

EARTH, MOON & SUN

Classroom Activities



Adapted from the Curriculum Packet
originally developed by:



UNC

MOREHEAD PLANETARIUM
AND SCIENCE CENTER

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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. ✨

CONNECTIONS TO STANDARDS

There are specific Georgia Performance Standards for Science relating to the content in *Earth, Moon & Sun*. These include the following Grade 2 Content Co-requisite standards in Earth Science:

S2E1. Students will understand that stars have different sizes, brightness, and patterns.

- a. Describe the physical attributes of stars—size, brightness, and patterns.

S2E2. Students will investigate the position of sun and moon to show patterns throughout the year.

- a. Investigate the position of the sun in relation to a fixed object on earth at various times of the day.
- b. Determine how the shadows change through the day by making a shadow stick or using a sundial.
- c. Relate the length of the day and night to the change in seasons (for example: Days are longer than the night in the summer.).
- d. Use observations and charts to record the shape of the moon for a period of time.

Similar concepts are found in the Grade 4 Content Co-requisite standards:

S4E2. Students will model the position and motion of the earth in the solar system and will explain the role of relative position and motion in determining sequence of the phases of the moon.

- a. Explain the day/night cycle of the earth using a model.
- b. Explain the sequence of the phases of the moon.
- c. Demonstrate the revolution of the earth around the sun and the earth's tilt to explain the seasonal changes.

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

additional standards

Teachers will notice that science and non-science content in *Earth, Moon & Sun* can be connected to a variety of lesson plans for students in Grades 2-5. For instance, the “Coyote and Sun” activity included in this guide demonstrates how the show may supplement lesson plans addressing the role of light, temperature, and soil composition in an ecosystem’s capacity to support life.

LESSON PLANNING

This 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 in this guide can be conducted during class periods after students see *Earth, Moon & Sun*. Some of the activities can also be used to help to prepare students for the experience of seeing the show.

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 "Information for Teachers: About Coyotes" (pp. 21-22) and "Write from Your Research: Prompt A" (p. 13). 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 "Information for Teachers: About the Sun" (pp. 23-24) and "Coyote and Sun: Learning about Food Chains" (pp. 10-11). 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 prompts outlined in the first part of "Write Away: Learning to Use Experiences to Develop Writing" (pp. 12-13). Assign one of the "Write from Your Experience" prompts (p. 13) or develop a prompt to help students translate their experience of the *Earth, Moon & Sun* show into writing and discussion.

Part 2. Review "Information for Teachers: About Navajo Story-Telling Traditions" (pp. 19-20) and "Stories that Teach Us: Learning about Fables" (pp. 5-6). Use your students' pre-writing about *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. You may wish to assign some of the words that were 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. ✨

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 an example of a Navajo fable that also features Coyote. This example will provide an opportunity to discuss story-telling traditions and fables as a literary form. In reading the tale, students can explore 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.

The activities described here can help teachers at various grade levels address different standards. For instance, the English Language Arts

Reading standards may ask your students to recount stories, including fables and folktales from diverse cultures, and determine their central message, lesson, or moral.

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 &*

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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. 11 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 sound of <ck>: 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.

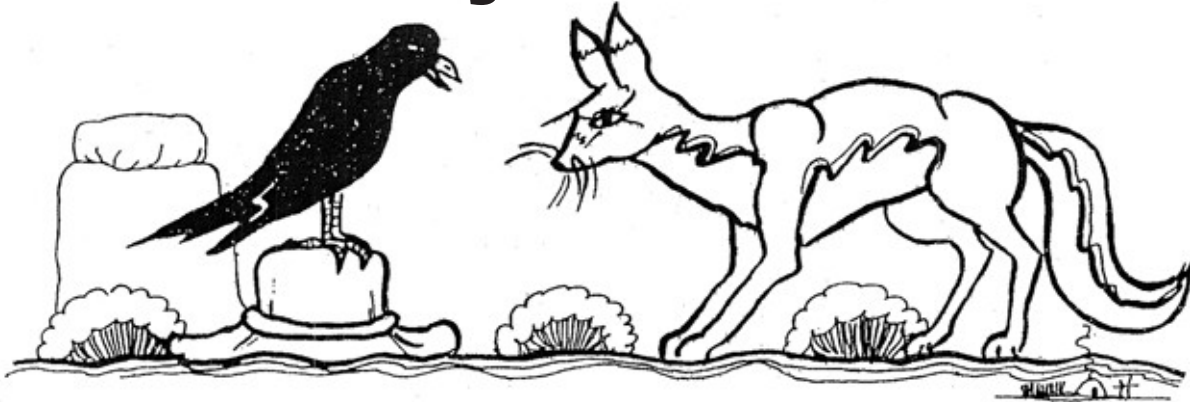
Is Coyote a character like that? Can your students remember mistakes that Coyote made in *Earth, Moon & Sun*? Were the mistakes intentional or unintentional? What does Coyote do in "Coyote and Crow"? What mistake does he make? What happens because of his action? What should Coyote have done? Coyote is 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, and animals are 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 around the world for centuries.

5. Explore settings. Though fables have been told by many kinds of people around the world, we can often find in each one clues about its 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 an activity like "Coyote and Sun" (see pp. 10-11 for instructions).

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.

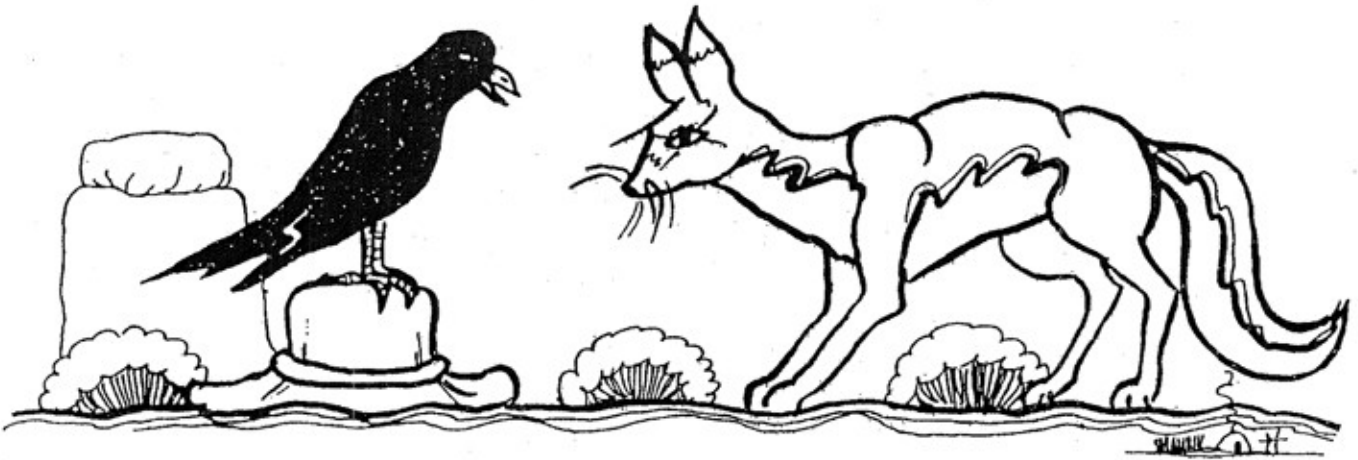
It was a cactus.

“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 _____



COYOTE AND SUN

LEARNING ABOUT FOOD CHAINS



One of the most charming segments of *Earth, Moon & Sun* illustrates how the flora and fauna on our planet are nourished by the Sun. Trees, flowers, frogs, elephants, dogs, and shrimp are shown in this segment. All these organisms and more depend upon the Sun—as do your students themselves!

A discussion of this part of *Earth, Moon & Sun* and an activity such as the one described in this guide 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.

Such a discussion and activity can become part of a lesson plan addressing Georgia’s Grade 4 Science Objective S4L1: Students will describe the roles of organisms and the flow of

energy within an ecosystem.

Teacher’s guide

You can begin discussion of this topic 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 any energy to do things! You can provide a simple explanation of the Sun as a source of energy, and then explain that we get energy from the Sun as that energy 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.

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In order to create a connection to 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.

Students can research coyotes in Georgia and in other states, noting the differences in the plants and animals they can include in the food chains for each ecosystem. They can even mine “Coyote and Crow,” 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 illustration provides 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.”

lesson extension

Put on a Puppet Show. The food chain assignment can become a group project. Once that project is completed, each group of students can put on a puppet show to illustrate the

flow of energy through their food chain. Each member of the group can create a simple paper-bag puppet to represent a link in the chain. (Be sure to include the Sun!) The students can then 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.

Instructions for making inexpensive paper-bag puppets are located here: <http://www.enchantedlearning.com/crafts/puppets/paperbag/>. ☼



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 for writing assignments. Students can recall information from experiences and write narratives to develop real or imagined experiences or events. Assignments that address these standards can help students develop writing skills and knowledge of domain-specific words they will be able to call upon throughout their school years.

When giving any of the writing prompts described below, 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. These are all useful words you may wish to review with your students and include in class discussions and writing assignments. However, in writing about aspects of the show, your students may choose to convey memories and ideas that require 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 this show represents 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.

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 mention things that aren't already on the board.

3. Recording. Write the words down on the board as they are mentioned so that the 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.

You can repeat steps 1-3 to focus students' attention on particular aspects of Earth, Moon & Sun, possibly providing some questions that guide them toward content you wish to cover.

4. Telling. Keeping an audience in mind can be a complicated task, but you may wish to discuss this topic with students old enough to consider it as they write. Writing is a great opportunity to tell someone else about an ex-

perience, 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 pre-writing 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. 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*.

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

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? Discuss a misconception that interests you (possibly one of those mentioned in the show, or another one) and research the facts we know that prove this misconception wrong. (Here are some misconceptions to get started with: All spiders make webs. Clouds are soft. George Washington had wooden teeth.) ✨

LOOKING UP

LEARNING MORE ABOUT WORDS RELATED TO SPACE

In this activity, students learn about NASA and use the Internet for research. After viewing *Earth, Moon & Sun*, they find out more about the new words they encountered by navigating the “Picture Dictionary” on NASA’s website. They incorporate what they learn into a story.

The “Picture Dictionary” is designed for K-4 students. Therefore, you may prefer to ask older students to explore NASA’s “Homework Topics,” which are designed for students in Grades 5-8. You can also expand their writing choices to include poems and songs. A worksheet for this alternative assignment is included (p. 18).

The “Looking Up” assignments described here can help teachers address several Common Core Standards. For instance, the English Language Arts Language Standards, which ask students to acquire and use accurately grade-appropriate general academic and domain-specific words and phrases.

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 History Division of the NASA website:

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. (<http://history.nasa.gov/>; accessed 7/2009)

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

3. Explain that the NASA website is a great place to find 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

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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 hyper-linked 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. 17). 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 *Earth, Moon & Sun*. 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	Space Walk
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 and if you should write your story on the back of this worksheet or on another piece of paper.

Use your imagination and have fun writing your story!

Name _____

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

All these topics are connected to *Earth, Moon & Sun*. 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 above.

As you read about this topic, note any facts that you would like to remember when you write your short story, poem, or song. Use the back of this worksheet to make sketches of interesting details you find in the photographs or illustrations that NASA has provided with each topic .

Notes: _____

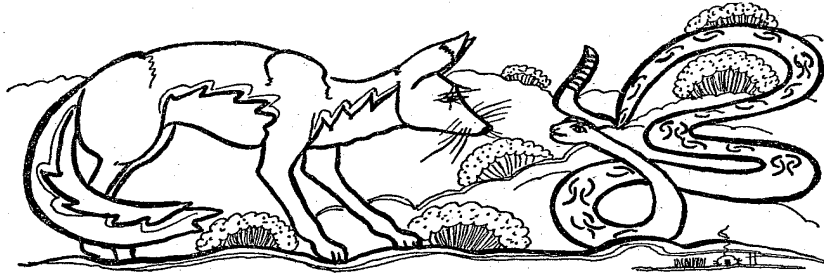
The most interesting fact about this topic: _____

Four words on the topic page that rhyme with each other. (At least two of the words must have two or more syllables.)

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!**

COYOTE TALES



Collected By **WILLIAM MORGAN**

Navajo text and translation By **ROBERT W. YOUNG** and **WILLIAM MORGAN**

English adaptation By **HILDEGARD THOMPSON**

Illustrations By **ANDREW TSIHNAJINNIE**

BUREAU OF INDIAN AFFAIRS

[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 search of the Internet, for instance—readily discover that there is a 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

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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 Hildeward 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

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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 Georgia Wildlife Resources Division also provides a very useful PDF formatted fact sheet with information about our state's coyote population: <http://www.georgiawildlife.com/node/1391>

ABOUT THE SUN

INFORMATION FOR TEACHERS

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

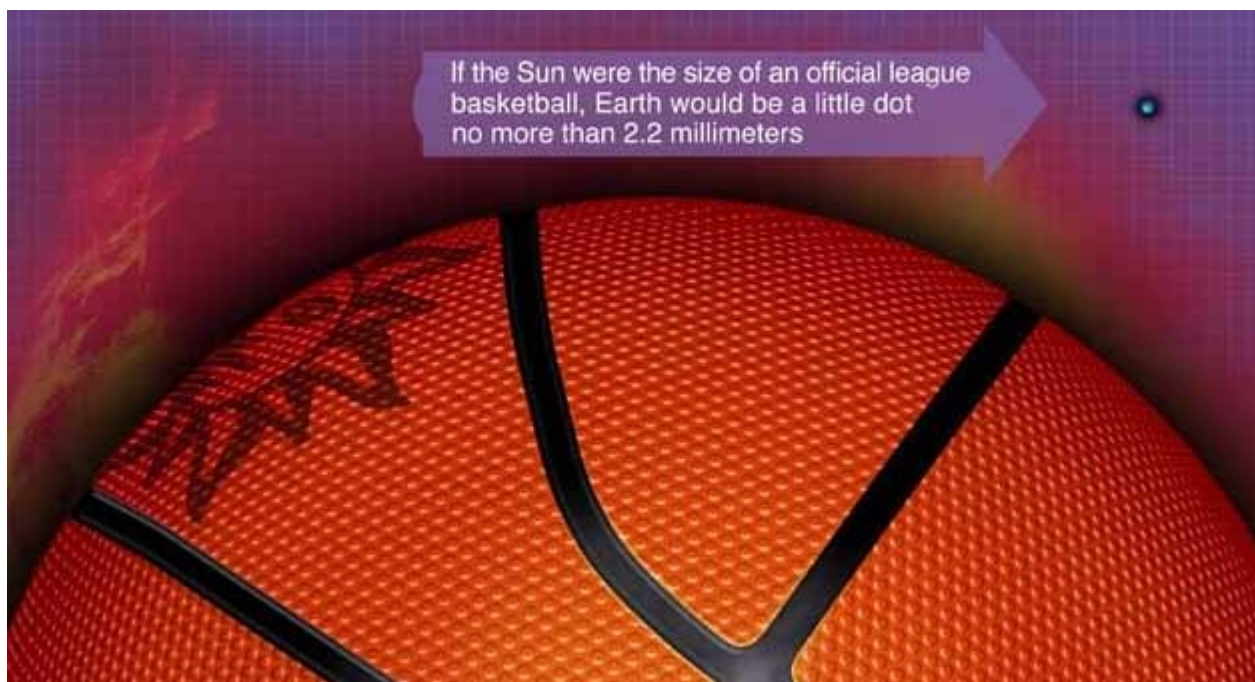
The Sun gives us heat, light, our food, and the air that we breathe. It powers the atmosphere to give us the winds and rain. Even the coal and oil that generate electricity for light and power come from plants and animals that lived hundreds of millions of years ago and depended on the Sun for life.

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 can't 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



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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 towards 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

Your students will be exposed to these scientific concepts during *Earth, Moon & Sun*. Afterward, you may wish to explore several further in your classroom by incorporating them into discussions of the show and into follow-up lesson plans, including a writing assignment.

atmosphere. The gases that surround a planet, moon, or star.

climate. The average weather in different regions of the Earth.

energy. The capacity for doing work.

erosion. The result of being worn away because of water, wind, or glacial ice.

gravity. A physical force that pulls objects together.

hemisphere. Half of a sphere. The Earth is divided into northern, southern, eastern, and western hemispheres.

horizon. An imaginary circle that marks the boundaries of the sky and the Earth, or an extension of the plane of the observer.

maria. Dark plains on the Moon caused by lava flow during the Moon's formation.

nuclear fusion. An atomic reaction in which many nuclei combine together to make a larger one. The result of this process is the release of

a large amount of energy. The Sun is powered by nuclear fusion, like all stars, converting hydrogen into helium.

orbit. A path that an object takes as it revolves around another object.

photosynthesis. This process, which involves the Sun, turns carbon dioxide to oxygen.

rotation. To turn once around an axis.

seasons. Spring, summer, fall, and winter. The seasons are caused by the tilt of the Earth's axis.

solar eclipse. This is what happens when the Moon blocks our view of the Sun.

sundial. An outdoor structure that has a fixed object called a "GNoman" to project a shadow, enabling it to use the Sun's light to tell time.

sunspots. Dark patches on the Sun's surface that are thousands of degrees cooler than the rest of the luminous surface.

telescope. An instrument that makes distant objects such as the stars appear closer, letting humans see things in space.

*Adapted from www.learnnc.org
and www.dictionary.com*