain why your choice is the best one.

WRITE FROM YOUR IMAGINATION

Prompt A. Do you remember seeing the astronauts going to the Moon at the end of the planetarium show? No one has been to the Moon in a long time. Can you imagine what it would be like if *you* could go to the Moon? Would you like to go? How would you get there? What would you like to see and do on the Moon?

Prompt B. Based on what you saw in *Earth, Moon & Sun*, write a story, poem, or song about how different the world would be without the Sun (or without the Moon).

Prompt C. What did you think about Coyote? Do you remember all the funny things he did? Write your own story about Coyote. Your story can be funny or serious. Use at least five words that were written on the board during the class discussion of *Earth, Moon & Sun*.

WRITE FROM YOUR RESEARCH

Prompt A. Coyote is a cartoon character in the *Earth, Moon & Sun* show. But coyotes are also real animals that live in every state in the United States. Find out more so that you can write a description of coyotes for someone who does not know about them.

Prompt B. Was there something in the *Earth, Moon & Sun* show that you would like to know more about? Tell your teacher so that she can help you learn more (by talking about it in class and looking up information in the media center). Write about what you learn.

Prompt C. The word "misconception" was discussed throughout *Earth, Moon & Sun*. What does this word mean? Can you think of other words that begin with "mis–"? (What about mistake, misunderstanding, misfortune, misspelling?) Does "mis–" in front of a word usually mean the word is describing a good thing or a bad thing? Can you remember some of the misconceptions you heard about in the show? (Heat makes the Sun rise during the day. The Sun is like a vacuum that sucks up the cold and darkness. The dark patches on the Moon, called maria, are seas. Earth is flat, and if we sail far enough, we will go right off the edge of our planet!) Discuss a misconception that interests you (one of those mentioned in the show or another one) and research the facts we know that prove this misconception wrong. (Here are some other science misconceptions to get started with: All spiders make webs. All birds can fly. Clouds are soft.) ☼

STORIES THAT TEACH US

LEARNING ABOUT FABLES

The central character in *Earth, Moon & Sun*—our guide from misconception to understanding—is Coyote, a character adapted from Native American oral traditions. The following pages include the text of "Coyote and Crow," an example of a Navajo fable that also features Coyote.

Before or after the show, reading "Coyote and Crow" with students can spark discussion of story-telling traditions and fables as a literary form. This tale can also provide opportunities for students to investigate the flora and fauna of the Southwest (the tale's setting), the motives of the two main characters, the lesson the tale teaches, and why such a lesson might be important to a society.

TEACHER'S GUIDE

Woven throughout the *Earth, Moon & Sun* show are traditional Native American stories based on observations of the world around us and the sky above us. The stories in the show feature Coyote, who is often the leading character in such tales. Coyote is known as "the trickster," because he is sometimes actively mischievous. But sometimes Coyote is simply flawed in the ways humans can be—greedy, impatient, unreliable, overly ambitious. In *Earth, Moon & Sun*, for instance, we find Coyote hastily scattering the stars instead of placing them carefully in the sky as he is supposed to. Like any interesting character in a story, Coyote gives readers and listeners much to consider, as they

think about his actions and motivations and try to learn from them.

Another story told in *Earth, Moon & Sun* involves Coyote, Crow, and Moon. Coyote and Crow steal the Moon so they will have light when they hunt at night. But when Coyote sneaks a look in the box where they're keeping Moon, Moon escapes. And now, Moon hides whenever Coyote is near. This story illustrates our perceptions of the Moon's phases, while also providing another example of Coyote's foibles. Your students can find many parallels between this story and "Coyote and Crow."

1. Read aloud. Especially if you have very young students, you may choose to read "Coyote and Crow" aloud to the class, with your students following along (with paper copies of the story, or with a copy written or projected on the board) so they know how to pronounce all the words. You can also assign parts to students to read aloud: a narrator, Coyote, Crow. And you can even ask students to act out the tale with some of the same paper-bag puppets that have starring roles in their food-chain skits (see p. 2 for instructions).

2. Investigate sounds. Ask your students to underline or point out words in this tale that begin with a hard <*c*> sound: cactus, carefully, caw, could, Coyote, Crow. Ask students to find words that end with the similar hard sounds of <*ck*> and <*k*>: ask, back, look, pick, rock, walk. Students will have to look very carefully to find the word with a soft <*c*> sound in it: nice (in "A nice bluebird," on the ninth line).

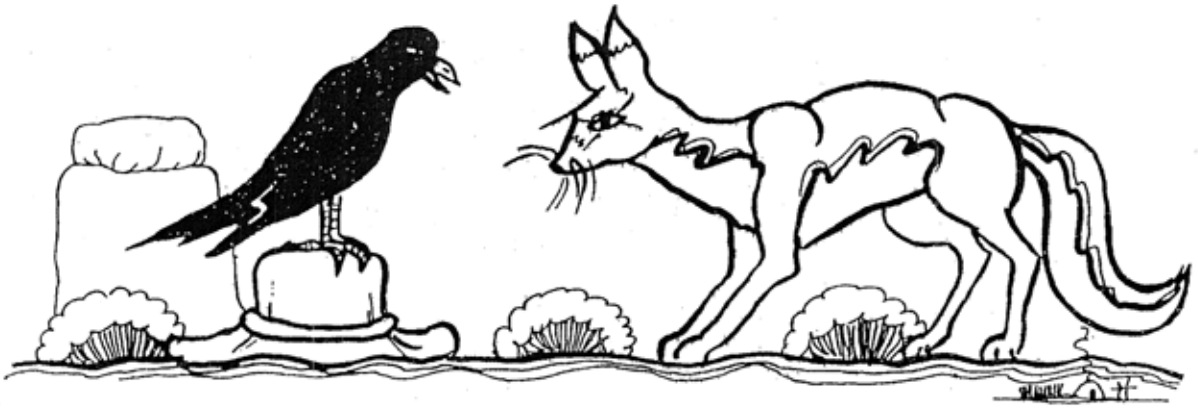
3. Discuss characters. Sometimes stories include characters who do not do the right thing. Is Coyote a character like that? Can your students remember mistakes that Coyote made in *Earth, Moon & Sun*? Were the mistakes intentional or unintentional? What does Coyote do in "Coyote and Crow"? What mistake does he make? What happens because of his action? What should Coyote have done? Coyote is not the only character in "Coyote and Crow." What about Crow? Is Crow a good character? What do your students think about the trick that Crow played on Coyote? Was that a nice trick to play? What should Crow have done?

4. Talk about fables. Typically, fables are short, tell a story, and teach a lesson. Animals are usually their main characters. Ask your students whether "Coyote and Crow" has any of the characteristics of fables. Are your students familiar with any other fables, like "The Tortoise and the Hare"? You may wish to show books from the media center and read some selections, letting students know that fables have been told by people for centuries.

5. Explore settings. Fables come from many countries around the world, and we can often find in them clues about their origins. Ask your students what clues tell them that "Coyote and Crow" comes from a particular part of the United States? What about the animal and plant life this fable refers to? The discussion of setting/environment can form a connection to science content and activities like those provided in "Coyote and Sun" (pp. 1–2).

6. Tell tales. Worksheets on the following pages provide frameworks for students to write their own fables or other types of stories about Coyote and Crow (or about Coyote and another animal they choose). Ideas for characters and settings can be drawn from the work students do for "Coyote and Sun" if that activity is assigned first. ☼

COYOTE AND CROW



One day Coyote was out walking. He saw Crow. Crow was holding his hat under his foot.

"What is under your hat?" asked Coyote.

"I have a bluebird under my hat," said Crow. "Will you hold it for me a little while?" asked Crow.

"I will hold it," said Coyote.

"Don't look under it," said Crow. "Don't let the bluebird get away."

"I will hold it," said Coyote. "I will hold it until you get back."

Crow flew away. He flew behind a rock. He could see Coyote, but Coyote could not see him.

Coyote looked all around. He did not see Crow. He looked at the hat.

"A bluebird," he thought. "A nice bluebird. Crow is gone. I'll eat the bluebird."

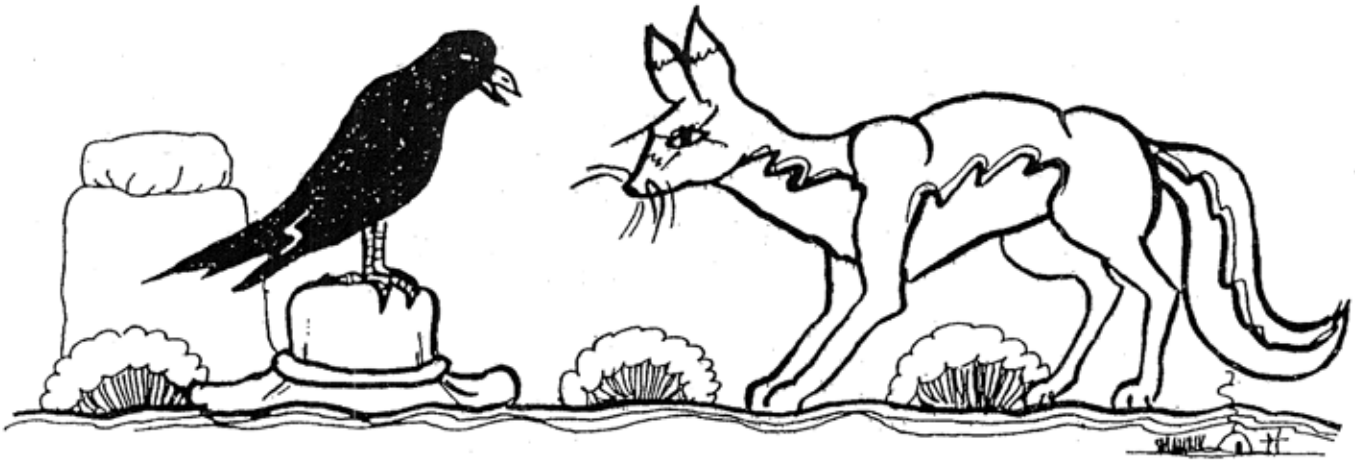
He looked around again. He raised the hat carefully. He grabbed—but it wasn't a bluebird. It was a cactus.

"Caw, caw, caw," said Crow from the top of the rock.

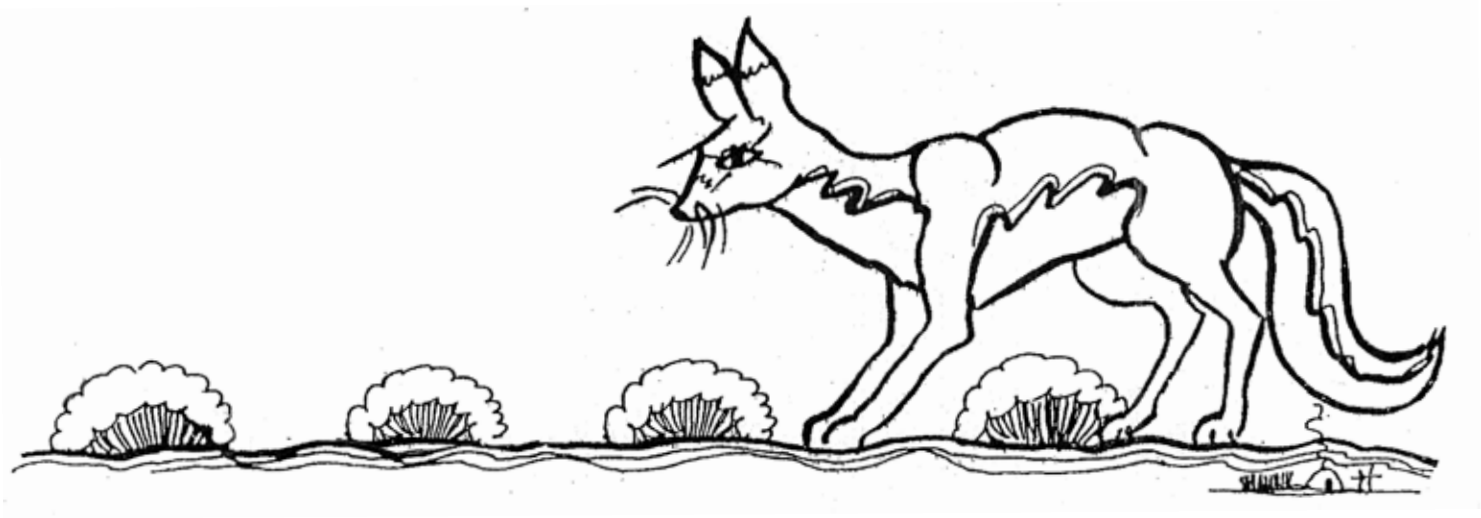
Coyote was angry. He sat down to pick the thorns out of his foot.

"Caw, caw, caw," said Crow again and flew away.

Written by _____



Written by _____



LOOKING UP

LEARNING MORE ABOUT WORDS RELATED TO SPACE

In this activity originated by Morehead science educator Elysa Corin, students find out about NASA and use the Internet for research. They use the "Picture Dictionary" on NASA's website to learn more about the new words they encounter in *Earth, Moon & Sun*. They incorporate what they learn into a story.

The "Picture Dictionary" is designed for K–4 students. Teachers may prefer to ask older students to explore NASA's "Homework Topics," designed for students in Grades 5–8. These students' assignment can also be expanded to include poems and songs. A worksheet for this alternative assignment is included (p. 14).

Picture Dictionary—http://www.nasa.gov/audience/forstudents/k-4/dictionary/index.html

Homework Topics—http://www.nasa.gov/audience/forstudents/5-8/features/homework-topics-index.html

TEACHER'S GUIDE

1. Lead a brief discussion about NASA. Ask students:

- What does the acronym NASA stand for?
- Who works at NASA?
- What kinds of things do people at NASA do?

NASA is the National Aeronautics and Space Administration. From the NASA History Program Office (http://history.nasa.gov/):

> Since its inception in 1958, NASA has accomplished many great scientific and technological feats in air and space. NASA technology also has been adapted for many non-aerospace uses by the private sector. NASA remains a leading force in scientific research and in stimulating public interest in aerospace exploration, as well as science and technology in general. Perhaps more importantly, our exploration of space has taught us to view Earth, ourselves, and the universe in a new way. While the tremendous technical and scientific accomplishments of NASA demonstrate vividly that humans can achieve previously inconceivable feats, we also are humbled by the realization that Earth is just a tiny "blue marble" in the cosmos.

2. Write out "NASA—National Aeronautics and Space Administration" on the board.

3. Explain that the NASA website is a reliable source of information about space and aeronautics (the science of flight). Write the NASA web address (http://www.nasa.gov) on the board. Tell students they will use a certain part of the NASA website called the "Picture Dictionary" to gather information.

4. Pass out the "Looking Up" worksheets. Mention to the students that they heard all of the words they see on the worksheet in the *Earth, Moon & Sun* planetarium show.

5. Read the list of words aloud to your students, so that they associate the correct pronunciation with the spelling of each word.

6. Ask the students to circle three words on the worksheet about which they would like to learn more. Students should write the three words they select in the appropriate spaces on their worksheets.

7. Once students have selected their words, direct them toward the computers. If completing this activity with younger students, a teacher or teacher's aide should sit with the students as they conduct their research. Explain the structure of the "Picture Dictionary" website. (Words are listed alphabetically. Students can either scroll down the page or use the hyperlinked letters at the top of the page to jump to the appropriate sections.)

8. When students find their words on the main page of the dictionary, instruct them to click on the pictures associated with their words. They should write the definitions (either directly from the web page or in their own words) on their worksheets and read the example sentences for comprehension. Make sure students know how to use the "back" button on the web browser to return to the main page of the "Picture Dictionary." Students should repeat this sequence to obtain their three definitions.

9. When they finish finding and recording their definitions, ask the students to write a short story using all three of their words correctly. Each story can be as short as two or three sentences, or it can be longer, depending upon the age and writing level of your students. With younger students, you may ask them to select just one or two of their chosen words to include in a story, or you may skip this step of the activity.

10. Students can write their stories on the back of their worksheets. A ruled back page to photocopy is included for this purpose (p. 13). Alternatively, this may be an occasion when you want students to develop their word-processing skills by composing their stories on the computers they used for their vocabulary investigations. The back of the worksheet can also be left open for brainstorming and outlining prior to composition.

LESSON EXTENSIONS

Explore the vocabulary. Talk together about the words the students chose and why they were interested in those words. What were the most surprising or interesting things your students discovered as they researched? You can make a simple graph on the board showing the most and least popular words.

Share the stories. Ask students who chose to write about one or more of the same words to read their work aloud, so that everyone can hear how the words were used by different writers. Find out who used words that no one else in the class used, and ask those students to read their work aloud. Be certain that every student who would like to has the opportunity to read aloud and to receive praise for her or his writing.

Look up other words. Have your students complete the "Looking Up" activity more than once, but select different words from the worksheet each time. You can also ask your students to select words that they are interested in that appear in the "Picture Dictionary" but do not appear on the worksheet. ☼

Name _____

LOOKING UP: WORDS IN *EARTH, MOON & SUN*

All these words are used in the *Earth, Moon & Sun* show. They are also in NASA's "Picture Dictionary" (http://www.nasa.gov/audience/forstudents/k-4/dictionary/index.html). **Circle three words that you want to learn more about.**

Astronaut	Experiment	Rotate	Space
Astronomy	Lunar Eclipse	Season	Spacewalk
Atmosphere	Orbit	Solar	Telescope
Energy	Planets	Solar Eclipse	Universe

Word 1: _____

Definition: _____

_____

_____

_____

Word 2: _____

Definition: _____

_____

_____

_____

Word 3: _____

Definition: _____

_____

_____

_____

Use your three words in a story. Remember to use complete sentences when you are writing. Your teacher will tell you how long your story should be. Use your imagination and have fun writing your story!

Name _____

LOOKING UP: TOPICS IN *EARTH, MOON & SUN*

All these topics are connected to the *Earth, Moon & Sun* show. They are also covered in NASA's "Homework Topics" (http://www.nasa.gov/audience/forstudents/5-8/features/homework-topics-index.html).

What Is Antarctica?	Who Is Neil Armstrong?	What's an Orbit?
What Was the Apollo Program?	What Is Earth?	What Is a Rocket?

Circle your chosen topic. As you read about this topic, note any facts that you would like to remember when you write your short story, poem, or song. Put quotation marks (" ") around sentences or phrases you copy verbatim (word for word). Use the back of this worksheet to write more notes and make sketches of interesting details you see in the photographs that NASA has provided with your topic.

Notes: _____

_____

_____

_____

_____

_____

_____

_____

_____

Four words on the topic page that rhyme with each other. At least one word must have two or more syllables:

_____ _____

_____ _____

The most interesting fact I learned about this topic: _____

_____

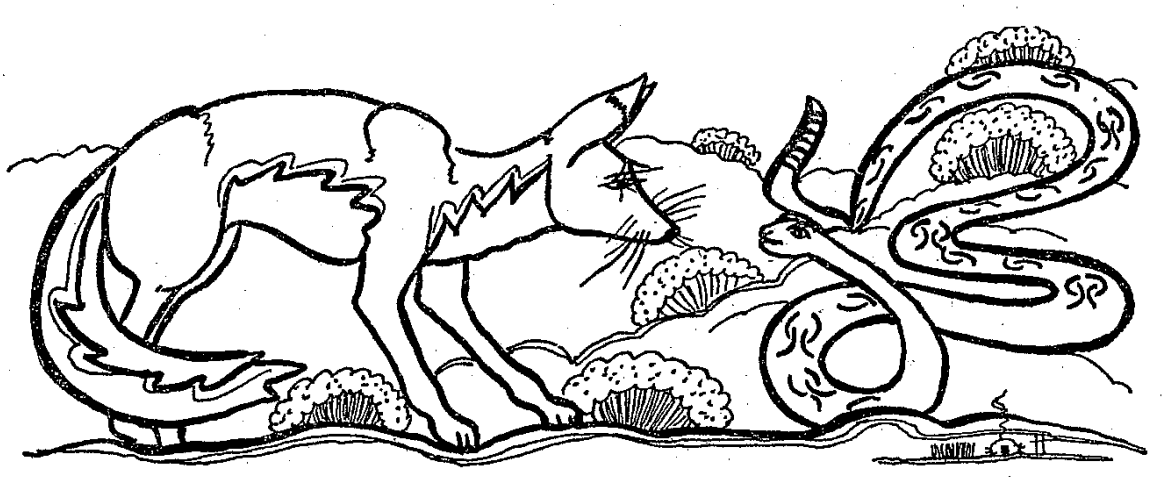
_____

Write a short story, poem, or song that includes your chosen topic. An important requirement of this assignment is that you must use accurate scientific information even when you are writing from your imagination. Your teacher will tell you how long your piece of writing should be. **Have fun writing!**

ABOUT NAVAJO STORY-TELLING TRADITIONS

INFORMATION FOR TEACHERS

Adapted from Robert W. Young's introduction to *Navajo Tales,* first published in 1949



[The collection called Navajo Tales *provides an historical snapshot, taken more than 60 years ago, of story-telling traditions that seemed, then, to be passing away. Robert W. Young likened the tales arising from these traditions to "the multitude of stories and fables inherited from the ancient Greek, Roman, Celtic and Germanic story-tellers, which have delighted and instructed countless generations of people."*

While times and customs change, as Young mentions, today's students can and do continue to enjoy Navajo and other Native American tales. Because modes of communication are also changing, students can—through a web quest, for instance—readily discover that there is widespread and active interest in preserving, understanding, and learning from this literary heritage.]

During the last decade or so, many of the customs which formerly characterized the Navajo people have tended to disappear. Among these apparently dying customs is that of story-telling.

Not many years ago, few Navajos had access to rapid modes of travel to visit neighboring towns. Few went to movies, or to other types of commercialized entertainment. In fact, few knew how to read and write, for there were not many schools, and the white man's education was not always something to be desired from the point of view of the Navajo of former times.

But this did not mean that there was a complete lack of entertainment and instruction of the young. The old way of life maintained certain standards of right and wrong, and had certain non-material aspects about which each successive generation had to learn. And winter nights

were long for a family gathered around the hogan [home] fire. To shorten the hours of darkness, people wanted to remain awake as long as possible. So they achieved a dual purpose of instruction and entertainment by telling stories.

The story-telling period usually began in the fall, along about the time of the first frost, when the spiders, lizards, snakes and other hibernating creatures had crept to their winter resting places. A child might be sleepy, but his father, grandfather, mother, or others of the older generation would awaken him and tell him to listen to a story. The story might take the form of history; it might tell of clan origins, clan interrelationships, or clan taboos. Again, it might be a portion of the legend connected with a certain ceremony.

Often such stories as the latter served to instruct the young with regard to right and wrong, and many times the characters would be personified animals. The story-teller would use a high-pitched voice with a nasal quality to imitate the speech of the animals, much to the delight of the little folk in his audience. A story might illustrate the fact that the strong should not use their strength to take things from the weak. Whatever the moral, the narrator might enlarge upon it at the end of the tale to be sure that it was properly impressed upon the hearer.

This was Navajo education of a former day. "School was out" in the early spring when the days lengthened, and the various creatures came out of their winter hiding places.

☼

["Coyote and Crow," the tale included in the Earth, Moon & Sun *guide, comes from* Navajo Tales*.]*

Navajo Tales contains adaptations of several Navajo stories. Their purpose is to provide familiar materials to Navajo children who are learning to read. To keep the stories at the vocabulary level of children learning to read, it was necessary to tell each story within a selected group of English words and to repeat the selected vocabulary as much as possible. Consequently, the form and language of the tales vary radically from those which characterized the original versions. But the subject matter—the theme of each narrative—is wholly Navajo. ☼

Adapted from *Coyote Tales* in the "Navajo Life Series" (Division of Education, Bureau of Indian Affairs, 1949). Collected by William Morgan. Navaho text and translation by Robert W. Young. English adaptation by Hildegard Thompson.

The illustrations—one of which accompanies "Coyote and Crow" in this *Earth, Moon & Sun* guide—are by Andrew Tsihnahjinnie (1916–2000), an important Navajo artist.

ABOUT COYOTES

INFORMATION FOR TEACHERS

Adapted from materials created by the National Park Service

Coyotes are small mammals, about the size of a medium-sized dog. They vary widely in coloration, ranging from an almost pure gray to a red-brown. The fur is generally much thicker in winter, giving the animal a heavier appearance, with the summer coat being much shorter and lighter.

A wide variety of habitats all across the United States can be called home for the coyote, which is found in both grasslands and forests. Each individual coyote or coyote pack has a home territory that is used on a regular basis, but not actively defended except during mating periods and when the coyote pups are in their dens.

The dens of coyotes can also be found in a variety of places, including rocky ledges, brushy

CALIFORNIA VALLEY COYOTE (*CANIS LATRANS OCHROPUS*) IN THE SAN GABRIEL MOUNTAINS. PHOTOGRAPH BY JUSTIN JOHNSEN

slopes, hollow logs, even small caves. Sometimes the shelters of other small animals are used.

Coyotes mate only once a year, between March and April. The pups are born blind and helpless about two months later. The young are cared for by the mother and other helpers, usually siblings from a previous year.

The adult males of the pack help rear the young by bringing food to the mother and later, after weaning, to the pups themselves. The pups emerge from the den in about three weeks, playful and ready to learn from their parents how to fend for themselves. This learning relationship often lasts for about a year.

Most research has shown that coyotes usually feed on small mammals and birds. They do not feed heavily on livestock or larger ungulates (like elk, deer, or bison) unless these animals are already dead or dying. Coyotes depend on various senses to locate their prey, with sight, hearing, and smell being most important—usually in that order.

Coyotes may be active throughout the day, but they are more easily seen early in the morning and around sunset. ☼

Adapted from National Park Service. (2006, April 29). *Coyote: Canis latrans*. Retrieved from http://www.nps.gov/archive/wica/coyote.htm.

NOTE: The North Carolina Wildlife Resources Commission also provides a very useful two-page document with information about our state's coyote population: http://www.ncwildlife.org/Wildlife_Species_Con/Profiles_new/coyote.pdf.

ABOUT THE SUN

INFORMATION FOR TEACHERS

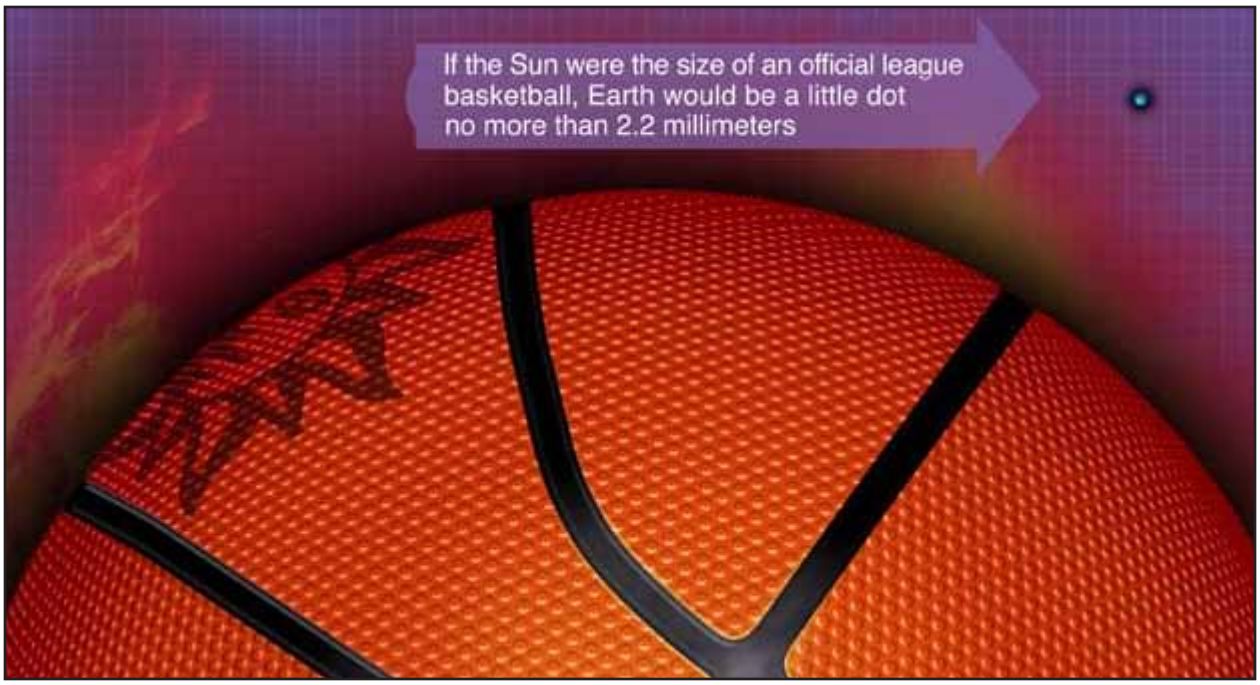
Adapted from materials created by NASA Science and the Solar and Heliospheric Observatory

The Sun gives us heat, light, our food, and the air that we breathe. It powers the atmosphere to give us the winds and rain. Even the coal and oil that generate electricity for light and power come from plants and animals that lived hundreds of millions of years ago and depended on the Sun for life.

The Sun heats the land, oceans, and air. It evaporates water from lakes and oceans. When the water vapor cools, it drops as rain or snow, giving us the moisture we need for drinking water and for plants and animals to grow.

The energy produced through fusion in the Sun's core powers the Sun and produces all of the heat and light that we receive here on Earth. The process by which energy escapes from the Sun is very complex. Since we cannot see inside the Sun, most of what astronomers know about this subject comes from combining theoretical models of the Sun's interior with observational facts such as the Sun's mass, surface temperature, and luminosity (total amount of energy output from the surface).

The Sun is an average star. There are other stars that are much hotter or much cooler, and intrinsically much brighter or fainter. However, since it is by far the closest star to the Earth, it



looks bigger and brighter in our sky than any other star. The Sun's diameter is about 1.4 million kilometers (860,000 miles). It would take 110 Earths strung together to equal the diameter of the Sun.

The Sun is mostly made up of hydrogen (about 92.1% of the number of atoms, 75% of the mass). Helium can also be found in the Sun (7.8% of the number of atoms and 25% of the mass). The other 0.1% is made up of heavier elements, mainly carbon, nitrogen, oxygen, neon, magnesium, silicon, and iron. The Sun is neither a solid nor a gas, but is actually plasma. This plasma is tenuous and gaseous near the surface, but gets denser down toward the Sun's fusion core.

Stars like the Sun shine for nine to ten billion years. The Sun is judged to be about 4.5 billion years old. ☼

Adapted from National Aeronautics and Space Administration. (2010, April 5). *NASA science for kids: Our sun.* Retrieved from http://science.nasa.gov/kids/kids-sun/.

Adapted from Solar and Heliospheric Observatory. (2010, March 22). *Our star the sun.* Retrieved from http://sohowww.nascom.nasa.gov/classroom/classroom.html.

KEY SCIENTIFIC VOCABULARY

Students are exposed to the following scientific concepts during the *Earth, Moon & Sun* show. In the classroom, teachers can reinforce and build upon students' understanding of these concepts by incorporating them in discussions of the show, writing assignments, and other lesson plans.

atmosphere. The mix of gases surrounding a planet, held there by gravity. Earth's atmosphere is composed mainly of nitrogen and oxygen. Other planets' atmospheres are different.

climate. The overall weather that is characteristic of a region over time.

energy. The fuel to do things (e.g., grow, breathe, move). The Sun provides Earth's environment and inhabitants with enormous amounts of energy in the forms of heat and light.

erosion. The process of being worn away (e.g., a coastline eroded by storms).

gravity. The force of attraction between two objects that have mass. A more massive object has a stronger force of attraction than does a less massive object (e.g., the Earth has a stronger force of attraction than does the Moon).

hemisphere. Hemi– means half. So, simply, a hemisphere is half a sphere. It is common to refer to the northern, southern, eastern, and western hemispheres of Earth and other planets.

horizon. When we look into the distance, this is the place (or line) along the landscape at which Earth seems to end and the sky seems to begin.

maria. These are expanses, called plains, on the Moon's surface that appear to us from our vantage point on Earth as being darker than the rest of the surface. Because they were once thought to be seas, maria get their name from the Latin word for sea. "Mare" is the singular.

nuclear fusion. A reaction in which particles (e.g., protons) are forced together to create new particles. The result of this process is the release of a large amount of energy. The Sun is powered by nuclear fusion, converting hydrogen into helium.

orbit. To revolve around another object. The shape of Earth's orbit around the Sun is an almost perfect circle.

photosynthesis. The process by which the Sun's energy (light and heat) is transformed, typically by green plants, into carbohydrates—forms of energy that then flow through ecosystems as the plants are eaten and so on.

rotate. To turn on an axis. Because Earth rotates fully every 24 hours, we have day and night.

revolve. To move in a circle. It takes a year for the Earth to revolve around the Sun.

seasons. Periods of time during the year that have distinct weather patterns (e.g., winter, spring, summer, and fall seasons; or rainy and dry seasons). These result from the tilt of Earth's rotation on its axis and the Earth's position in its orbit around the Sun. Regions experience these patterns differently depending upon where they are located on Earth.

solar eclipse. A phenomenon that occurs when the Moon moves directly across the Sun and obscures our view of the Sun.

sundial. A device, usually placed outdoors, that tells time according to the lengths of shadows cast across it during the day.

sunspots. Dark patches that appear temporarily on the Sun's surface when the temperature in these areas falls because of changes in the Sun's magnetic field.

telescope. An instrument, typically involving lenses or mirrors, that enables us to see objects that are very far away. ☼

CONNECTIONS TO STANDARDS

Specific North Carolina Essential Standards and Extended Essential Standards discussed in *Earth, Moon & Sun* include:

SCIENCE: GRADES 3, 4

3.E.1—Recognize the major components and patterns observed in the Earth/Moon/Sun system.

EX.3.E.1—Understand how changes in the seasons affect the Earth.

4.E.1—Explain the causes of day and night and phases of the Moon.

Other concepts—including gravity, fusion, eclipses, and exploration—are also discussed.

ADDITIONAL ESSENTIAL STANDARDS

Science and non-science content in *Earth, Moon & Sun* can be used in a variety of lesson plans for Grades 2–5. For instance, the "Coyote and Sun" activities in this guide demonstrate how the show can help to address these North Carolina Essential Standards:

SCIENCE: GRADES 4, 5

4.P.3—Recognize that energy takes various forms that may be grouped based on their interaction with matter.

5.L.2—Understand the interdependence of plants and animals with their ecosystem.

Activities like those in "Stories that Teach Us" can supplement lesson plans addressing these North Carolina Essential Standards:

SOCIAL STUDIES: GRADES 2, 3

2.C.1—Understand how various cultures influence communities.

2.C.2.1—Explain how artistic expressions of diverse cultures contribute to the community (stories, art, music, food, etc.).

3.C.1—Understand how diverse cultures are visible in local and regional communities.

COMMON CORE STATE STANDARDS

The "Stories that Teach Us" activities address these Language Arts standards:

READING LITERATURE: GRADES 2, 3

2—Recount stories, including fables and folktales from diverse cultures, and determine their central message, lesson, or moral.

The "Write Away" and "Looking Up" activities address these Language Arts standards:

LANGUAGE: GRADES 2–5

6—Acquire and use accurately a range of general academic and domain-specific words and phrases.

WRITING: GRADES 2–5

1—Write opinion pieces on topics or texts.

2—Write informative/explanatory texts.

3—Write narratives to develop real or imagined experiences or events.

8—Recall relevant information from experiences or gather relevant information from print and digital sources. ☼