
Project CONN-CEPT Science Units

Astronomy: Sun, Moon, and Stars (K-2)

Properties and States of Matter (1)

May the Force Be with You: Forces, Motion, and Simple Machines (2-3)

Changes, Stages, and Cycles of Living Things (2-3)

Eurekas about Ecosystems (4)

Light (4-5)

Sound (4-5)

Ecosystems and Adaptations (6)

Weather: The Never Ending Story (6)

Cells: The Story of Life (7)

Interactions and Reactions (7-8)

Interactions and Reactions: Chemical Reactions (7-8)

Project CONN-CEPT Social Studies Units

Time, Change, and Continuity in History (K)

Local Government (3)

The Northeast Region of the United States (4)

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With Liberty and Justice for All (6-8)

Units in Preparation

Resources, Needs, Goods, Trade (K-2)

Cultural Universals across Comparative Cultures (2)

Geology and Geological Features (3)

Habitats (3)

Peopling of the Americas (4-5)

Using Primary Sources in U.S. History (6-8)

Earth's Oceans (7)

Research for this grant was supported under the Javits Act Program (Grant No. S206A020086) as administered by the Institute of Educational Sciences, U.S. Department of Education. The opinions expressed in this report do not reflect the position or policies of the Institute of Education Sciences or the U.S. Department of Education.

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A Shared Story

The exhibit hall was huge, and publishers' banners, suspended from the ceiling, waved back and forth in the air conditioned room. Hundreds of conference participants filled the aisles. Vendors of curriculum materials, eager to share their colorful and glossy wares with passing teachers and administrators, stood at the edge of their displays offering warm smiles, prizes, and publishers' catalogues.

Charlene and Andrew had carefully planned their tour through the aisles and divided up so that they could see all the materials. They looked forward to their time in the vendor area because they needed curriculum materials in social studies and science for their upper elementary and middle school students. They hoped they would find something good. They wanted coherent, comprehensive units that addressed their state and national standards, had good assessments, required students to think their way through content, provided teachers with teaching strategies, and some guidance regarding how to differentiate the curriculum for students with varied learning needs.

They looked at many cleverly designed curriculum packages and kits. Most materials were collections of episodic learning activities. Some contained coherent learning activities for students, but did not teach to the critical concepts and principles embedded in state and national standards. Other materials, claiming to be comprehensive, did not contain aligned pre- and post-assessments, user-friendly teacher information, suggestions for teaching, or techniques for differentiating. Several kits attended to concepts and principles, but none was comprehensive enough to address all the standards for a particular grade level. At least two kits would be required to cover the prerequisite standards. Worse, the cost for the two kits would not include the price for the consumables that would have to be purchased each year to keep the kits adequately stocked. They could hardly pay for the cost of one kit!

Charlene and Andrew met at the back of the hall and compared notes. They were disappointed because they realized that the high-quality, standards-based curriculum materials they wanted were not in the racks. Now what? Were there other vendors? If so, who were they and how could they be contacted? If there were no vendors with the materials they needed, could they write the needed curriculum themselves? Who could help them? Did the district have money to pay stipends for curriculum development? How could they possibly write all the curricula that was required to address the state assessments?

We dedicate this curriculum unit, as well as others written under this Javits grant, to all the teachers who have had experiences like Charlene and Andrew. We hope the unit presented here will meet the needs of educators who live in real classrooms, contend with real time constraints, prepare students adequately for high-stakes assessments, seek high-quality curriculum materials, and strive to meet the varied learning needs of all their students.

Deborah E. Burns
Jeanne H. Purcell

PREFACE

In 2002, the Connecticut State Department of Education was awarded a Javits grant from the U.S. Department of Education called Project CONN-CEPT. The major focus of grant activities was the creation of standards-based curriculum units, K-8, in science and social studies. These rigorous curriculum units have been created for all students because every child must have access to the highest quality curriculum. At the same time, the units also have a particular focus on the needs of advanced learners—those who know more, learn more rapidly, think more deeply, or who are more innovative in a particular area of study. It was our goal to embed learning opportunities for advanced learners that were tightly aligned with the concepts and principles that guided the unit.

The Parallel Curriculum Model

This standards-based curriculum unit has been designed using the *Parallel Curriculum Model* (PCM) (Tomlinson, Kaplan, Renzulli, Purcell, Leppien, & Burns, 2002). The *Parallel Curriculum Model* is a set of four interrelated designs that can be used singly, or in combination, to create or revise existing curriculum units, lessons, or tasks. Each of the four parallels offers a unique approach for organizing content, teaching, and learning that is closely aligned to the special purpose of each parallel. The four parallels include: the Core Curriculum Parallel, the Curriculum of Practice, the Curriculum of Connections, and the Curriculum of Identity.

The *Core Curriculum* addresses the core concepts, principles, and skills of a discipline. It is designed to help students understand essential, discipline-based content through the use of representative topics, inductive teaching, and analytic learning activities. The *Curriculum of Connections* builds upon the Core Curriculum. It is a plan that includes a set of guidelines and procedures to help curriculum developers connect overarching concepts, principles, and skills within and across disciplines, time periods, cultures, places, and/or events. This parallel is designed to help students understand overarching concepts, such as change, conflict, cause and effect, and patterns, as they relate to new content and content areas. The *Curriculum of Practice* is a plan that includes a set of guidelines and procedures to help students understand, use, generalize, and transfer essential knowledge, understandings, and skills in a field to authentic questions, practices, and problems. This parallel is designed to help students function with increasing skill and competency as a researcher, creator, producer, problem solver, or practitioner in a field. The *Curriculum of Identity* is a plan that includes a set of guidelines and procedures to assist students in reflecting upon the relationship between the skills and ideas in a discipline and their own lives, personal growth, and development. This parallel is designed to help students explore and participate in a discipline or field as it relates to their own interests, goals, and strengths, both now and in the future.

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The *Parallel Curriculum Model* also contains a new concept called Ascending Intellectual Demand (AID). Ascending Intellectual Demand offers practitioners a way to think about a discipline and each student's steady, progressive movement from novice to expert within that discipline. As students are ready, teachers ask students for increasing levels of cognition, affect, and application. As such, AID is a framework teachers use to increase the challenge level for students by asking them to behave and act in expert-like ways. (Tomlinson, Kaplan, Purcell, Leppien, Burns, & Strickland, 2006).

This unit has been designed using the Core Curriculum Parallel. Core Curriculum addresses the essential concepts, principles, generalizations, and skills of a subject area. It is designed to help students understand essential, discipline-based content through the use of representative topics, inductive teaching, and analytic learning activities. Although the majority of lessons in this unit have been designed using the Core Curriculum Parallel, it also contains several lessons that provide students with opportunities to explore other parallels that are closely connected to the subject matter.

Our Invitation...

We invite you to peruse and implement this curriculum unit. We believe the use of this unit will be enhanced to the extent that you:

- **Study PCM.** Read the original book, as well as other companion volumes, including *The Parallel Curriculum in the Classroom: Units for Application Across the Content Areas, K-12* and *The Parallel Curriculum in the Classroom: Essays for Application Across the Content Areas, K-12*. By studying the model in depth, teachers and administrators will have a clear sense of its goals and purposes.
- **Join us on our continuing journey to refine these curriculum units.** We know better than to suggest that these units are scripts for total success in the classroom. They are, at best, our most thoughtful thinking to date. They are solid evidence that we need to persevere. In small collaborative and reflective teams of practitioners, we invite you to field test these units and make your own refinements.
- **Raise questions about curriculum materials.** Provocative, compelling and pioneering questions about the quality of curriculum material—and their incumbent learning opportunities—are absolutely essential. Persistent and thoughtful questioning will lead us to the development of strenuous learning opportunities that will contribute to our students' life-long success in the 21st century.
- **Compare the units with material developed using other curriculum models.** Through such comparisons, we are better able to make decisions about the use of the model and its related curriculum materials for addressing the unique needs of diverse learners.
- **Examine PCM as one bridge between general and gifted education.** We believe that the rigorousness of PCM has much to offer *all* students, not just those who may already know, do, or understand at very different levels of sophistication.

ACKNOWLEDGEMENTS

We would like to thank our mentors, Carol Tomlinson and Carolyn Callahan. They have been our constant supporters and guides as we moved into uncharted territory related to curriculum development and differentiation.

Over the years we have been guided by the wise counsel of our curriculum writers: Cheryll Adams, Renee Alister, Karen Berk, Fie Budzinsky, Meagan Bulger, Yvette Cain, Lori Cipollini, Leslie Chislett, Megan Coffey, Edie Doherty, Claire Farley, Kurt Haste, Carla Hill, MaryAnn Iadarolla, Caitlin Johnson, Megan Lamontagne, Donna Leake, Lisa Malina, Kay Rasmussen, Martha Rouleau, Cindy Strickland, Mary Grace Stewart, Kim Turret, Ann Marie Wintenberg, and Karen Zaleski. They have worked tirelessly on their curriculum units and provided us with many insights into the curriculum writing process. Although we had a road map at the outset of the writing process, our writers helped us to craft new roads when the old ones no longer worked. We thank them for their integrity, care, innovativeness, and encouragement.

We thank all of the people who featured into the field testing process. These people include teachers in Cheshire, Hartford and Portland Public Schools. We especially want to thank the following building administrators who supported our work: Tory Niles and John Laverty from Hartford; Linda Cahill and Deborah Granier from Portland; and Steve Proffitt, Diane DiPietro, Sharon Weirsmann, Russ Hinkley, Beverly Scully, and Mary Karas from Cheshire. The insights from teachers and administrators helped to make our curriculum units stronger and more practical.

Kim Allen, from Project LEARN, provided us with assistance and support in all of our endeavors and made sure that we stayed the course in solid financial standing. Nancy Wight and Gail Heigel, from Cheshire Public Schools, spent untold hours formatting, typing, duplicating, collating, and distributing the experimental units and ordering the numerous student materials and teacher resources that supplement these lessons. They are the masters of due diligence and attention to detail. We also wish to thank Eileen Williams and Patricia Johnson, from the State Department of Education, for formatting, typing, and preparing the pre-assessments and post assessments for the units. They worked tirelessly for many hours after work and on weekends to meet our deadlines and never lost their smiles.

We thank Cheshire Public Schools and the Connecticut State Department of Education for allowing us to take on this tremendous task and allowing us the hours within day (and night) to accomplish all that was required.

Our families and friends deserve special recognition because they offered unwavering support and encouragement. We recognize they made personal sacrifices, and we hope that we have grown as a result.

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Most of all, we would like to thank Judy Walsh on whose shoulders these units truly stand. With the greatest of care and unparalleled thoughtfulness and consideration, Judy has edited each manuscript, worked collaboratively with each author to refine each lesson, written lessons when it was necessary, and provided a sense of humor and her wisdom as a teacher. She is selfless and seeks only to advance each author and the project. In every way, she has been our “North Star” on the project.

Format for the Project CONN-CEPT Curriculum Units

Each Project CONN-CEPT curriculum unit is formatted in the same way and contains four components: an overview, the lessons, a content map, and a comprehensive list of resources required in the unit. The *overview* is a chart that includes the lesson principles, concepts and skills, the time allocation, the standards that are explicitly addressed within each lesson, and a brief description of each lesson. The overview provides potential users with a “snap-shot” of the unit, related standards, and classroom activities.

The *lessons* follow the overview and vary in number depending upon the content area and grade level of the unit. Each lesson is comprehensive and addresses 10 curriculum components: content, assessments, introductory and debriefing activities, teaching strategies, learning activities, grouping strategies, products, resources, extensions, and differentiation activities. For the most part, each lesson provides specific information about each of these components. An aligned pre- and post-assessment is included for the entire unit, and aligned formative assessments are provided at critical junctures in the unit. Additionally, each lesson contains all the required black-line masters and materials.

Many lessons contain two features that are unique to Project CONN-CEPT materials: opportunities for Ascending Intellectual Demands (AID) and talent-spotting activities. Ascending Intellectual Demand is a term used to describe learning opportunities that require students to work at increasing levels of discipline-specific expertise (Tomlinson et al). They are appropriate for any student who demonstrates advanced ability or expertise in a discipline. The AID opportunities are labeled using the acronym AID. Additionally, many lessons contain searchlight opportunities. Searchlight opportunities are rich moments during a lesson for teachers to observe students and note those who appear to have heightened interest in the topic under investigation. To support these students’ emerging interests, extension ideas are provided.

A *content map* comes after the lessons. Like the overview, the content chart is a snap-shot of the important knowledge in a unit: the major and minor principles, concepts, skills, themes and guiding questions. Teachers who want in-depth information about the knowledge contained in the unit will find this chart useful.

A comprehensive list of *resource materials* concludes each unit. Although the required materials are also listed at the beginning of each lesson, the comprehensive listing provides teachers with a one-page summary of all the materials and it facilitates planning.

ASTRONOMY: SUN, MOON AND STARS

Introduction to Astronomy Grades - K - 2

This unit on Sun, Moon and Stars has been designed using the Core Curriculum parallel. Core Curriculum addresses the essential concepts, principles, generalizations, and skills of a subject area. It is designed to help students understand essential, discipline-based content through the use of representative topics, inductive teaching, and analytic learning activities. Although the majority of lessons in this unit have been designed using the Core Curriculum parallel, it also contains several lessons that provide primary grade students with opportunities to explore the Curriculum of Connections through intradisciplinary and interdisciplinary connections.

The unit contains seven sessions that are outlined in the chart below. The first column contains the lesson number and the name of the parallel(s) that the lesson addresses. The second column contains a series of numbers. The numbers reflect the national standards—culled from *National Science Education Standards* (NSES) (National Research Council, 1996) and *Benchmarks for Science Literacy* (BSL) (American Association for the Advancement of Science, 1993)—that are addressed in each lesson and that are listed and numbered on Preface VIII. Connecticut’s standards are also referenced here and are cited in the same column. For brevity’s sake, only one or two standards are listed in each row of the chart and represent the major focus of individual sessions. However, the lessons have been designed to build upon each other, and each session builds iteratively upon many of the standards.

Column three contains the principles that guide the lesson. The principles—which state relationships among essential concepts—reflect what we want students to know and be able to do upon completing the lessons. They are derived from the standards, reflect both declarative and procedural knowledge, and illustrate the careful attention that has been given to “teasing apart” the complexity of ideas contained within standard statements.

Column four includes a brief description of the lesson. It provides an overview of some of the teaching and learning activities that are designed to occur within the classroom.

National Standards

The Physical Setting

1. There are more stars in the sky than anyone can easily count, but they are not scattered evenly, and they are not all the same brightness or color. (*Benchmarks for Science Literacy*, K-2)
2. The sun can be seen only in the daytime, but the moon can be seen sometimes at night and sometimes during the day. The sun, moon and stars all appear to move slowly across the sky. (BSL*, K-2)
3. The moon looks a little different every day, but looks the same again about every four weeks. (BSL, K-2)

Earth and Space Science

4. The sun, moon, stars, clouds, birds, and airplanes all have properties, locations and movements that can be observed and described. (*National Science Education Standards*, K-4)
5. The sun provides the light and heat necessary to maintain the temperature on earth. (NSES**, K-4)

Science as Inquiry

6. Scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge). Good explanations are based on evidence from investigations. (NSES, K-4)

Habits of Mind

7. By the end of the second grade the students should raise questions about the world around them and be willing to seek answers to some of these questions by making careful observations and trying things out. (BSL, K-2)
8. By the end of the second grade the students should draw pictures that correctly portray at least some of the features of the thing being described. (BSL, K-2)

* American Association for the Advancement of Science. (1993). *Project 2061: Benchmarks for science literacy*. New York: Oxford University Press.

** National Research Council. (1996). *National science education standards*. Washington, DC: National Academy Press.

ASTRONOMY: SUN, MOON AND STARS

Connecticut Related Content Standards Grades PreK-2

I Scientific Inquiry (Expected Performances - A INQ. 1, A INQ. 2, A INQ. 3)

Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.

Scientific Literacy

Scientific literacy includes speaking, listening, presenting, interpreting, reading and writing about science. (Expected Performances – A INQ. 4, A INQ. 5, A INQ. 6)

1.1 Forces and Motion (Expected Performances – A 11)

What makes objects move the way they do?

The sun appears to move across the sky in the same way every day, but its path changes gradually over the seasons.

- An object's position can be described by locating it relative to another object or the background.
- An object's motion can be described by tracing and measuring its position over time.

Lesson	Standards	Lesson principles	Lesson description
<p>1 (CORE/AID) 1 hour, 15 minutes</p>	<p>4, 8</p>	<ul style="list-style-type: none"> • For a very long time, people have observed and studied the objects in the sky. • From a long distance away, the big objects in the sky look very small. 	<p>This first lesson is an invitation to students to wonder and think about the sky. In addition, it is also a pre-assessment. Students are asked to make a drawing of objects in the day and night sky. Then students are asked to distinguish between objects that are “attached” to earth and distinguish them from objects that are “not attached” to earth. Finally, students participate in a kinesthetic activity in which they construct their own understanding about the effect of distance on the size of objects. An AID opportunity invites interested students or students with prior knowledge to compare and contrast additional objects up close and far away and derive the principle: objects always look smaller at a distance.</p>
<p>2 (CORE/AID) 1 hour, 40 minutes</p>	<p>2</p> <p>CT Standard: I (Expected Performances:</p> <p>A INQ 1, 2, 3, 4, 5, 6)</p> <p>1.1 (Expected Performances) (A11)</p>	<ul style="list-style-type: none"> • The sun appears to move across the sky in the daytime. (AID) • We can see the sun only in the daytime; we cannot see the sun at night. 	<p>Students are invited into this set of lessons with a discussion that focuses on two questions: When does day begin? And when does night begin? Then, students participate in a demonstration that involves a rotating globe, small pieces of clay that represent people, and a lamp. Using questioning, the teacher guides students to the new understanding that it is the rotation of the earth that causes the day/night cycle, not the movement of the sun. To underscore their new understanding about the movement of the earth, students participate in another activity in which they discover that their shadows change size and shape at different times of the day. Two extension activities are provided: an Astronomer’s Corner and an Astronomy Writing Center.</p>

ASTRONOMY: SUN, MOON AND STARS

Lesson	Standards	Lesson principles	Lesson description
<p>3 (CORE/ CONNCNTNS/ AID) 1 hour; 30 minutes</p>	<p>5, 6, 7 CT Standard: I (Expected Performances: A INQ 1, 2, 3, 4, 5, 6)</p>	<ul style="list-style-type: none"> • We need the sun for life on earth. • People, plants, and animals need sunlight and warmth to survive. • The sun has characteristics that can be observed and described. 	<p>In this set of activities, students participate in two experiments to discover the effect of sunlight on objects. In the first experiment, students compare the effect of sunlight on a light-colored and dark-colored object to discover that the sun warms objects. In the second experiment that spans 2-3 days, students compare plants that have been provided with sunlight to those that have been kept in darkness. Astronomer’s Corner and Writing Center activities are provided. Interested students are invited to participate in an activity in which they explore the effects of a simple solar oven.</p>
<p>4 (CORE/ AID) 40 minutes</p>	<p>2, 3, 8 CT Standard: I (Expected Performances: A INQ 1, 2, 3, 4, 5, 6)</p>	<ul style="list-style-type: none"> • We can see the moon in the night sky and sometimes we can see it in the daytime. • The moon has characteristics that can be observed and described. • The moon appears to move slowly across the sky. 	<p>Students participate in a demonstration to help them construct their own understanding about the moon’s movement. They record their new ideas about the moon’s movement in their journals at the Writing Center.</p>
<p>5 (CORE/ AID) 1 hour; 50 minutes</p>	<p>3, 4 CT Standard: I (Expected Performances – A INQ 1, 2, 3, 4, 5, 6)</p>	<ul style="list-style-type: none"> • The moon has characteristics that can be observed and described. • The shape of the moon changes a little bit every day, but looks the same again in about a month. 	<p>Using student’s at-home observations about the shape of the moon, students create their own “moon chart.” Through whole-class discussions, students come to see and understand that there is a pattern to the changing shape (phases) of the moon. Subsequently, students explore the characteristics of the moon: shape, surface, size, and distance. Activities are included for the Astronomer’s Corner and Writing Center. In an AID activity, students create a model of the moon that can be used to illustrate the phases of the moon.</p>

Lesson	Standards	Lesson principles	Lesson description
<p>6 (CORE/AID/ CONNECTNS) 50 minutes</p>	<p>1 CT Standard: I (Expected Performances: A INQ 1, 2, 3, 4, 5, 6)</p>	<ul style="list-style-type: none"> • There are too many stars to count. • The stars are scattered in the sky. • They are different sizes and colors. • The stars are always there, even in the daytime when you can't see them. • A long time ago people connected stars in the sky to make pictures. 	<p>This session is an invitation to students to wonder about the stars and stories that have been created about them. In a large-group format, students are provided with an opportunity to look at two pictures of star clusters and to create an accompanying story that they share with a classmate. Additional writing opportunities are elicited at the Writing and Astronomers' Centers. An AID opportunity is provided for students with strong visual imaginations.</p>
<p>7 (CORE/AID) 40 minute lesson 30 minute post assessment</p>	<p>7 CT Standard: I (Expected Performances: A INQ 1, 2, 3, 4, 5, 6)</p>	<ul style="list-style-type: none"> • We can learn new things about the sun, moon, and stars by launching manned and unmanned spacecraft from earth. • Astronauts have traveled to the moon and back. • There is a difference between fiction and reality. 	<p>In this final session of the unit, students explore the nature and role of space travel. Students begin their exploration by discussing their physical needs on earth. Using prepared Astronaut Cards, they come to understand that space travelers need special equipment and vehicles to complete a voyage. Students needing additional challenge are: (1) provided with an opportunity to learn more in-depth about stars, and (2) invited to create questions about space travel and research them on the web.</p>

ASTRONOMY: SUN, MOON AND STARS

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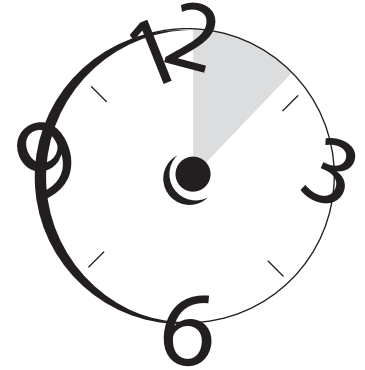
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LookUp!

Core/AID

Time Allocation: 1 hour, 15 minutes
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Lesson Overview

Human beings have lived on the earth for a very long time and have always been interested in watching the sky. A long time ago astronomers learned about time, seasons and distance from observing and recording changes in the sun, moon, stars and planets. Conceptual thinking about astronomy may seem inaccessible to young children but talking about the familiar objects they see in the sky can begin to build a foundation of accurate scientific information on which they will continue to build. In this module, students focus on the astronomers' skills of observing, recording and telling what they see in the day and night sky. The aim is to introduce astronomy to students, not just as a series of facts about far away objects, but as a sky filled with interesting things to learn more about.

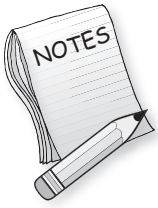
Guiding Questions

- What do you see when you look at the sky?
- What objects do you see in the sky in the daytime?
- What objects do you see in the sky in the nighttime?
- How big is the sun?
- How big is the moon?
- Why do you think people who lived on the earth a long time ago watched and studied the sky? (AID)

BIG IDEA

Big objects look small from
a distance.

ASTRONOMY: SUN, MOON AND STARS



Content Goals

Universal Theme

- Inquiry

Principles and Generalizations

- For a very long time, people have observed and studied the objects in the sky.
- From a long distance, the big objects in the sky look very small.

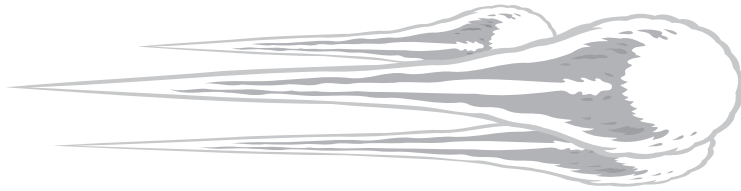
Concepts

- Sky
- Sun
- Moon
- Horizon
- Objects or celestial bodies
- Stars
- Planets
- Astronomer
- Astronomy
- Telescope
- Binoculars
- Observation
- Distance
- Miles (AID)



Teacher Information

- Early scholars and astronomers could see that the sky was constantly changing. They created detailed permanent records of their observations and passed them on to the next generation. Eventually these records led to an understanding of how to measure and predict future events. For this reason astronomy may be considered to be the first science.
- Early scholars like Aristotle, Ptolemy and Thomas Aquinas learned a lot about the objects in the sky just by observation with the naked eye.



- The commonly held belief was that the earth was the center of the universe, and everything else rotated around it. This theory reflected religious more than scientific thinking.
- In the 17th century Galileo became the first person to study the sky with a telescope. This helped him confirm a radical idea that Copernicus had proposed in the 1500's, that the sun was the center of the universe, and all the planets revolved around it.
- The sun and the moon have played a crucial role in developing ancient and modern calendars.
- Our current solar calendar is based on the early Roman (Gregorian) calendar developed in 1582.

One day = one 24 hour rotation of the earth

**One year = one 365 day rotation of the earth
around the sun.**

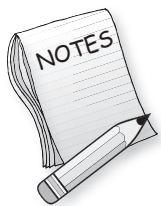
One solar year = the cycle of the four seasons

- Most ancient civilizations (Babylonian, Egyptian, Greek, Roman, as well as Jewish, Muslim, Chinese, Hawaiian, Native American) developed lunar calendars that were based on the 29 1/2 day rotation of the moon around the earth. See *Moon Calendars* by Kim Long pg 91-111 for additional information about early moon calendars.
- Some cultures continue to use the traditional lunar calendar (Chinese, Muslim, Hebrew).
- Early sailors used the moon and the stars for navigation.
- Our moon is about 2,000 miles in diameter.
- The earth is about 8,000 miles in diameter.
- The sun is over 800,000 miles in diameter.
- There is still a lot to learn about the universe from studying the sky.

Skills

- Recognize attributes
- Make observations
- Identify characteristics

ASTRONOMY: SUN, MOON AND STARS



Materials and Resources

1. White or manila construction paper
2. Black construction paper
3. Paper, crayons, markers for drawing
4. Pictures or posters of the sun and moon

Preparation Activities

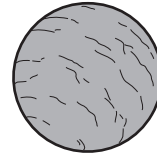
1. Have drawing materials available.
2. Do not post astronomy pictures in the classroom before the children draw their picture. You want to see what they already know about the day or night sky before looking at pictures of the day and night skies.

Introductory Activities (10 minutes)

- Explain to children that a long time ago, there were no people on the earth, just animals. After the dinosaurs were gone, and people came to the earth, they were always interested in watching the sky.
- Ask the children the question, “What is the sky?”
- Show a picture of an ancient astronomer looking into the sky, but do not name the objects that he was looking at just yet. Ask the children what they think the astronomer is looking at. “What do you think the sky looked like a long time ago?” Ask the question, “What does *ancient* mean?” Explain that it means very old. Tell the children that an astronomer is a scientist that studies the sky. Explain that this ancient astronomer in the picture was looking at some of the same objects in the sky that we look at today. Today there are modern astronomers who continue to study the sky.
- I want you to think about what you see in the sky in the daytime and at nighttime.
- Focus your discussion with the children on helping them to see that as long as people have been on the earth, they have been interested in looking up to observe and study the sky.

Pre-assessment (40 minutes)

In order to assess what students know, have them draw two pictures, one with objects they have seen in the DAY sky, and one with objects they have seen in the NIGHT sky. This will be an informal assessment, aimed at providing insight to a child’s thinking of the objects and their position in the sky.



Draw the Day Sky (20 minutes)

1. All students will complete this activity, working in either whole group or in small groups of three to five students. Provide children with light construction paper, markers, crayons and/or crayons at each table. Ask children to draw a picture showing the things that they see in the sky in the daytime. Then ask them to identify the objects by writing or telling about them to you. Circulate around the room and help the children write the words they are saying. Listen to their thoughts and conversation. When the children are finished with their drawings, ask each child to share something about his or her drawing with the group. Some of them may show the moon in the day sky, and this is accurate as the moon is visible in the daytime in the first and third quarter.
2. Once drawings are complete, display them in the classroom for all students to see. There is no right or wrong. Accept everything that the children include. They will have an opportunity to create new drawings at the end of the unit.

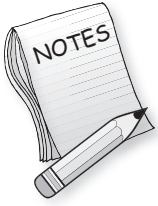
Draw the Night Sky (20 minutes)

1. Repeat the same activity either in whole group or in small groups, but this time ask the children to draw and say or write the objects they see in the night sky.
2. Display the drawings; ask the children to talk about what they have drawn. If a child says falling star, meteor, eclipse, ask him or her what the object is. Listen to the response to determine his or her understanding of objects in the sky.

Alternative pre-assessment

Interview a random group of children to determine what they know about objects in the day and night skies. Record answers to compare with post assessment interviews.

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Teaching and Learning Activities (20 minutes total)

I – Objects that are attached to the earth and objects that are not attached to the earth (10 minutes)

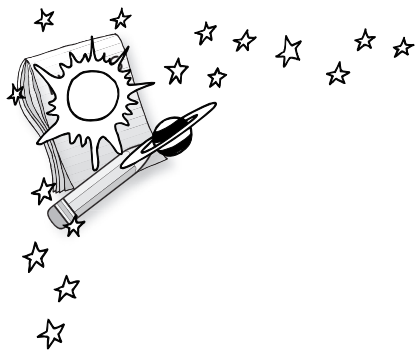
1. With the drawings posted in the classroom so that the children can see them, make two columns on the chalkboard, one for **OBJECTS THAT ARE ATTACHED TO THE EARTH** and another for **OBJECTS THAT ARE NOT ATTACHED TO THE EARTH**. (Trees, hills, mountains are attached to earth, birds live close to the earth, clouds are actually very close to the earth, but objects in the sky that are not attached to the earth are very far away.)
2. Begin by explaining the difference between the two columns, and ask children to name something from their drawing. Decide together which list it belongs on. You want to help children shift their focus from trees and birds and hills and fences to the big, faraway objects in the deep, blue sky. Explain that the items in the sky that we want to study are those that are **NOT** attached to the earth: the sun, the moon, and the stars. Birds and trees, hills and mountains are all things that we could touch, but not the sun and the moon because they are too far away. Share with the children that people who devote their lives to studying big objects in the sky are called astronomers. If a child mentions clouds, explain that they might have rain or snow in them and that clouds affect our weather (clouds can bring us rain or snow), but that clouds are not **ALWAYS** in the sky, and we are looking for the permanent objects that are always in the sky.
3. Your final list of permanent faraway objects in the sky will be the sun, the moon and the stars. If children mention planets, put them on your list, but explain that we are going to focus our study for now on the sun, the moon, and the stars.

II. Looking at Far-Away Objects (10 minutes)

1. To help students understand how big the sun and the moon really are, arrange a demonstration along a very long hallway or outside on a sidewalk or playground.

2. With a group of students, hold a **BIG BALL**, and ask students to describe it. They will say **BIG**; help them to find a way to describe it, or measure it, (Comes up to my knees, too big to hold, bigger than Joey's head...)
3. Now ask two students to walk the ball down to the end of the hallway (minimum distance of approximately 50 feet). Ask children if the ball looks different than it did up close. Ask why it looks smaller. Ask, "Is this the same ball?" Ask children to describe it, or measure it by holding their fingers together, closing one eye. Children will say it is smaller. Help them be descriptive in comparing the same object up close and at a distance.
4. Help children to verbalize and agree on the big idea that **BIG OBJECTS LOOK SMALL FROM A DISTANCE**.
5. Take this idea back to the classroom and relate it to the big objects in the sky, the sun and moon.
6. If a child asks how far away the sun is, try to provide a reasonable answer in terms that he/she can relate to. An accurate answer is to say that if you were in a car driving to the sun (impossible, of course), you would have to drive very fast (100 miles per hour) for seven years to get to the sun. The sun is 93 million miles away. Check for understanding of the concept of one mile. Try to relate it to something familiar like walking around a track or measuring a mile on your bike or comparing how long it might take to walk a mile versus riding in a bus or car or an airplane for a mile.
7. Ask the children, "How big is the sun?" (or moon). You can write the big numbers on the board: the sun is over 800,000 miles in diameter, and the moon is about 2,000 miles in diameter. The big numbers will be meaningless, and most likely the term *diameter*. Hold up a ball to describe diameter. Explain that both the sun and the moon are round like a ball. And that they are **HUGE** objects! Ask if they know which number is bigger, and which object is larger. In describing the sun and the moon, try to think of analogies that are meaningful to them. For example, you might ask what is the biggest thing they have ever seen. Responses might include a mountain, a model of a dinosaur at a museum, Wal-Mart, a baseball field...) Try to talk about the sun or the moon in terms of these

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familiar things. You could describe the moon as big enough to hold a million of the biggest mountains in the world. It is not crucial that they understand conceptually what a million is. The point is to help them grasp the idea that the moon is a really big object, but it looks small because it is so far away.

8. Ask if anyone has heard the words *telescope* or *binoculars*. Listen to their answers and ideas and explain that these objects help people see things that are very far away. Astronomers use telescopes to study the sky. Show them how to use them and explain that they can try looking through them in the Astronomers' Corner.

Products and Assignments

- Original drawing of day sky
- Original drawing of night sky or
- Student interviews

Optional Extension Activities

1. If there are children who are particularly interested in comparing objects up close and at a distance, an optional activity is to have them complete the activity Drawing and Comparing Objects Up-Close and At a Distance. Arrange the children to work in pairs or groups of three.
2. Locate three large items that are easy to draw (beach ball, globe, big book, cardboard box). Use the Blackline Master BLM1.1 Drawing and Comparing Objects at a Distance. Write in the name of the object in the left column. Fold the paper in half length-wise so that they will not be looking at the drawing they made for up-close. Children will view an object up-close and at a distance and record what they see by drawing each object.
3. Place the first object on the table in front of the children, and ask them to draw that object. Now place this same object a distance away (down the hallway, by the big tree, by Mrs. Jones' door...) and ask the child to draw a picture of it.

4. The beach ball up close will be a big circle, and at a distance will be a small circle. For each item, ask the children if both drawings are of the same object. Ask why the pictures are not the same. Which drawing is bigger? Which drawing is smaller? How can the same object look different?
5. (AID) For children who may be comfortable using a ruler, ask them to extend their arm holding a ruler and measure how tall the object is, both up-close and at a distance. Allow them to use a ruler, meter stick, or any non-standard measurement. Explain that they need to hold the (zero) end of the ruler at one end of the object and read how many increments tall the object is.
6. Repeat this activity with another object or two, until children can explain the pattern: big objects look smaller at a distance. Make sure the children can explain what they have discovered: objects look smaller at a distance. Post their data chart in the classroom.
7. Another optional activity for all students is to locate a parent or a member of the community that has a telescope that can be set up in your classroom. Show children how they can bring far away objects up closer by looking through a telescope.

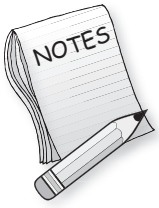
Post Assessment

Post assessment will not be completed in this module. As children increase their knowledge and understanding of the sun, moon and stars, they will have the opportunity to revise or create new drawings at a later date.

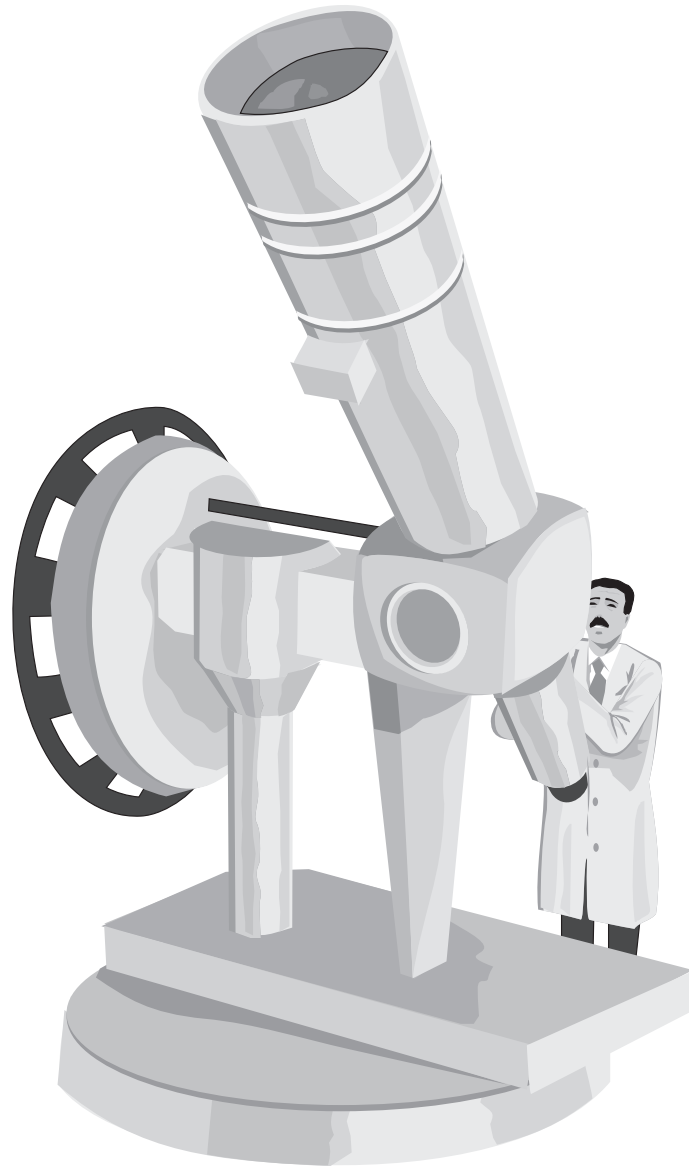
Debriefing and Reflection Opportunities (15 minutes)

1. Go back to your lists, and assess for understanding of the difference between the objects that are attached or close to the earth and those that are not.
2. Clarify that the role of an astronomer is to observe, record and talk about the objects that are far away from us and are visible in the sky every day and every night.
3. Ask the children to think of ways to describe things that are very huge or very far away, and relate these distances to the sun, moon or stars.

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4. Invite the students to think of questions that they have about the sun, moon, and stars. Post these questions in the room and end the lesson by stating, “We will see if we can answer these questions in the next few weeks as we study, like astronomers, the sun, the moon, and the stars.”
5. Provide an opportunity for children to revise their drawings if they wish.



BLM1.1 Drawing and Comparing Objects Up-Close and At a Distance

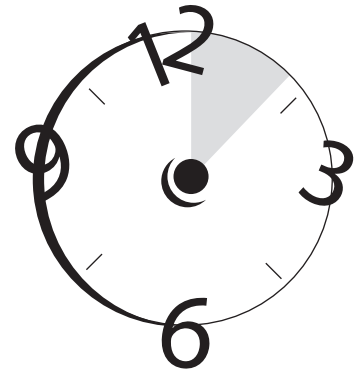
Object	Drawing Up-Close	Drawing at a Distance

Good Morning, Sunshine!

Core/AID

Time Allocation: 1 hour, 40 minutes

Required Materials and Resources on Page 86



Lesson Overview

This lesson will focus on the two most basic units of time (day and night) and the one object in the sky that determines whether we are in daylight or darkness on earth. The sun appears to be moving across the sky, but it is the constant rotation of the earth that creates the cycle of day and night. To explain why we cannot see the sun at night, the teacher will simulate the day/night cycle on earth with a demonstration using a lamp and a globe. This lesson provides a concrete representation of the abstract idea that it is the movement of the earth that causes the day/night cycle, and not the movement of the sun. Children will explore the changing nature of shadows to reflect the apparent movement of the sun across the sky in the daytime. The goal of this module is to introduce accurate factual information about the day/night cycle related to a child's daily life experience of sunrise, daylight, sunset and darkness.

In this module, the children are introduced to the **Astronomer's Corner** and the **Astronomy Writing Center**.

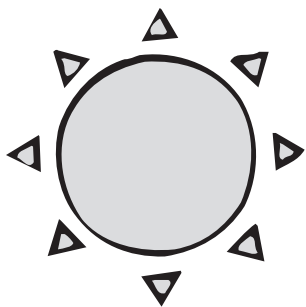
Guiding Questions

- Where is the sun in the morning?
- Where is the sun in the evening?
- What is a sunrise?
- What is a sunset?
- Where is the sun at night? (AID)
- What is a shadow?
- What does your shadow look like?

BIG IDEA

Cycles

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Content Goals

Universal Theme

- Time

Principles and Generalizations

- The sun appears to move across the sky in the daytime (AID).
- We can see the sun only in the daytime; we cannot see the sun at night.
- A shadow is created when an object is blocking the light from the sun.
- The shape and position of the shadow depends on the location of the sun in the sky.

Concepts

- Sunrise/sunset
- Daylight/darkness
- Morning/evening
- Sunlight
- Cycle
- Rotation (AID)
- Shadow
- Calendar

Teacher Information

- Day and night are created by the 24 hour revolution of the earth rotating on an imaginary axis that runs through the north and south poles.
- As the planet rotates, different regions face the sun.
- The earth is tipped about 23 degrees as it rotates on its axis, so the sun does not directly face the equator as it rotates.
- One side of the earth is always in sunlight for half of the rotation cycle and the other half in darkness for 12 hours.
- The “path” of the sun across the sky changes very slowly with the seasons. (The arc is highest in the sky in the summer.)
- One of the earliest astronomical instruments was a shadow stick for accurately marking sunrise and sunset times.
- Archaeologists have found many examples of earlier cultures that used the sunrise-sunset equinox line to position their buildings (the Temple of Amon-Re in Karnak, Egypt, Cathedral builders in the Middle Ages).

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- Archaeology is the study of past human life by studying relics and monuments of ancient people.
- In the northern hemisphere, there are two days of the year when there are exactly 12 hours of sunlight and 12 hours of darkness, March 21 (spring equinox) and September 23 (autumn equinox).
- The changing lengths and positions of shadows reflect the changing position of the sun
- The angle the sun determines the length of a shadow. Link the sun/shadows/shadow stick/sundial to ancient structures and techniques that earlier cultures used for predicting and telling time, seasons, etc.
- Shadows can give us consistent and reliable information about the position of the sun.

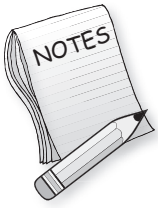
Skills

- Make observations
- Compare and contrast

Materials and Resources

1. Globe on a stand
2. Lamp to stand on a table, preferably with a shade that will focus light on the globe
3. Piece of clay or small figure to attach to globe
4. Sidewalk chalk
5. Chart paper
6. Black and yellow construction paper, glue (shadow poster activity)
7. Crayons, markers
8. Journals: two or three sheets of 8 1/2" x 14 "paper or oaktag folded in half to make a book
9. Fowler, Allan. (1992). *The Sun is Always Shining Somewhere*. Children's Press. (ISBN #0516449060)
10. Swinburne, Stephen R. (1999). *Guess Whose Shadow?* Scholastic. (ISBN# 0-439-26651-3)
11. Kandoian, Ellen. (1987). *Under the Sun*. GP Putnam's Sons. (ISBN# 0-399-22025-9)

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Suggested Astronomy Center materials

1. Parkes, Brenda. *The Sun*. Newbridge Discovery, (ISBN# 1-56784-929-6)
2. Ashe, Frank. *The Sun is My Favorite Star*. Gulliver Books Harcourt, (ISBN# 0-15-202127-2)
3. Authentic pictures of the sun taken by astronomers, pictures of the satellites that went into space to study the sun
4. A globe

Additional recommended teacher resources:

1. A simple model of the sun, earth and moon
2. Moeschl, Richard (1993). *Exploring the Sky: Projects for Beginning*
3. *Astronomers*. Chicago Review Press. (ISBN# 1-55652-160-X) This book contains a rich history of how astronomy has influenced the development of calendars, architecture, and human behavior across time and cultures.
4. Spandenburg Ray. (2001). *The Sun*. Danbury, CT: Ray Franklin Watts-Scholastic. (ISBN# 0-531-11767-7)
5. For children particularly interested in what the sun looks like, there is a device called the SunSpotter which will allow people to view a reflected image of the sun. Check to see if a school in the area may have one that you could borrow

Preparation Activities

1. You will need a sunny day to do the outdoor shadow activities. (There is an indoor alternative.)
2. Determine the best location for the day/night simulation, preferably a darkened room, so the lamp will be most effective as the sun. Place the globe on a table, and the lamp three or four feet away.
3. Select pieces of clay for people or stickers to position on the earth as it rotates.
4. Have materials related to the sun at the Astronomy Center.
5. Have booklets prepared for the Astronomy Writing Center, and materials for writing and drawing (crayons, markers, colored pencils).

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Introductory Activities (10 minutes)

- Ask the children to explain the difference between daytime and nighttime. (They may say that it is light in the daytime, dark at night). But when does the day (daylight) begin? And when does night (darkness) begin? Establish with the children that sunrise and daylight begin with the appearance of the sun, and sunset and darkness begin with the disappearance of the sun. And that this is a repeated event, every day and every night, all year long, every day of their lives, as far back as anyone can remember, as long as people or animals have been on the earth.
- Ask children to think about where the sun is at night. When you go to sleep at night, is the sun sleeping too? Let's try to find out where the sun is at night.
- Read aloud *Under the Sun* or *The Sun is Always Shining Somewhere*.

Pre-assessment

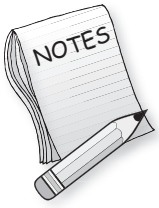
N/A

Teaching and Learning Activities (40 minutes)

I. Day/Night Simulation

1. In a darkened room, arrange the students in a group around the table with the globe and lamp. Explain that you are going to demonstrate why the earth is in daylight in the daytime and in darkness at night.
2. Turn the lamp on, and the lights in the room off. Your lamp will direct a cone of light toward the earth. Point to the lighted side of the globe and explain that people on this side of the earth are in daylight. Point to the other side of the globe, and say, "People on this side of the earth are in darkness."
3. Point again to the side of the earth in daylight, and ask, "What do most people do during daylight (work, go to school, play outside)? And what are people doing on the dark side of the earth (at home, sleeping)?"
4. Ask a child to place a clay figure or sticker on the earth in darkness. Demonstrate how the earth rotates and the clay figure comes into daylight and again into darkness. Explain that the earth moves slowly, and it takes one whole day for it to turn (rotate) a complete circle.

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5. Encourage children to take turns placing clay on the globe and rotating the globe slowly, indicating which part of the world is experiencing day, then night, as the clay figurine moves from daylight to darkness. Allowing children to manipulate three-dimensional objects may help them clarify what they see in two-dimensional pictures and drawings. Ask for volunteers to use the globe and lamp to explain to the rest of the class what they know about the sun in the daytime and nighttime.

(AID) Since rotation is a major concept in science and particularly in astronomy, look for children that may be particularly interested in the idea that the earth is constantly turning. You may observe that they are focused and capable of simulating the rotation as they take their turns with the globe and the clay figure.

For such a child or children, you may encourage further discussion or experimentation with rotation. Ask him or her to think about other things that rotate or spin (bicycle tire, ball) and describe (compare) the action with words and pictures in their journal. For example, a child might say that if you turn a bicycle upside down, the tire is turning in a circle but doesn't look like it is turning until you are up close. Or perhaps a child might say that a spinning ball moves sideways. The objective is to encourage the child to think of the specific movement that a rotating object makes, understand that it is constantly turning slowly or rapidly. Encourage him or her to write about it in pictures.

6. (AID) Ask the children if there is a volunteer in the class who can use the globe and lamp to answer the question, "Where is the sun at night?" If a child can demonstrate the answer to this question, not just say it in words, ask him or her to write about it in his or her journal using words and pictures.

II. Exploring Shadows

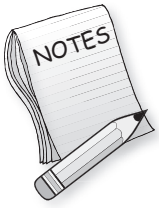
SAFETY NOTE: Tell children that they are NEVER to look directly at the sun, as it is too bright and will damage their eyes. Explain that astronomers use telescopes with special filters and mirrors that reflect the sun onto another surface to study it. The sun is so bright it could permanently damage your eyes!

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1. Read *Guess Whose Shadow?* Explain that sometimes everything has a shadow. Do you have a shadow? Let's go outside and see. This is an outside whole group activity.
2. On a sunny day, take the class outside.
3. Assign each student a partner for this activity.
4. Ask the children to stand with their backs to the sun. The teacher will stand in front of the group and model the desired behavior. Then ask if the children can find *your* shadow. Now ask them if they can find *their* shadow. Ask them to describe their shadow. Then ask them to bend down, raise their arms, and describe what happens to their shadow.
5. Ask students to turn and face in the direction of the sun, using one hand or arm to shade their eyes. Ask again, where is your shadow now? Ask if their shadow has moved with them or remained in the same place. Why does it happen that way?
6. Make sure children understand that they make a shadow when they block sunlight, and that they can tell the position of the sun by looking at a shadow.
7. If you are on a concrete or asphalt surface, have one child hold a position to create a shadow, and the other child draw around that shadow using sidewalk chalk. Have the first child try to fit into the other person's shadow. Ask if he or she can do it.
8. (AID) Later in the day, if possible, go back outside and ask one child if he or she can fit into his/her shadow drawing now. Is the shadow bigger or smaller now than it was earlier in the day? Does it fit into the morning shadow drawing? What has changed? Ask the children to describe how their shadow is different now than it was before earlier in the day. Ask why they think the shadow is different?

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9. For those who do not have an opportunity to go back outside and re-examine their original shadow drawing, ask them to see if they can find their shadow after school and tell you if it looks different or the same as it did in school earlier that day.
10. Ask children to write in their journals the answer to the question, "Why does your shadow change?"

Indoor alternative shadow activity:

1. Cover a circular or rectangular table with white paper so that children can draw on it. You will need a clamp-on lamp to attach at about adult head height from the floor. Do this activity in a darkened room. If you do not have a circular table large enough for this activity, you could create a work area on the floor with large sheets of white paper, and the lamp clamped to the back of the chair.
2. Position a tall object in the center of the table. Clamp the lamp (sun) on the back of one of the chairs, so that the object is casting a shadow on the opposite side of the table. Ask children to find the shadow that the object makes. Ask a child to trace around the shadow, and write his/her name on the shadow that he or she traced.
3. Then move the object to another position and observe how the shadow is different. Ask children to describe how it is different than the previous shadow, and have a child trace it and put his or her name on it.
4. Continue to move the object in a large circular pattern and have children record each shadow. Ask the children, "Are the shadows always the same or do they look different. How are they different? How would you describe the difference?"
5. Reposition the lamp to a lower position so that you get some long shadows. Move the object around to create a pattern of long, tall shadows. Ask the children to compare them to the other shadows. Why are some shadows longer and some shorter? Ask the children why the shadow looks different when you move the object around the table. You want the children to be

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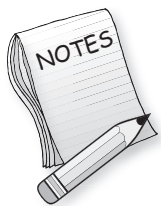
able to see that the bright lamp is creating the shadow. You want children to describe a shadow and compare the different shapes of the shadows, and understand that as the lamp moves, so does the size and shape of the shadow.

6. Now say to the children, “Let’s pretend the lamp is the sun, and you are the large object making the shadow.” Turn the lamp off. As a volunteer if you are standing here where the object is, where will the shadow be when I turn the lamp on? Take turns trying this activity with several children.
7. Ask the children to notice their own shadow the next time they are outside on a sunny day.

Astronomer’s Corner (20 minutes)

1. Introduce the Astronomer’s Corner to the children. Explain that as we are studying the sun, moon and stars, we will have an Astronomer’s Corner for exploring the books and materials that we have used in class. In addition to the read aloud books for the area of focus, include other books and resources (pictures, posters, binoculars, children’s encyclopedias, etc.), that you can find in your school library or from other sources in the community. For each area of focus, have new materials for children to review.
2. Create Shadow Posters
Fold a piece of poster paper into four equal sections. Explain to the children that they are going to use the four sections to make four drawings. Demonstrate with a piece of poster paper. Draw a horizontal line across each box about three quarters of the way toward the bottom to create a “ground” line, where a person or object is standing. In each drawing they are going to answer this question: If the sun were in this position and a person or object were standing here, *where* would the shadow be and *what would it look like?* Say to the children as they are working that these are SCIENCE posters, and their purpose is to show accurate SCIENTIFIC INFORMATION about what we observe about the sun and shadows. Begin by having the children place the object or person on the “ground” line. Then have them position the sun in the sky. You may choose to have the children draw the sun and/or object, or you may want to pre-cut yellow circles for suns, figures, or objects

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(like balls or trees) for the children to place on their drawings. The focus of this activity is for the children to think about *where* the shadow would be and *what it would look like*. Ask them to think about that and then draw (or cut from black construction paper) the shadow and draw it (or glue it) in position in each drawing. Post the drawings in the classroom. Select a few drawings that are correct and ask those children to explain their drawings to the class.

3. Shadow Center: Arrange a corner where a bright light can be cast against a smooth wall surface so children can make and describe shadows. Allow them to work in pairs to make the most interesting shadow shapes they can think of. Ask them to describe the shape their partner makes.

Astronomy Writing Center (20 minutes)

1. Introduce the Astronomy Writing Center to the children. Explain that as we are studying the sun, moon and stars, each of you will make a sun, moon, and stars book to show what you have learned. The suggested format for the sun, moon, and stars book is described under Materials and Resources.
2. This week at the Astronomy Writing Center, children can design and draw a cover for their Astronomy book, or begin to record what they have learned about the sun. When all children in a group have completed their writing and drawing, ask each to share his/her book with the group and tell what he/she has learned.
3. Regroup and explain to children that we are going to look at some pictures of people and their shadows, and you want them to think about where the sun would have to be to make the shadow. Demonstrate a couple of examples on the board, check for clarity and understanding of the task, then ask children to complete.

Products and Assignments

- Astronomer's Corner and Shadow Center participation
- Astronomy Writing Center participation
- Shadow posters (optional)

Extension Activities

1. Using Shadows to Tell Time

This activity is for AID children who may be interested in observing and recording the movement of the sun.

If we didn't have clocks and watches, how would we know what time it was? Before clocks and watches were invented, people used the sun to tell time. They made sundials. Ask if they know what a sundial is, if they have ever seen one. Ask how they think the sun could be used to tell time. Provide a simple explanation to show how you can mark where the shadow falls, and then mark it again in one hour, and again in two hours to show the passing of time. You are recording the (apparent) movement of the sun across the sky in the daytime.

2. Make a Sundial

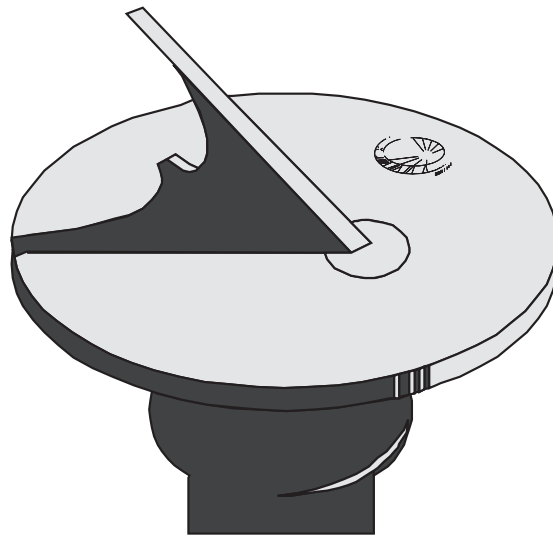
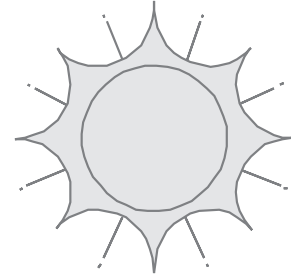
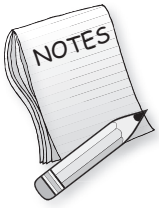
Arrange students in groups of three. Help them select an open, sunny area to position their sundial. Place the cardboard on the ground, lying flat. Insert the stick or dowel rod through the center of the cardboard, into the ground so that it will remain securely in place for the next few hours. Ask children to notice where the shadow of the stick falls on the cardboard, and mark that line, using a straight-edge (yard stick or meter stick) to make a straight line. Write the time on the line (9:00). Have the children repeat this in one hour, and again in two hours. Bring their sundials back into the classroom and explain to the class or write in their journals what they have learned about using the sun to tell time.

3. Another AID extension activity is to have a child look at a shadow of an object and *predict* how that shadow will change as the position of the sun changes.

Post Assessment

N/A

ASTRONOMY: SUN, MOON AND STARS



Debriefing and Reflection Opportunities (10 minutes)

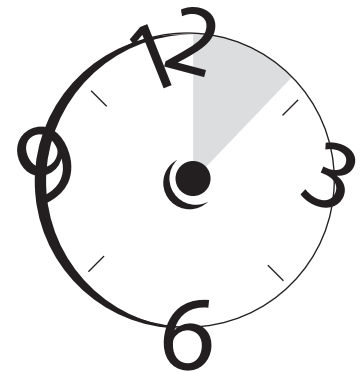
1. Review the daily pattern of sunrise and sunset. To reinforce this pattern of movement, find a location in your classroom or school where the sun is visible and not visible at a certain time during the day.
2. Ask children to notice if their shadow is different after school today than it was during class.
3. Ask children if they have any new questions that they would like to ask about the sun. Record these questions and help the students try to discover the answers in the resource materials at the Astronomer's Corner.

Who Needs the Sun?

Core/Connections/AID

Time Allocation: 1 hour, 30 minutes

Required Materials and Resources on Page 86



Lesson Overview

This lesson will focus on the one object in the sky upon which we depend for life. Students will identify characteristics of the sun (bright, hot, round, location, distance) and relate their own experience to these characteristics of the sun.

Guiding Questions

- What does it mean to need something?
- What do you know about the sun?
- What do people and animals need the sun?
- How do you know the sun is hot?
- How far away is the sun? (AID)

BIG IDEA

The Sun

Content Goals

Universal Theme(s)

- Energy

Principles and Generalizations

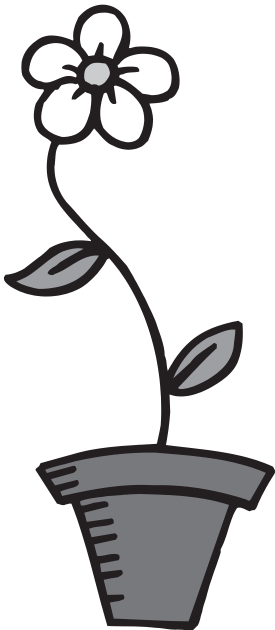
- We need the sun for life on earth.
- People, plants and animals need sunlight and warmth to survive.
- The sun has characteristics that can be observed and described.

Concepts

- Warmth
- Heat
- Need
- Characteristics of the sun
- Life
- Energy (AID)
- Living things vs. non-living things
- Growth

Teacher information

- Ancient people worshipped the sun. They observed the daily cycle of the sun and knew that they needed it for life though they really didn't understand why.
- Compared to other stars, the sun is a small star, called a yellow dwarf star.
- The sun is a fiery ball of hot, swirling, glowing gases, mostly helium and hydrogen.
- The sun provides the light, heat and energy necessary for life.
- Compared to the size of the earth, the sun is enormous.
- The diameter of the sun is 865,000 miles. The diameter of the earth is about 8,000 miles. If the sun were hollow, it would hold over one million earths!
- The sun appears bigger to us than most stars because it is closer to the earth.
- All planets revolve around the sun, which is the center of our universe
- The temperature at the center of the sun may be 27 million degrees Fahrenheit. If the sun were closer, the earth would be too hot; all the



Who Needs the Sun?

water would evaporate and no life could survive. If the sun were farther away, all the water would freeze; ice would cover the earth, and it would be too cold for life to survive.

- The layer of ozone around the earth is designed to protect us from the damaging ultra-violet rays from the sun. But increasing damage to the ozone has reduced the effectiveness of this protective layer; therefore, it is important to protect human skin from too much exposure to the sun.
- Looking directly at the sun will damage your eyes. Be clear in telling children never to look directly at the sun. Astronomers use telescopes with very expensive filters and lenses that reflect the image of the sun on to another surface so they can study it.
- Without heat and light from the sun, we could grow no food to eat.
- Without the sun, there would be no daily or seasonal weather patterns.
- Without the sun having played a role in the decomposition of organic matter a long time ago, we would not have fossil fuels (coal, gas, oil) on this earth today for our energy needs.
- As recently as 1990, NASA launched a spacecraft to study the sun. There is still a lot more to learn about the sun.

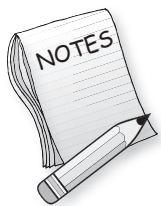
Skills

- Categorize
- Make observations
- Describe and record observations
- Identify characteristics
- Compare and contrast

Materials and Resources

1. Parkes, Brenda. *The Sun*. Newbridge. (ISBN# 1-56784-929-6)
2. Video about the sun – show a “sun” segment of the video.
3. Chart paper
4. Prepare in advance 20 Item Cards: a picture of one item per card approximately 3” x 5,” half of which are items that need the sun, half do not need the sun
5. Double-stick tape
6. Two pieces of black felt or two black T-shirts
7. Two small plants

ASTRONOMY: SUN, MOON AND STARS



8. Shoebox
9. Aluminum foil
10. Muffin

Preparation Activities

1. Find a warm sunny place in your classroom or nearby where you can place two pieces of black felt (or two black T-shirts) in the sun for 30 minutes or so.
2. Prepare a stack of Item Cards (one for each student in the class), which are pictures of familiar things (flower, dog, rock, child, tree, flowering bush, chair, coin, tiny plant, shoe, etc.). There should be one picture card for each child in the class.

Introductory Activities (5 minutes)

- Ask the children what it means to need the sun. (All living things would die without it.) Why do some things need the sun and other don't? (It keeps them warm and helps them grow.) What do you think your life would be like without the sun? (darkness, cold)

Pre-assessment

N/A

Teaching and Learning Activities (80 minutes)

MAKING A CLASSROOM POSTER: WHAT NEEDS LIGHT FROM THE SUN? (30 minutes)

1. Read-aloud *The Sun*, by Brenda Parkes, Newbridge Educational Publishing (ISBN# 156784-929-6) which explains how the warmth of the sun provides heat and light that plants and animals and people need living on earth. (10 minutes)
2. Ask, "What are some living things that need sunlight and warmth to survive?" Divide a piece of chart paper into two columns *Living Things That Need Sunshine and Warmth* on one half and *Nonliving Things* on the other. Arrange students in pairs. Pass out one Item Card to each student. Think/Pair/Share with partner to decide if each item needs the sun, and why. One at a time, ask each child to come to the board and attach his/her picture in the correct column on the chart paper. Use the double-stick tape to attach

Who Needs the Sun?

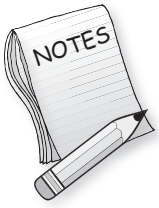
the pictures to the chart. If there are items a child is unsure about, ask other students what they know about that item that will help the child decide. Post the chart on a wall in the classroom where students can refer to it again in this lesson.

EXPERIMENTS WITH WARMTH AND LIGHT FROM THE SUN

1. Experiment #1: The Warmth of the Sun - to feel the warmth that the sun provides, explain that we are going to set up an experiment. We will place one object in the sun (fabric, preferably 2 dark colored T-shirts, towels or something similar) and a second object in the shade or a closet. Tell children that we will leave these items in place for 30 minutes, and then we will compare how they feel. After 30 minutes or so, have them take turns placing one hand on the item in the sun and the other hand on the item in the closet for a couple of seconds. Ask, "What do you notice?" "Is there any difference between them?"
2. Ask which object is warmer and which object is cooler, and if they can explain why.
3. After each child has compared the objects, have him or her tell what he or she learned about the sun.



ASTRONOMY: SUN, MOON AND STARS



4. Experiment #2: Light from the Sun - to see the effect of sunlight, take two small healthy plants and place one in the sun and one in the closet. Compare the plants daily. Be sure to water both plants, so that only difference between the plants is sunlight.
5. Ask children to compare the plants and describe the difference between them. Record the differences between the plants for a few days until children see clearly the effect of lack of sunlight on plants. Continually make a reference to the sun as the source of the sunlight and repeat that we are dependent on this huge faraway object in the sky as the provider of warmth and sunlight that all plants on the earth need to grow. After the experiment, you may want to allow the withered plant to be placed in the sun a few days to help it recover.

Ask children to think about how the sun could make plants grow from so far away.

(AID) If a child mentions the word *energy* in his/her discussion about the sun, ask him or her to research the concept of energy and share with the class or a small group what he or she has learned about energy and the sun.

Visit the Astronomer's Corner

Allow children time to review books and materials related to the sun.

Visit the Astronomy Writing Center

1. Allow all children time to draw or write new words or ideas about the sun in their sun, moon, and stars journal.
2. Provide time for children to share with their group or with the whole class what they have written or drawn about the sun.

Products and Assignments

- Class Chart of *Living Things that Need Sunshine and Warmth* and *Nonliving Things*
- Astronomer's Corner participation
- Astronomy Writing Center participation

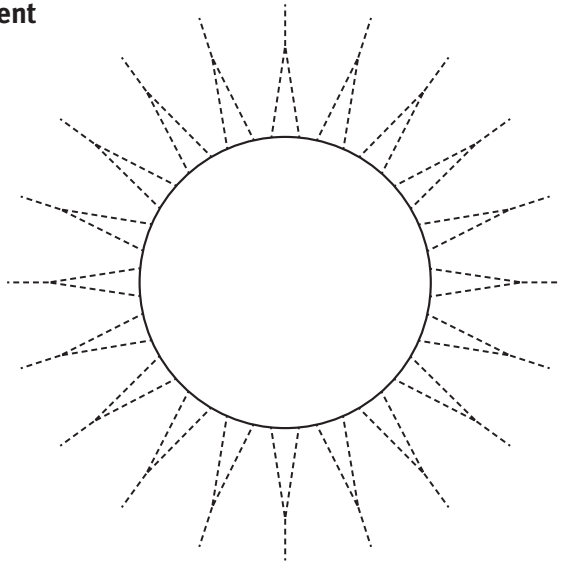
Who Needs the Sun?

Extension Activities

1. This is an optional activity for children interested in learning more about the sun's heat. Make a solar oven. Wrap a shoe box with aluminum foil place it in the direct sun. After an hour, cut the muffin in half and feel how the sun's rays have warmed the muffin!
2. (AID) Use a thermometer to record the temperature inside the solar oven. Record the temperature reading once at the beginning of the experiment and again after one hour.

Post Assessment

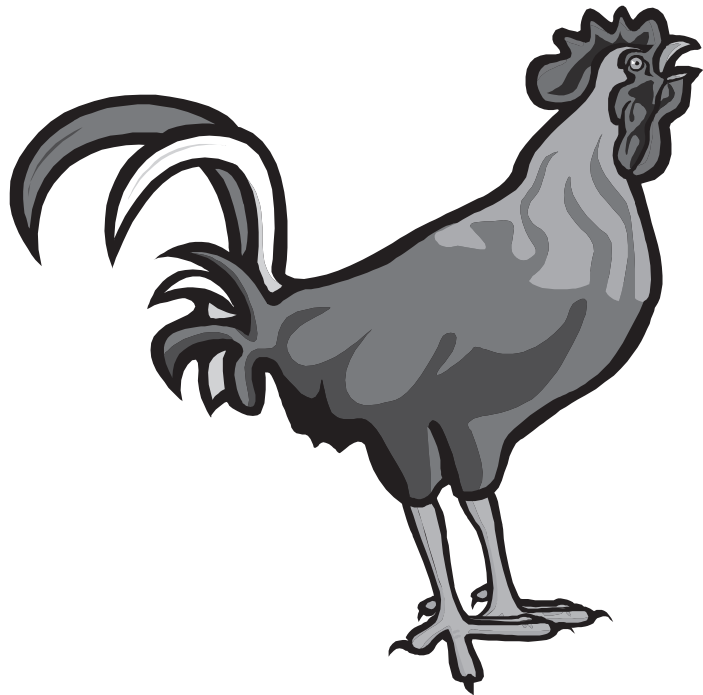
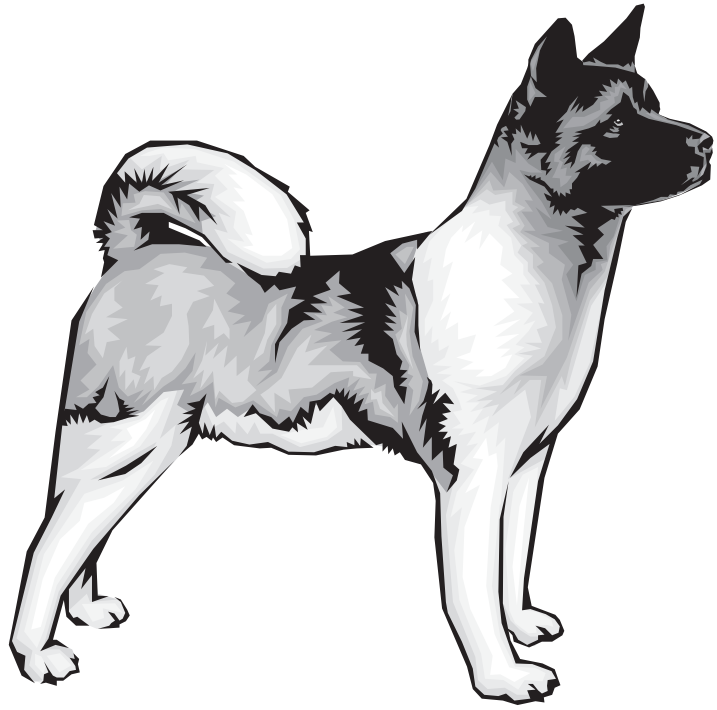
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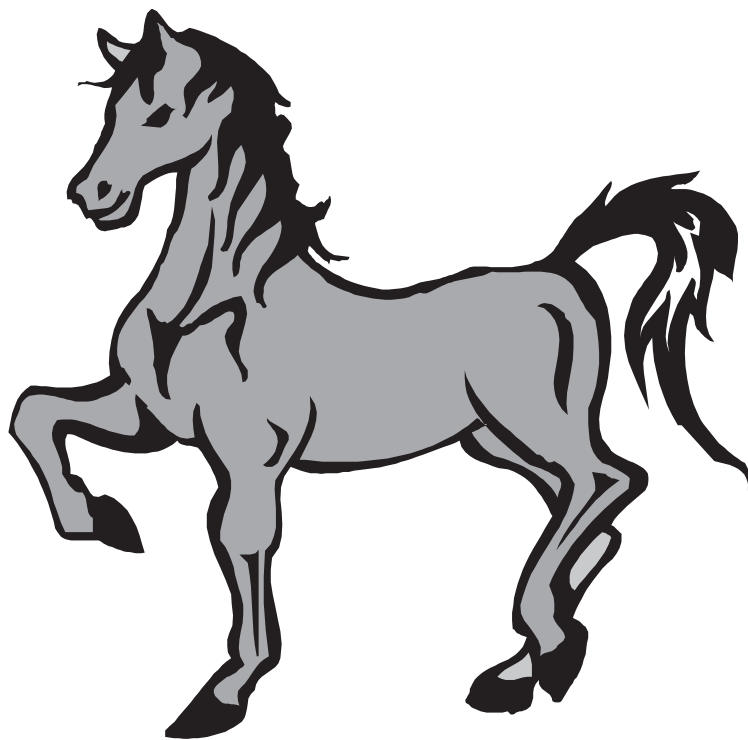


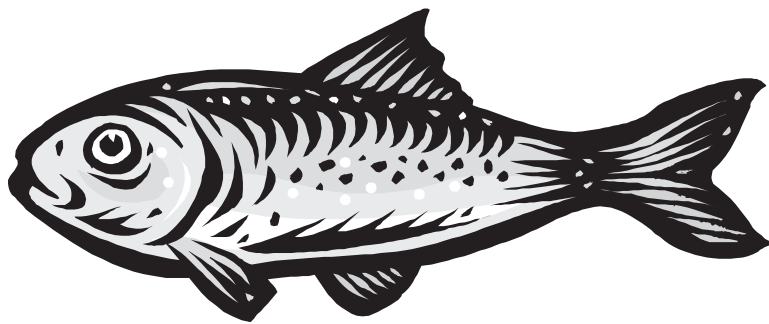
Debriefing and Reflection Opportunities (5 minutes)

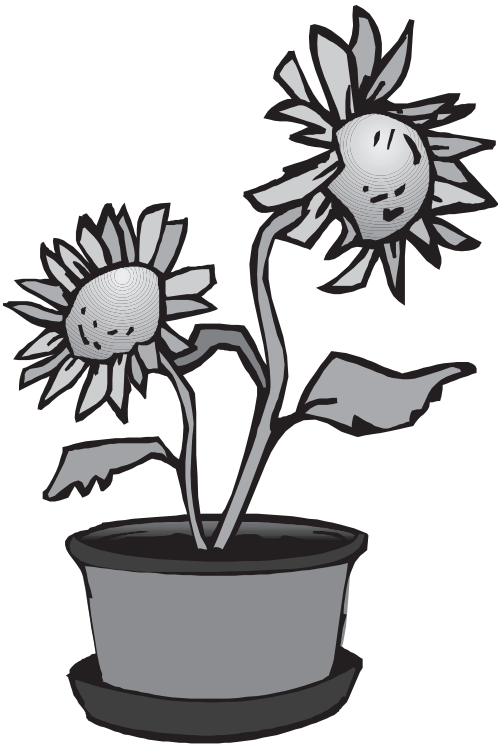
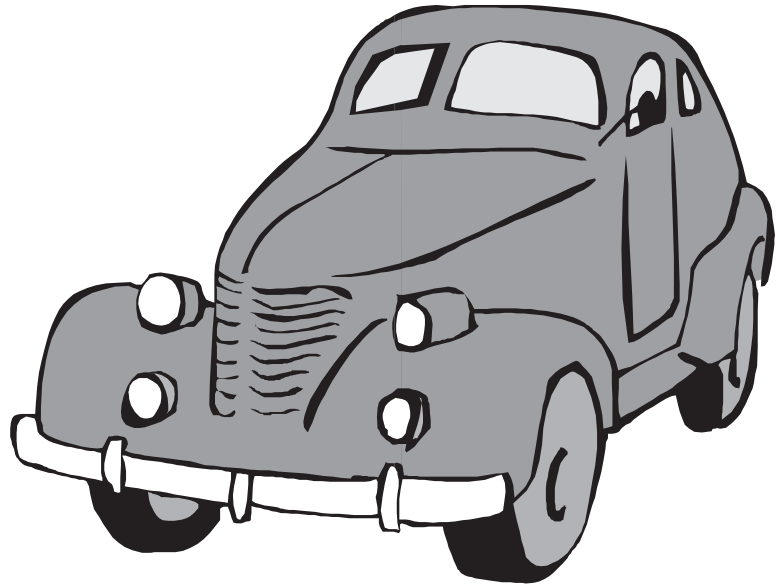
- Review the chart of *Living Things That Need Sunshine and Warmth* and *Nonliving Things*. Ask if anyone can think of other items to add to the chart.
- Refer to the facts about the sun from the previous lesson. What would happen to plants if they were in the sun all day and all night? What would be different about your life if the sun were out all day and all night?
- Ask the children if there is a volunteer to explain what he or she learned about day and night from the exercise with the lamp and the turning globe. Encourage the child to use the globe for the explanation or demonstration.

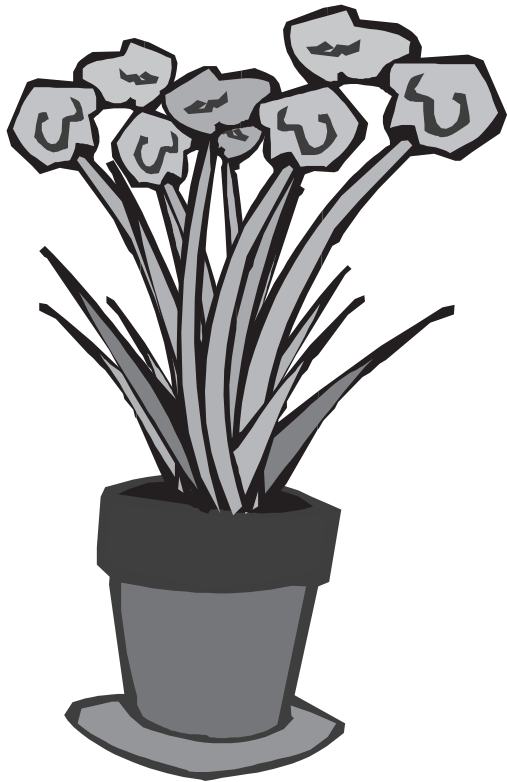
“Pictures For Item Cards”

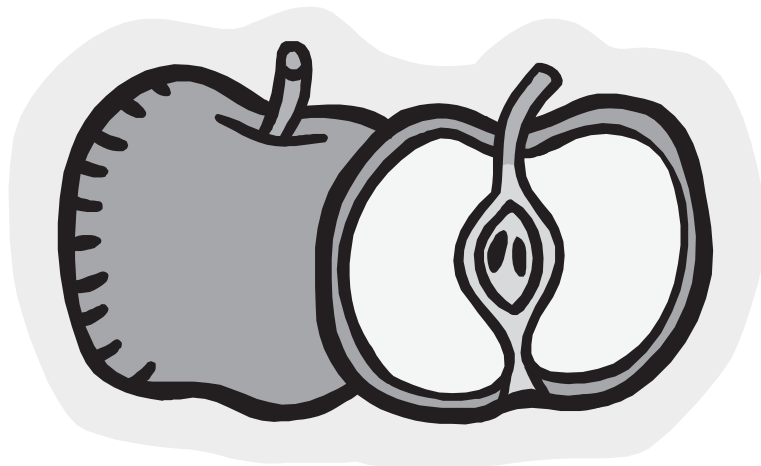




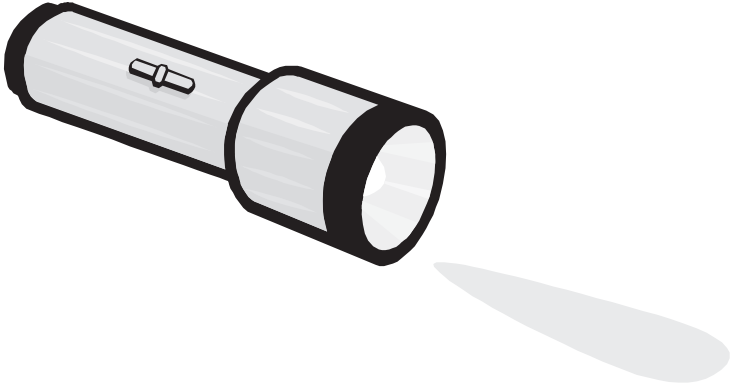














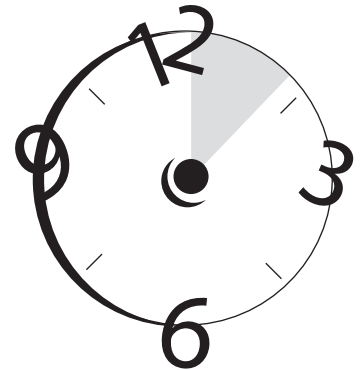


Where is the Moon Tonight?

Core/AID

Time Allocation: 40 minutes

Required Materials and Resources on Page 86



Lesson Overview

The early Greeks thought that the moon was a goddess that rode through the night sky on her chariot. We know that the moon does move across the night sky and is also sometimes visible in the daytime as it continually rotates in its orbit around the earth. In this lesson, the teacher will provide a visual demonstration of how the moon revolves around the earth, and children will try to relate this information to their observations that the moon isn't always in the same place in the sky.

The unit includes a take-home component in the next lesson that encourages parents to observe the moon in the afternoon or evening sky with their child and repeat the observation on three separate occasions. We want children to understand that the moon is not always in the same place. Eventually children will understand that this movement is part of a regular and predictable cycle of movement (AID).

Ideally this lesson will occur during the first quarter phase of the moon when the moon is visible in the eastern sky in the afternoon or in the third quarter phase when the moon is visible in the morning in the western sky.

This lesson will focus on the changing position of the moon in the sky; the next lesson will focus on the different shapes (phases) of the moon.

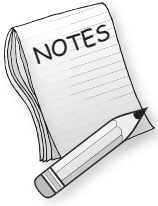
Guiding Questions

- What does the moon look like in the night sky?
- What does the moon look like in the day sky?
- Is the moon always in the same place?

BIG IDEA

Cycles: Lunar Orbit

ASTRONOMY: SUN, MOON AND STARS



Content Goals

Universal Theme

- Lunar orbit

Principles and Generalizations

- We can see the moon in the night sky and sometimes we can see the moon in the daytime.
- The moon has characteristics that can be observed and described.
- The moon appears to move slowly across the sky.
- The moon has a pattern of movement. (AID)

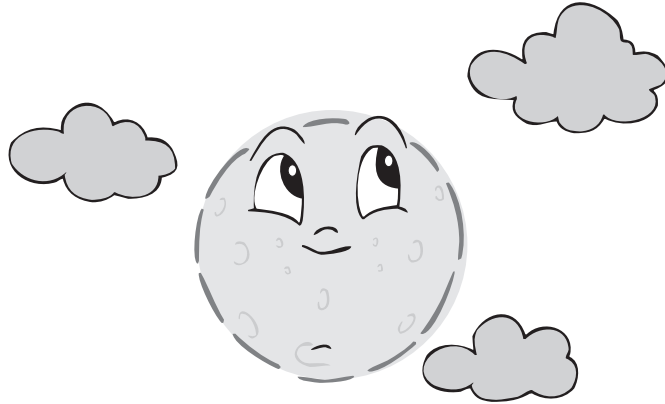
Concepts

- Path
- Movement
- Gravity
- Orbit (AID)

Teacher Information

- Ancient people from every culture watched the moon and thought the moon was a powerful god. Find some specific examples.
- The moon is the brightest object in the night sky because it is the closest object to earth.
- The moon travels around the earth in an elliptical path called its orbit.
- The moon rotates around the earth while the earth and other planets rotate around the sun.
- It takes about one month for the moon to complete one orbit around the earth.
- The moon has a predictable pattern of movement in the night sky. It rises in the east and moves westward across the sky.
- The pull of the moon's gravity as it rotates around earth causes our ocean tides.
- The sun has only a small impact on our tides on earth; it is primarily our moon that creates tides.
- Our moon creates tides which range from one foot to fifty feet. On Nantucket Island tides are one foot, while the Bay of Fundy has tides of forty or fifty feet.

Where is the Moon Tonight?



Skills

- Make observations
- Describe and record observations

Materials and Resources

1. Price, Christine. (1997). *The Man in the Moon*. Steck-Vaughn Pair-It Books. (ISBN#1-59242-249-7)
2. Lamp
3. Styrofoam ball to represent the moon

Preparation Activities

For this demonstration, you will need to find a place to anchor a lamp in a stationary position about your height. You will also need an open area to rotate in a circle with arm extended.

Introductory Activities (10 minutes)

- Read aloud *The Man in the Moon*.
- Tell the children that astronomers explain that the moon continually moves very slowly in a certain path around the earth. Let's see if we can learn more about this path.

Pre-assessment

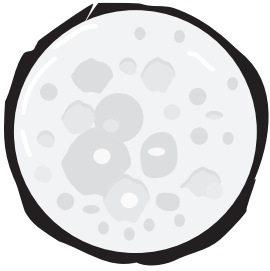
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Teaching and Learning Activities (25 minute)

Demonstration

1. Share with the children that you are going to show them a demonstration of how the moon moves around the earth.
2. Put the lamp in the center of your demonstration area. Show students the lamp, the Styrofoam ball, and your head.
3. Explain that the lamp represents the sun, your head represents the earth, and the Styrofoam ball represents the moon.

ASTRONOMY: SUN, MOON AND STARS



4. Stand in the center of the classroom, about four feet from the lamp (sun). Extend your arm horizontally, holding the Styrofoam ball in your hand.
5. Revolve slowly in a large circle around the lamp with your arm slightly extended. Rotate the ball in your hand (optional). Tell the students that the ball in your hand is the moon revolving slowly around the earth.
6. Help the students notice that the sun is always in the same place and tell them to watch how the moon moves in a circle around the sun.
7. Ask for a volunteer to repeat the demonstration. Allow children to take turns demonstrating how the moon revolves around the earth by holding the moon in their outstretched hands and slowly turning their moon in a circle around the earth (their heads).

Astronomer's Corner

1. Allow children to examine the books and materials related to the moon.
2. Share their information from home observations about the moon with other children.
3. Encourage them to manipulate the simple model of the sun, earth, and moon.

Writing Center

Children are to write or draw what they have learned about the moon in their journals. They may include what they learned or observed from any observations at home.

Products and Assignments

Students are to record their observations of the moon in the next lesson.

Extension Activities

Encourage children to tell (or write) a story about an experience they have had or would like to have about watching the moon.

Post Assessment

N/A

Where is the Moon Tonight?

Debriefing and Reflection Opportunities (5 minutes)

1. Revisit the idea that the moon is always moving slowly in the sky, and that sometimes we can see it in the daytime.
2. Refer back to the simple model of the sun, earth and moon, and state again that the earth moves in a circle around the moon, while the moon moves in a circle around the earth
3. (AID) Ask the children, where is the moon when we can't see it?

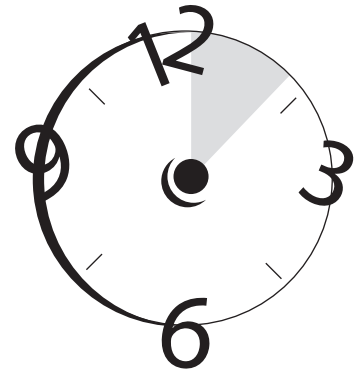


Is The Moon Playing Tricks on Me?

Core/AID

Time Allocation: 1 hour, 50 minutes

Required Materials and Resources on Page 86



Lesson Overview

A full moon is perhaps the most intriguing sight in the sky. Every generation of human beings on this earth has been fascinated by the moon's patterns of movement and apparent change in shape. People have studied it, prayed to it and created stories and legends about it because of its interesting, observable characteristics: shape, size, surface texture, and pattern of movement. Children will explore the moon's characteristics, why it appears in different shapes, and why those different shapes are called phases of the moon.

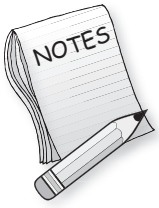
Guiding Questions

- How would you describe the shape of the moon?
- What are the other shapes of the moon?
- Where does the moon get its light? (AID)
- If you could touch the moon, what do you think it would feel like?

BIG IDEA

Cycles: Lunar Phases

ASTRONOMY: SUN, MOON AND STARS



Content Goals

Universal Theme

- Lunar phases

Principles and Generalizations

- The moon has characteristics that can be observed and described.
- The shape of the moon changes a little bit every day but looks the same again in about a month.
- The visible shape of the moon is affected by the position of the sun and the earth in their orbits. (AID)

Concepts

- Sphere
- Full moon
- Half moon
- Crescent moon
- Moonlight
- Craters
- Phases of the moon (AID)
- Gibbous moon (AID)

Teacher Information

- The moon is a solid sphere of rock and dust. It has no air or water or life.
- The surface of the moon is rough and bumpy. There are craters, mountain ranges, surface crack and flat lava plains.
- The holes on the moon's surface are called craters, and were made from huge chunks or rock crashing into the moon's surface.
- The moon has no energy to give the earth like the sun does.
- The moon has no light of its own. Moonlight is light reflected from the sun.
- The amount of sunlight reflecting off the moon determines how we see the shape of the moon. These different shapes are called the phases of the moon.
- The moon repeats the same cycle every month.

Is The Moon Playing Tricks on Me?



- There are four primary phases of the moon: new moon, first quarter, full moon, and last quarter. It takes about a week to move from one phase to the next.
- The new moon is hardly visible to us because the moon is exactly between the earth and the sun, and only the backside of the moon is lighted.
- The first quarter moon looks like a half moon because the moon has completed one quarter of its orbit around the earth. The first quarter moon rises in the sky about noon, and is highest in the sky at sunset and is no longer visible by midnight.
- A full moon looks like a complete circle (sphere) because the moon has now reached halfway around the earth in its rotation and all of the lighted portion of the moon is visible to us. A full moon rises in the eastern sky just as the sun sets in the western sky, so you can't see the full moon in the daytime.
- The last quarter or third quarter moon again looks like a half moon, but the half that is lighted is opposite to the half that was lighted on the first quarter moon. You can see the third quarter moon in the eastern sky after midnight and in the western sky before noon.
- The crescent moons are just before and just after the new moon.
- The gibbous moons are just before and just after the full moon. See attached moon charts.
- The moon is constantly moving along a path from eastern sky to the western sky.
- Different cultures have given different names to full moons. For this information and more about the moon, go to this website:
<http://www.enchantedlearning.com/subjects/astronomy/moon/phases.shtml>

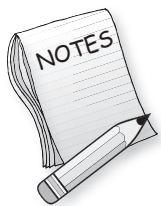
Skills

- Make observations
- Describe and record observations
- Compare and contrast
- Identify characteristics

Materials and Resources

1. *Finding the Moon*. Delta Science Reader. 2003 Delta Education LLC. (ISBN # 1-59242-249-7)

ASTRONOMY: SUN, MOON AND STARS



2. Fowler, Alan. (1991). *So That's How the Moon Changes Shape. Rookie Read About Science Reader*. Children's Press. (ISBN #0-516-44917-6)
3. Price, Christine. (1997). *The Man in the Moon*. Steck-Vaughn Pair-It Books. (ISBN #30-8172-6428-0)
4. Gibbons, Gail. (1997). *The Moon Book*. Holiday House. (ISBN#0-8234-1297-0)
5. Video that shows the moon phases and clear images of the surface of the moon
6. Clay Marbles or a non-toxic homemade play dough - You could ask parent volunteers to make it at home and bring it in.
7. Extra flour if needed for hands or surfaces while children are working
8. Tables or flat surface working area - enough for each child to have room to create their play dough moon
9. Rocks for making craters, depressions on the moon
10. Three flashlights with two D size batteries
11. Moon phase cards: pictures of the moon in different phases, each on a card approximately 4 inches by 4 inches - these will include crescent moon, half moon and full moon or (AID) the gibbous moons. Go to this website link to print pictures of the moon, <http://home.hiwaay.net/~krcool/Astro/moon/> Go to this link to read more about phases of the moon.
12. Lunar calendar for the current year
13. Glow-in-the-dark paint
14. Heavy gauge monofilament fishing line (12 to 20 lb.)

Preparation Activities

1. Play dough could be stored in zip-lock plastic bags until time for use. Separate it into equal chunks (approximately 1/2 pound) for each child. Have tools, spoons, etc ready for use
2. Phases of the moon cards
3. Chart paper for daily recordings

Is The Moon Playing Tricks on Me?

Introductory Activities (10 minutes)

Read aloud *The Man in the Moon* by Christine Price. Explain that, like astronomers, we are going to examine the features and characteristics of the moon to see if we can answer some of the questions in the book.

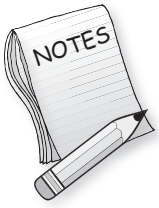
Pre-assessment

N/A

Teaching and Learning Activities (90 minutes)

1. Make a moon chart based on children's observations. Build this every week as they bring in their Moon Observation drawings (BLM5.1 through 5.4)
 - You will build a moon chart for one month recording the children's observations. See Moon Shape Letter to Parents (pg 62). Every weekend, a guide will be sent home to parents asking them to notice the shape of the moon with their child sometime over the weekend, and to record it by telling about its shape or drawing it. This activity will provide opportunities to view the moon in a variety of shapes (phases), and will allow an opportunity to see the repeating pattern of the moon's shape. Refer to your lunar calendar to verify that the children's observations were correct and to make sure that they did not record the crescent moon backwards.
 - After a discussion on the shape of the moon as observed by the children, have a student draw the shape to be placed on the moon calendar chart.
 - (AID) Class Astronomer could record this information from the sky or newspaper or website every day for a month, and report on results.
2. Exploring the characteristics of the moon
 - Exploring shape
 - Ask children what is the shape of a full moon. If someone says a circle, say yes, but is it a flat circle? Hold a flat circle up for the children to see. Is this what the moon looks like? Then hold a ball or spherical object for them to see, and ask them how they would draw this ball? Let a volunteer or two try it; they will draw it as a circle. Explain that when we draw a ball it looks like a circle, because we are drawing the outside edge that is the shape of a circle. But we know that the moon is round like this ball and so has a whole round curved interesting surface for us to learn about.

ASTRONOMY: SUN, MOON AND STARS



3. Exploring surface

- Let's look more closely at the surface of the moon (or what the ground would look like if we were walking on the moon). Examine pictures of the surface of the moon and ask children how they would describe it. Encourage them to use descriptive words, such as rough, lumpy, hard, rocky, and list them on the board. Some children my say call craters "circles." Be sure that you have resources at the Astronomer's Corner that that show detailed pictures of the moon's surface and craters and how they are formed on the moon. *Finding the Moon, Delta Science Readers* (ISBN# 1-59242-249-7) is a good reference with pictures of the surface of the moon.

4. Exploring size

- Ask the children how big they think the moon is? Explain in terms that are familiar to them. The moon is really too big to fit into any classroom; it is two thousand miles across the middle. Ask if anyone knows how big one mile is. Try to find a location that they are familiar with, a soccer field or the school building and make the analogy that if you could put 400 soccer fields together, they would all fit inside the moon. Then ask, "Why does it look so small to us?" See if they recall the previous lesson when they learned that big objects look small at a distance.

5. Exploring distance

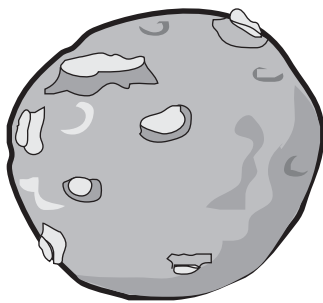
- Sometimes the full moon looks so close it seems you could touch it!
- How long would your arm need to be to touch the moon? Only about 240,000 miles long!
- How far away is 240,000 miles? If you could drive a car 100 miles per hour, it would take 2,400 hours or 100 days to get to the moon.
- How fast is 100 miles per hour? It is faster than the fastest speed that you can drive on the highway.
- How long is 100 days? That is about as long as the whole summer!
- (AID) If the moon is so far away, how do we know that this is what it looks like up-close? Where did these pictures come from?

Is The Moon Playing Tricks on Me?

Astronomer's Corner

1. Read and explore the books and resources related to the moon. Ask children to look carefully at the surface of the moon, and think about the shapes they see. Ask “What shape is the moon?” (round like a ball, sphere) “And how would you describe the surface if you were standing on the moon?” (bumpy, with holes, deep circles, craters).
2. Cut up the moon phase names and using the moon phase cards, match the names to the moon phase picture cards.
3. Make a model of the moon.
 - After children have talked about the surface of the moon, give them each about a half-pound of clay or play dough, enough to sculpt a model of the moon about four inches in diameter. Ask what is the basic shape for their moon? (a round ball, sphere). Tell them to use their fingers and rocks to form craters, hills, depressions, bumps and/or mountains on the surface of their spherical moons. Once a child has completed his/her moon, immediately insert a paper clip until about a 1/2” loop extends from the surface of the moon. When the clay cures, use this loop for attaching the monofilament, so children can hang their moon models. A suggestion is to paint one half of their moons with a glow in the dark paint, so they can observe different shapes of the moon as it spins in the dark.
4. Optional: Make a Crater Center
 - Take turns making craters in a sand box. Explain that this is how the moon's surface got some of the dents and holes in it, because a long time ago there were big rocks floating around in space that crashed into the surface of the moon. You will need to explore the best height from which to drop a rock to form the “crater.” Carefully remove the rock and show the children how to examine the shape left in the sand.

ASTRONOMY: SUN, MOON AND STARS



Astronomy Writing Center

Draw and write in journals what they have learned about the moon. Writing may include letters they hear in a word or any graphic representation of words or ideas about the moon. They may use books and materials from the Astronomy Center to help them write or draw. Circulate and ask children about their ideas as they work. When the children are finished, allow each child an opportunity to share his/her ideas with the group

Products and Assignments

- Moon chart made from the Moon Observation Sheets BLM5.1, BLM5.2, BLM5.3, BLM5.4
- Matched moon phase cards
- A moon model
- Build a moon chart

Extension Activities

(AID) Show Me a Half Moon...

1. Children will paint one half of the moon with a glow-in-the-dark paint. Dangle the moon inside a cardboard shoebox with monofilament line attached to the paper clip.
2. Using a flashlight, students will shine their flashlight on the moon model to see if they can create a full moon, a half moon and a crescent moon using the flashlight.
3. Tell the children if they are successful making a full, (half or crescent) moon to invite you over to show you how they did it.
4. Take turns using the flashlight.
5. Rotate other pairs or small groups with their moon models and different pairs or small groups of children.
6. Children could record their shapes in their journal.

Is The Moon Playing Tricks on Me?

Post Assessment

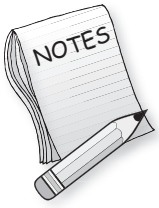
N/A

Debriefing and Reflection Opportunities (10 minutes)

Read aloud *The Moon Book* by Gail Gibbons (see publication information in Materials and Resources). Encourage dialogue and interaction about what they have learned about the characteristics of the moon.



ASTRONOMY: SUN, MOON AND STARS



Moon Phase Picture Cards



Full Moon



Half Moon

Is The Moon Playing Tricks on Me?

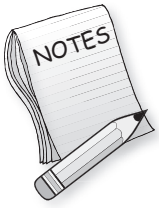


Crescent Moon



Crescent Moon

ASTRONOMY: SUN, MOON AND STARS



Gibbous Moons (AID)

Waxing Gibbous Moon

(growing larger: more than half, but not yet full)



Waning Gibbous Moon

(growing smaller: after a full moon, not yet half)

Is The Moon Playing Tricks on Me?

Moon Names List

Full Moon

Half Moon

Crescent Moon

Waning Gibbous Moon

Waxing Gibbous Moon

ASTRONOMY: SUN, MOON AND STARS

Observing the Moon's Shape

A Guide for Parents

Dear Parents,

We are studying the sun, moon and stars in our Astronomy science unit at Darcey School!

This Activity Packet focuses on Observing the Moon's Shape and helping your child record his or her observations.

Attached are four RECORDING SHEETS. We would like the children to do one observation per weekend for four weeks. We are hoping to record the moon in different phases: full, half and crescent so we can build a moon calendar in the classroom from children's observations and recordings. Encourage your child to draw the shape of the moon as accurately as he or she can.

The big idea with this activity is that the moon appears to be different shapes. We want children to observe and accurately record (draw) what they see. As children become more sophisticated in their thinking, they will understand that the moon is always round, but the shape that we see depends on the degree to which the moon is illuminated by the sun. In the classroom, we will be talking and learning about the phases of the moon, and we want the children to record their observations, just as our ancient astronomer ancestors did.

Please return each individual sheet once you have completed the observation. Be sure to have your child write his or her name on the observation sheet!

Thank you for your help!

Observing the Moon

Observation # 1

NAME _____

Note to Parents: Observe the moon with your child four weekends in a row, and help him or her to record the observation each time. Help your child record the time and location, but allow him or her to draw the moon as accurately as he or she can. It is preferable to use a pencil for this drawing. Ask your child for a word or brief description of the moon and ask him or her to write it in the box under his or her drawing (or dictate it to you).

Time (morning, afternoon, night)	Location (tell where you were when you saw the moon)	Drawing (draw what the moon looked like)

Observing the Moon

Observation # 2

NAME _____

Note to Parents: Observe the moon with your child four weekends in a row, and help him or her to record the observation each time. Help your child record the time and location, but allow him or her to draw the moon as accurately as he or she can. It is preferable to use a pencil for this drawing. Ask your child for a word or brief description of the moon and ask him or her to write it in the box under his or her drawing (or dictate it to you).

Time (morning, afternoon, night)	Location (tell where you were when you saw the moon)	Drawing (draw what the moon looked like)

BLM5.2

Observing the Moon

Observation # 3

NAME _____

Note to Parents: Observe the moon with your child four weekends in a row, and help him or her to record the observation each time. Help your child record the time and location, but allow him or her to draw the moon as accurately as he or she can. It is preferable to use a pencil for this drawing. Ask your child for a word or brief description of the moon and ask him or her to write it in the box under his or her drawing (or dictate it to you).

Time (morning, afternoon, night)	Location (tell where you were when you saw the moon)	Drawing (draw what the moon looked like)

BLM5.3

Observing the Moon

Observation # 4

NAME _____

Note to Parents: Observe the moon with your child four weekends in a row, and help him or her to record the observation each time. Help your child record the time and location, but allow him or her to draw the moon as accurately as he or she can. It is preferable to use a pencil for this drawing. Ask your child for a word or brief description of the moon and ask him or her to write it in the box under his or her drawing (or dictate it to you).

Time (morning, afternoon, night)	Location (tell where you were when you saw the moon)	Drawing (draw what the moon looked like)

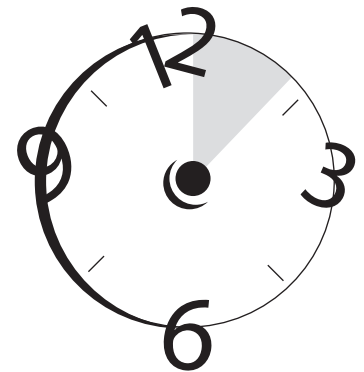
BLM5.4

Stories in the Sky?

Core/Connections/AID

Time Allocation: 50 minutes

Required Materials and Resources on Page 86



Lesson Overview

If you have ever experienced a clear moonless night away from city lights, thousands of stars will draw you deep into the night sky where your imagination can roam free. You will no doubt connect the dots to see images familiar to you, just as previous generations have done. This lesson will focus on common star patterns (constellations) and the stories that human beings from different cultures over a long period of time have told about them. Children will see pictures of these constellations and will create their own constellation and stories, while exploring fascinating facts about the stars they see in the night sky. This module includes a request for parental involvement to find an opportunity for stargazing with their children and to record and share their observations.

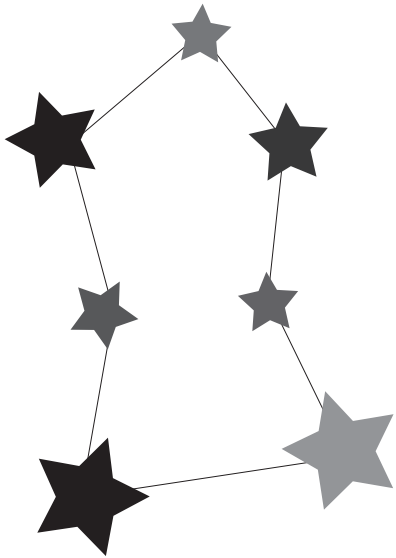
Guiding Questions

- How would you describe the stars that you see in the night sky?
- Where are the stars in the daytime? (AID)
- What do you see when you look at the night sky?
- What is the Big Dipper?

BIG IDEA

Stars: Constellations

ASTRONOMY: SUN, MOON AND STARS



Content Goals

Universal Theme

- Infinity

Principles and Generalizations

- There are too many stars to count
- The stars are scattered in the sky.
- They are different sizes and colors.
- The stars are always there, even in the daytime when you can't see them.
- A long time ago, people connected stars to make pictures in the sky.

Concepts

- Size
- Distance
- Location
- Constellation
- History
- Stories
- Patterns
- Star characteristics (AID)

Teacher Information

- A star is a fiery ball of swirling hot gases, just like our sun.
- Our sun is a medium sized star.
- All stars are not the same size. Some are so huge they would hold a million stars the size of our sun inside them! But other stars are smaller than our moon.
- The stars look much smaller than our sun because they are much farther away.
- If it would take seven years to travel to the sun in a car going 100 miles per hour; it would take hundreds of years to get to the next nearest star!
- The stars are so far away from us that astronomers measure the distance in light-years. A light-year is the distance light travels in a year, which is 6 trillion miles!
- Some stars are 100 light-years away. (That means that the light you are seeing tonight left the star 100 years ago!)

Stories in the Sky?

- The stars are always in the sky, but due to the sun’s brightness, we cannot see them in the daytime.
- The stars all appear white to us. But if we could see them up-close, we would see different colors. Blue-white stars are the hottest; yellow-orange stars (like our sun) are medium hot; and the least hot stars are light red and orange.
- Stars appear to “twinkle” because the starlight is bent as it passes through the earth’s atmosphere. They appear to “twinkle” more near the horizon, less so the higher they appear in the sky.
- Many ancient cultures studied the night sky and saw patterns and pictures in the sky. They made up stories that supported their beliefs about religion or mythology.
- Astronomers continue to study the stars to learn more about them.
- Astrology is a pseudo-science which links the position of the stars to human events and behavior
- The best way for astronomers to study the stars is with telescopes from satellites that are positioned outside of the earth’s atmosphere where there is no air to distort the starlight.
- The Hubble Space Telescope is currently sending back new information to us about the stars.

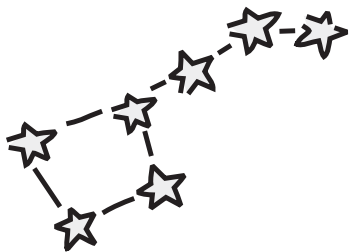
Skills

- Identify characteristics
- Make observations
- Work with patterns

Materials and Resources

1. Branley, Franklin. (1991). *The Big Dipper*. HarperCollins. (ISBN #0-06-445100-3)
2. Branley, Franklin. (1981). *The Sky is Full of Stars*. HarperCollins. (ISBN# 0-06-445002-3)
3. Nicholson, Cynthia Pratt. (1998) *The Stars*. Buffalo, NY. Kids Can Press Ltd. (ISBN #1-55074-659-6)
4. Black construction paper
5. Star stamp
6. Big Dipper template

ASTRONOMY: SUN, MOON AND STARS



7. Constellation templates
8. Pictures and stories of constellations
9. Round cylinders or rectangular boxes, black on the inside, open on one end for viewing, the other end with a pocket for inserting a disc or card with the constellation on it.
10. Constellations pictures

Preparation Activities

Read the books for this unit.

Introductory Activities (10 minutes)

- Using the Big Dipper template as a pattern, draw the seven stars on the board so that all students can see it. Explain that these stars are part of a picture or constellation that you can see every night in the sky, and it is called the Big Dipper. Connect the stars to make the Big Dipper. Ask if anyone has ever seen the Big Dipper in the night sky. Count the stars together with the children. Explain that these seven stars are always in the sky, but sometimes during the year, the Big Dipper may be turned upside down or sideways in the sky. Sometimes it may be covered with clouds, but it is always there. Ask the children to try and imagine why people a long time ago called this a big dipper. Can you think of any other name for it? Keep the Big Dipper posted in the classroom as they proceed to learn more about constellations and design their own.
- Read aloud *The Big Dipper* by Franklin Branley.

Pre-assessment

N/A

Teaching and Learning Activities (30 minutes total)

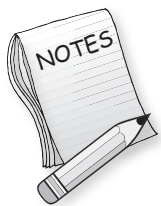
WHAT IS A CONSTELLATION? (10 minutes)

1. Begin this activity with a whole group demonstration.
2. Draw two big rectangles on the board, and explain that this is the dark night sky, and you are going to place seven “stars” at random in the night sky, using chalk or dry erase markers. Position the seven stars differently in each of the rectangles.

Stories in the Sky?

3. Say to the children, “Look at the stars that I have drawn and see if you can connect them to make a familiar picture.” Don’t immediately model how to connect the stars into a picture, but encourage them to look at them and think about it for 10 or 15 seconds or longer, and use their imagination. You could model a partial solution, a cat’s ear, a fish tail, and eventually demonstrate a complete solution.
4. Explain that the constellations are all pictures of things that people see everyday in their lives. For example, the Native Americans connected the dots to make a picture of a giant spider web. Another Native American constellation looked like a pile of firewood. The Greeks connected the dots to make a picture of a bear. Every group of people that named a constellation had a story to tell about the picture. What do you think the story might have been that the Native Americans told about the spider? About the firewood? What do you think the story might have been that the Greeks told about the bear? Allow time for children to think about the things they see everyday in their lives that they might be able to use for a story. Have books and sample of constellations that they have previously looked at the Astronomer’s Corner.
5. Ask for a volunteer to come to the board and connect the dots to make a picture, and tell his or her story of explanation.
6. If there are no volunteers, show your own example of one way to connect the dots to make a picture of something familiar. (You may need to practice this activity in advance so that you can successfully create a model constellation from seven stars.) Then tell your story explaining why you drew that picture. It might be a story about a favorite pet that wakes you up every morning by jumping on your bed, and that makes you so happy that you can’t wait to get up and start a new day!
7. Encourage children to think of ideas for another constellation example. Ask them to think about why people wanted to look at the stars in the sky and connect the dots to make pictures of things that were familiar and important to them. This might be a good opportunity to mention the North Star (Polaris) that always appears in the same place in the sky and was used

ASTRONOMY: SUN, MOON AND STARS



by many people through the years for navigation. Explain that since this right star is always in the same place, people learned to rely on it to help them figure out the right direction to go to get to their destination. Why did all these people who lived a long time ago connect the stars in the sky to create familiar pictures?

Astronomer's Corner

- Create a Constellation. Using a star stamp, white ink or paint, each child will stamp stars (more than 5, less than 10) on a sheet of black construction paper in a random design. Students will explain their picture and name their constellation. In the Writing Center they will write the story about their constellation in their journal.
- Additional Activity: Using picture cards of figures from constellations have children match each picture card to its constellation.

Writing Center

Ask children to write the story about their constellations in their journal or tell it to classmates or the teacher. Explain that the purpose of their story is to explain why the object they chose is important to them and why they might want to see it in the night sky.

Products and Assignments

- Constellation design
- Astronomy center participation
- Journal writing

Extension Activities

(AID) A child may select a constellation such as Orion (the Hunter) or Canis Major (the Great Dog) and research the story that is told about that constellation. The child can then either tell the story to the class or write about it in his or her journal.

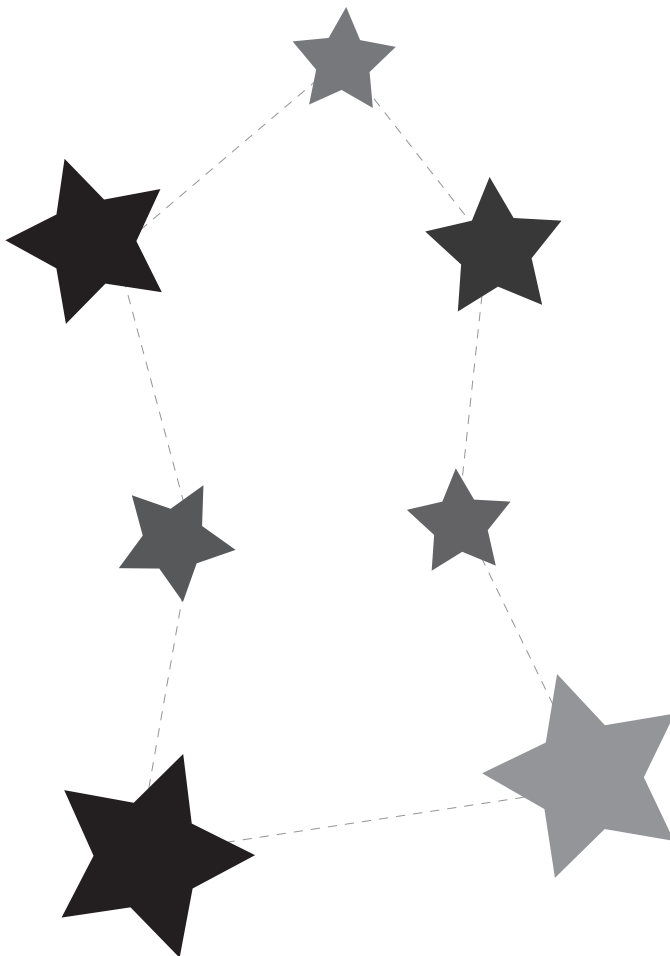
Stories in the Sky?

Post Assessment

N/A

Debriefing and Reflection Opportunities (10 minutes)

1. Ask children what they learned about the stars. Review the facts about the stars: they are hot balls of fire that are very far away, there are too many to count, they are always there even in the daytime when we can't see them.
2. Review the idea that people a long time ago looked at the same sky that we do, and they connected the stars in the sky to make pictures of things that were meaningful to them.
3. Encourage them to see if they can find the Big Dipper in the night sky, if they have not already done so.
4. Ask if there are any questions about stars they would like to explore for answers.



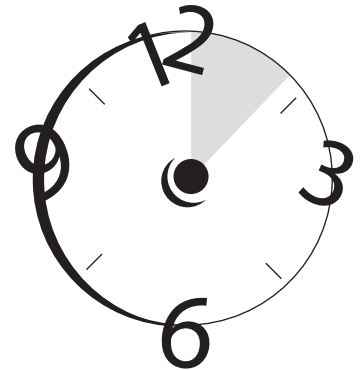
What is an Astronaut?

Core/AID

Time Allocation: 40 minutes

Unit Post Assessment: 30 minutes

Required Materials and Resources on Page 86



Lesson Overview

This lesson will focus on space exploration, and how we learn more about the huge objects in the sky that are so far away from earth. No doubt children have watched science fiction and other movies that given them confusing messages about what it is really like to travel in space. Many children may think that traveling in an airplane is the same as traveling in space or may think that it is actually feasible to live on another planet. This module will show the children pictures and tell them stories about real astronauts that have traveled to the moon, satellites, and will explain the difference between manned and unmanned spacecraft.

Two debriefing activities for the sun, stars and moon unit are included and either may be used as a post assessment for the unit.

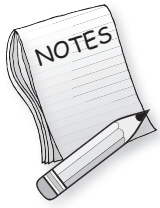
Guiding Questions

- What is an astronaut?
- What special things does an astronaut need to go to the moon?
- What can we learn by going to the moon?

BIG IDEA

Space Exploration

ASTRONOMY: SUN, MOON AND STARS



Content Goals

Universal Themes

- Space exploration
- Discovery

Principles and Generalizations

- We can learn new things about the sun, moon, and stars by launching manned and unmanned spacecraft from earth.
- Astronauts have traveled to the moon and back

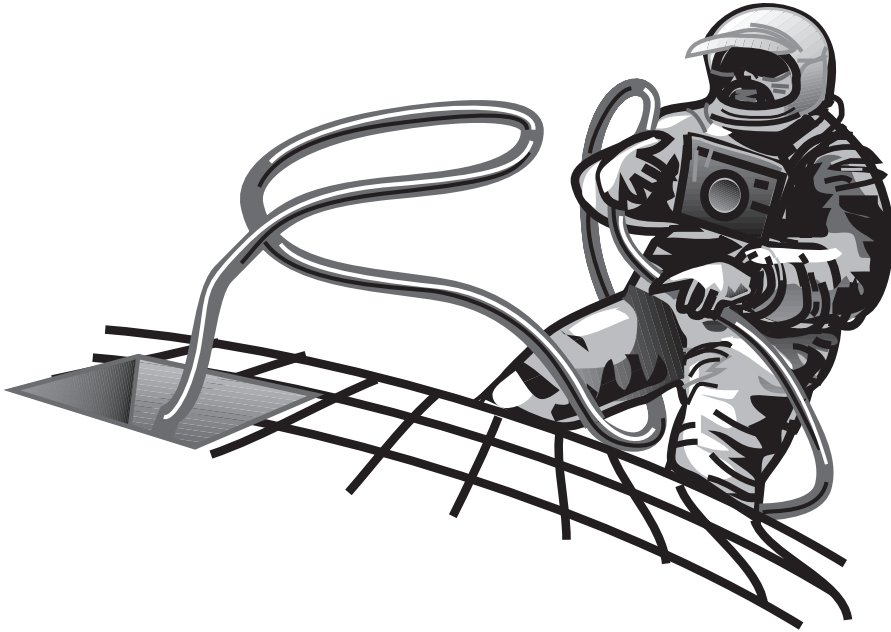
Concepts

- Astronaut
- Space travel
- Spacecraft
- Spacesuits
- Satellites (AID)
- Manned and unmanned spacecraft
- Robot (AID)

Teacher Information

- The Soviet Union launched Sputnik, the first unmanned satellite into space in 1957.
- The U.S. and Soviet Union became very competitive about the race into space.
- Eisenhower formed the first U.S. space agency (NASA) in October 1958.
- President Kennedy was determined to land a manned U. S. spacecraft on the moon by the end of the 1960's.
- In 1969, Apollo 11 landed on the moon; Neil Armstrong was the first human being to walk on the moon.
- Initially the space race was driven by nationalist pride, but now the focus is on satellites for communications, as well as satellites used for military matters, such as spying and surveillance.
- Space exploration is a costly endeavor, and the debate continues in the U. S. over spending priorities.
- But the human desire to explore and learn about space and the other planets and life beyond is insatiable.

What is an Astronaut?



Skills

- Identify characteristics
- Compare and contrast
- Determine fantasy and reality

Materials and Resources

1. Thompson, Gare. (1997). *Lift Off!* Steck-Vaughn Company. (ISBN# 0-8172-6448-5)
2. Barton, Byron. (1988). *I Want to Be an Astronaut*. Harper Collins. (ISBN# 0-694-00261-5)
3. Wilkinson, Philip. *Spacebusters The Race to the Moon*. (ISBN# 0-7894-2961-6)
4. Winter, Max. (2000). *Meet the Astronauts*. Newbridge. (ISBN#-1-58273-392-9)

Preparation Activities

Have astronaut cards, pictures, and books displayed and available.

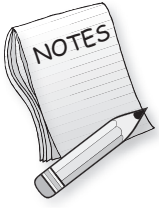
Introductory Activities (10 minutes)

Read aloud or show segment of a video about real astronauts in a spacecraft traveling to the moon.

Pre-assessment

N/A

ASTRONOMY: SUN, MOON AND STARS



Teaching and Learning Activities (30 minutes)

1. Ask the children to think about the special clothing the astronauts are wearing, and why they need it. Ask them to notice the space ship, and how the spaceship helps them travel to the moon.
2. Explain that the moon is a very different environment and that people cannot live there, because there is no sun, heat or water. In order for people to go to the moon, we have to create a safe way for them to travel.
3. Brainstorm a list with the children of the thing we need on earth to live. For example:
 - We need air to breathe.
 - We need clothes to keep us warm or protect us from the sun.
 - We need food to eat.
 - We need to brush our teeth.
 - We need a place to sleep.
 - We need shoes.
 - We need buildings to work in.
 - We need light to be able to see.
4. Contrast the environment of the earth with the environment of the moon. It has none of the things that we need: no air, no water, no buildings, no restaurants, no cars, and no food.
5. Explain that we need to create this environment so that human beings can travel to the moon. That is why astronauts need special equipment to go the moon!
6. Using the Astronaut Cards, examine each piece of equipment used by astronauts: helmets provide air to breathe, the suit provides warmth, shoes provide protection for their feet, etc. The spaceship provides a safe vehicle for them to travel in temperatures that are much colder than earth; it is a place where they eat and sleep; and it has an office so they can talk to people back on earth.

What is an Astronaut?

7. Ask why we put so much effort into building spaceships and creating special clothing for astronauts. We spend a lot of money to travel to the moon! Explore with the children what we learn from space travel. (We can learn more about our planet earth from studying other bodies in the sky. A special thing about human beings is that we are naturally curious and will always want to know more about what is over the next hill, what is just beyond what we can see.) Look at everything that the ancient astronomers learned about the stars and the moon and the planets! We want to use our modern technology to create spaceships that will take us closer to the objects in the sky, so we can continue to learn more about them. There is so much to learn! Ask the children to think of questions they have about space exploration.

(AID) For a child that is interested in further exploration, provide resources to help him or her explore the difference between manned and unmanned spacecraft. This research may include robots and/or satellites. Ask the child to research the questions: What is a robot? How can robots help us in space? Did you find any examples of a satellite in your research? Ask the child to write or draw in his or her journal to answer these questions and then present the information to the rest of the class.

Astronomer's Corner

Working in pairs, have the children take turns with the Astronaut Cards. Each will pick a card and describe what it is and how it helps the astronauts. Have books and pictures available to the students so they can see the actual conditions on the moon, a gray, hard rocky surface with no buildings, and not much daylight.

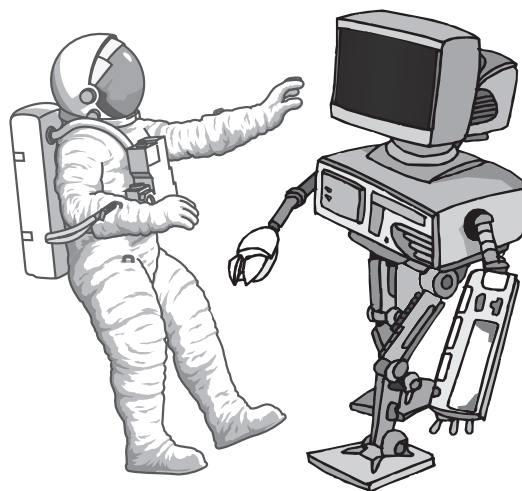
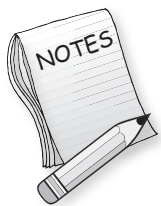
Astronomy Writing Center

Ask the children to write or draw a picture showing what they learned about astronauts or traveling in space.

Products and Assignments

- Children's completed astronomy journals
- Post Assessment drawings and explanation of position of sun morning, noon and night

ASTRONOMY: SUN, MOON AND STARS



Extension Activities

1. Ask the children to think of a question they would like to ask an astronaut.
2. Invite a guest speaker with specific knowledge about space travel to come and talk to the children about how astronauts brush their teeth in a space ship and can answer their questions.
3. Use dramatic play to simulate astronaut activities.

Post Assessment (30 minutes)

Ideally this activity should be completed by each child individually, so that a child is unable to see what other children are drawing. Ask children to draw a picture that shows where the sun is in the sky in the early morning. Then using the same picture, ask each child to show where the sun would be around lunchtime, and again after supper. You want to assess their understanding that the sun appears low on the horizon in the morning, straight overhead in the middle of the day, and low on the horizon on the opposite side of the picture in the evening (or late afternoon, depending on the time of year).

Alternative Post Assessment

Interview a random group of children to determine what they know about objects in the day and night sky. Record answers to compare with pre-assessment interviews.

Debriefing and Reflection Opportunities (10 minutes)

1. Review with the children why travel into space is so dangerous for human beings and what special things are needed so that people can travel in space (air, food, water, warmth, etc.).
2. Compare pictures of spacecraft with people in them to robots or satellites or shuttles that are sent into space without people in them.
3. Reinforce the fact that people have landed on the moon, but will never go to the sun or the stars because they are too far away and too hot. The only way we can study the sun or the stars is to send a probe (robot spaceship) to get closer to them and bring back more information about them to study.

“Curriculum Map”

Author: Clare Farley

Curriculum Map: Astronomy: Sun, Moon and Stars

Grade Level: K - 2

Major Principles and Generalizations	Time Allocation and Parallel	Minor Principles and Generalizations	Concepts	Skills	Themes	Guiding Questions
<p>1. For a very long time, people have observed and studied the sun, stars and planets in the sky.</p>	<p>CORE/AID Lesson 1 1 hour, 15 minutes</p>	<p>From a long distance, the big objects in the sky look very small.</p>	<ul style="list-style-type: none"> • Sky • Sun • Moon • Horizon • Objects or celestial bodies • Stars • Planets • Astronomer • Astronomy • Telescope • Binoculars • Observation • Distance • Mile(s) 	<ul style="list-style-type: none"> • Recognize attributes • Make observations • Identify characteristics 	<p>Inquiry</p>	<ul style="list-style-type: none"> • What do you see when you look at the sky? • What objects do you see in the sky in the daytime? • What objects do you see in the sky in the nighttime? • How big is the sun? • How big is the moon? • Why do you think people who lived on the earth a long time ago watched and studied the sky? (AID)
<p>2. The sun appears to move across the sky in the daytime. (AID)</p>	<p>Core/AID Lesson 2 1 hour, 40 minutes</p>	<ul style="list-style-type: none"> • We see the sun only in the daytime; we cannot see the sun at night. • A shadow is created when an object is blocking the light from the sun. • The shape and position of the shadow depends on the location of the sun in the sky. 	<ul style="list-style-type: none"> • Sunrise/sunset • Daylight/darkness • Morning/evening • Sunlight • Cycle • Rotation (AID) • Shadow • Calendar 	<ul style="list-style-type: none"> • Make observations • Compare and contrast 	<p>Time</p>	<ul style="list-style-type: none"> • Where is the sun in the morning? • Where is the sun in the evening? • What is a sunrise? • What is a sunset? • Where is the sun at night? (AID) • What is a shadow? • What does your shadow look like?

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<p>3. We need the sun for life.</p>	<p>Core/ Connections/ AID Lesson 3 1 hour, 30 minutes</p>	<ul style="list-style-type: none"> • People, plants and animals need sunlight and warmth to survive • The sun has characteristics that can be observed and described. 	<ul style="list-style-type: none"> • Warmth • Heat • Need • Characteristics of the sun • Life • Energy (AID) • Living things vs. non-living things • Growth 	<ul style="list-style-type: none"> • Categorize observations • Make observations • Describe end record observations • Identify characteristics • Compare and contrast 	<p>Energy</p>	<ul style="list-style-type: none"> • What does it mean to need something? • What do you know about the sun? • Why do people and animals need the sun? • How do you know the sun is hot? • How far away is the sun? (AID)
<p>4. The moon appears to move slowly across the sky.</p> <ul style="list-style-type: none"> • The moon has a pattern of movement.(AID) 	<p>Core/AID Lesson 4 40 minutes</p>	<p>We can see the moon in the night sky, and sometimes during the day.</p>	<ul style="list-style-type: none"> • Path • Movement • Gravity • Orbit (AID) 	<ul style="list-style-type: none"> • Make observations • Describe and record observations 	<p>Lunar orbit</p>	<ul style="list-style-type: none"> • What does the moon look like in the night sky? • What does the moon look like in the day sky? • Is the moon always in the same place?

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<p>5. The shape of the moon changes a little bit every day but looks the same again in about a month.</p> <ul style="list-style-type: none"> The visible shape of the moon is affected by the position of the sun and the earth in their orbits. (AID) 	<p>Core/AID Lesson 5 1 hour, 30 minutes</p>	<p>The moon has characteristics that can be observed and described.</p>	<ul style="list-style-type: none"> Sphere Full moon Half moon Crescent moon Moonlight Craters Phases of the moon (AID) Gibbous moon (AID) 	<ul style="list-style-type: none"> Make observations Describe and record observations Compare and contrast Identify characteristics 	<p>Lunar phases</p>	<ul style="list-style-type: none"> How would you describe the shape of the moon? What are the other shapes of the moon? Where does the moon get its light? (AID) If you could touch the moon, what do you think it would feel like?
<p>6. There are too many stars to count</p>	<p>Core/AID Lesson 6 50 minutes</p>	<ul style="list-style-type: none"> The stars are scattered in the sky. They are different sizes and colors. The stars are always there, even in the daytime when you can't see them. A long time ago, people connected stars to make pictures in the sky. 	<ul style="list-style-type: none"> Size Distance Location Constellations History Stories Patterns Star characteristics (AID) 	<ul style="list-style-type: none"> Identify characteristics Make Observations Work with patterns 	<p>Infinity</p>	<ul style="list-style-type: none"> How would you describe the stars that you see in the night sky? Where are the stars in the daytime? (AID) What do you see when you look at the night sky? What is the Big Dipper?

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<p>7. We can learn new things about the sun, moon and stars by sending manned and unmanned spacecraft from earth.</p>	<p>Core/AID Lesson 7 40 minutes</p> <p>Unit Post Assessment 30 minutes</p>	<p>Astronauts have traveled to the moon and back.</p>	<ul style="list-style-type: none"> • Astronaut • Space travel • Spacecraft • Spacesuits • Satellites (AID) • Manned and unmanned spacecraft • Robot (AID) 	<ul style="list-style-type: none"> • Identify characteristics • Compare and Contrast • Determine fantasy and reality 	<ul style="list-style-type: none"> • Space exploration • Discovery 	<ul style="list-style-type: none"> • What is an astronaut? • What special things does an astronaut need to go to the moon? • What can we learn by going to the moon?

“Materials and Resources List”

Lesson	Primary Materials	Books	Additional Materials (Supplied by Teacher)
1	White construction paper (1 pack), black construction paper (1 pack) crayons (30), 10 sets of markers, solar system picture set		
2	Globe on stand, 1 box of modeling clay, 1 bucket of sidewalk chalk, glue (4 tubes), black construction paper (1 pack), yellow construction paper (1 pack), crayons, markers, chart paper (1 pad), oaktag (1 pack) + composition paper (1 pack) for making journals	<i>Under the Sun</i> <i>The Sun Is Always Shining Somewhere</i> <i>Guess Whose Shadow</i> <i>The Sun is My Favorite Star</i>	Table lamp
3	Videotape about sun and moon, 1 roll of double-stick tape, 2 pieces of dark felt, 1 set of item cards, chart paper on page 32	<i>The Sun</i>	2 small plants, 1 shoebox, 1 muffin, aluminum foil
4	Styrofoam ball to represent the moon	<i>The Man in the Moon</i>	Table lamp
5	Flashlight with batteries, video about the sun and moon, 25 lbs. marblex clay, moon phase cards, lunar calendar, 1 jar white paint, 1 jar fluorescent paint, 1 set of paint brushes, heavy fishing line	<i>The Moon Book</i> <i>So That's How the Moon Changes Shape</i>	Small rocks or gravel for making craters on moon models paper clips
6	Folder of constellation photos, black construction paper, star stamp or foam stars and glue	<i>The Big Dipper</i> <i>The Sky is Full of Stars</i>	
7	Astronaut cards	<i>Spacebusters</i> <i>I Want to be an Astronaut</i>	

