

2013-2014



KIDS' DAY
SERIES

ON THE CASE: SPACE SCIENCE PROGRAM

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Curriculum Unit Overview

Participants in the *On the CASE: Space Science* will explore a variety of topics related to space science. By studying the solar system, and investigating the scientific principles surrounding flights, space and gravity, students will gain insight into many subjects familiar to astronauts and space scientists.

Instructional Period	Lesson Title	Topic	Standards
Week 1	Solar System Scientists	Students will identify and explore the solar system by recalling previous knowledge, and learning the very basics of space and the planets.	Science 112.10 8 (B) observe and record changes in the appearance of objects in the sky such as clouds, the Moon, and stars, including the Sun contributions of scientists.
Week 2	Mission “Patch” (Should You Accept It) And Space Explorations	Students will explore the roles of astronauts and their professional missions through basic research strategies.	Science 112.10 8 (B) observe and record changes in the appearance of objects in the sky such as clouds, the Moon, and stars, including the Sun contributions of scientists.
Week 3	All SUN, ALL FUN...or NOT!	Students will understand specific functions of the Sun, its purpose, and other characteristics.	Science 112.10 8 (B) observe and record changes in the appearance of objects in the sky such as clouds, the Moon, and stars, including the Sun contributions of scientists.
Week 5	Calling Planet Earth	Students will learn natural features of planet earth by developing earth replicas.	Science 112.10 8 (B) observe and record changes in the appearance of objects in the sky such as clouds, the Moon, and stars, including the Sun contributions of scientists.
Week 4	Inner/Outer Planets Galore	Students will discover the features of the other seven planets in the solar system and identify important characteristics of each.	Science 112.10 8 (B) observe and record changes in the appearance of objects in the sky such as clouds, the Moon, and stars, including the Sun contributions of scientists.
Week 6	MOON Madness	Students recognize that moon’s position as it revolves around the Earth by developing an understanding or the Moon’s phases and patterns.	Science 112.10 8 (B) observe and record changes in the appearance of objects in the sky such as clouds, the Moon, and stars, including the Sun contributions of scientists.
Week 7	Gravity Pulls Us Down Again	Students investigate the force of gravity and recognize it as a constant pull here on earth. Students evaluate situations that gravity is altered.	Science 112.10 6 (C) observe forces such as gravity acting on objects. 6 (D) design an experiment to test the effect of force on an object such as a gravity.
Week 8	Comparing Parachutes	Students will investigate the process of air resistance and its relations to space flights.	Science 112.10 6 (C) observe forces such as gravity acting on objects. 6 (D) design an experiment to test the effect of force on an object such as a gravity.
Week 9	Exploring Space with Telescopes	Students will apply the processes of inquiry in building a telescope. And they will be able to describe the objects seen through the telescope.	Science 112.10 explore that scientists investigate different things in the natural world and use tools to help in their investigations.

Galaxy Space Scientists

Lesson 1 Topic: The Solar System

Lesson Objective: Students will identify and explore the solar system by recalling previous knowledge, and learning the very basics of space and the planets.

Targeted Grade Level: 2nd -5th

Anticipated Time: 45 minutes

Activity	Description
TEKS ALIGNMENT	<p>112.10 Science</p> <p>3(C) explore that scientists investigate different things in the natural world and use tools to help in their investigations.</p> <p>2 (F) communicate valid conclusions supported by data in writing, by drawing pictures, and through verbal discussion.</p> <p>3 (D) connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.</p>
MATERIALS/ SET UP	<ul style="list-style-type: none"> ➤ KWL Chart ➤ National geographic “PLANETS” Book Level 2 ➤ Large white poster boards or flip chart paper ➤ Large sheets of paper with a sticky adhesive back ➤ Paints/markers/Color Pencils/Colors ➤ Construction paper (black), manila paper and/or mini poster boards ➤ Scissors and glue ➤ Computer with internet accessibility (if possible) ➤ Solar System Lesson for Kids/ Learn about Planets, Stars and Galaxy Video: http://www.youtube.com/watch?v=h5bVZTpVxy4 or http://www.teachertube.com/viewVideo.php?video_id=118735 ➤ The magic school bus: lost in the solar system by: Joanna Cole and Bruce Degen <p style="background-color: #f4a460; margin: 5px 0;">CLASSROOM SET UP</p> <ul style="list-style-type: none"> ➤ Set room so students can easily see the whiteboard, chalkboard, or overhead projector. ➤ Set materials for day’s class on a table where they can be easily accessed. ➤ Create a model of the solar system, so that the students will have a visual example.
OPENING	<ul style="list-style-type: none"> ➤ Create a KWL chart on a poster board, flip chart paper or interactive smart board if accessible and “you” the teacher are comfortable with utilizing it. ➤ To begin the lesson, have students voluntarily list in the “K” column what they already know about The Solar System. Some of the information may not be accurate, however, this is not the time to correct them. The goal is to encourage reflection. ➤ After 3 minutes have students list in the “W” column what they <i>want</i> to learn about the Solar System.
	VIDEO: After 3 minutes, have students watch <i>Solar System</i>

Modifications:
 This is an alternate video that instructor can utilize as well.

Solar System (All Planets) Interesting Facts for Kids
<http://www.youtube.com/watch?v=Ktd4XDBT.OM>

<p>INTRODUCTION</p>	<p><i>Lesson for Kids/ Learn about Planets, Stars, Galaxy</i> You tube video. http://www.youtube.com/watch?v=h5bVZTpVxy4 or http://www.teachertube.com/viewVideo.php?video_id=118735</p> <ul style="list-style-type: none"> ➤ Explain to the entire class that for the next 8 weeks we are going to explore EXCITING facts about Space and the Solar System. ➤ Let them know that each week we will discover different parts of space and enjoy great videos, book, guest speakers and activities.
<p>ENGAGE</p>	<p>Lesson Introduction: Teacher should explain that today the class will build a solar system platform and learn the location of each planet within it. <i>Building the Solar System</i></p> <ul style="list-style-type: none"> ➤ Pass out necessary materials (colored construction paper similar to the colors of the planets or white construction paper with markers, colors or map pencils allowing for students to color the cut out planets the appropriate color) to the students and instruct them not to touch the item until you tell them to do so. You should also have a set of materials, so that you can demonstrate step by step directions. ➤ Explain that it is difficult to determine the true size of the planets, so they should just make the Sun the biggest using circle objects. Then make Jupiter, Saturn, Uranus, and Neptune a bit smaller than the Sun. With the remainder of the planets much smaller. Remind them that Saturn has beautiful rings that can be created with string or construction paper (point this out on the pictures of the solar system). To make neat circles the teacher can provide large coffee cans, can foods, vases and other objects with flat circular traceable objects. ➤ Place the sun near the left edge of the poster board. The Planets will move in order from the sun back toward the center of the board. ➤ Using the circular objects, draw the orbits of the 8 planets. The first 4 planets orbit relatively close to the Sun, then there is a gap (this is where the asteroids orbit). Then the last 5 planets orbit very far from the Sun (point this out on the picture on page 10 of the National Geographic book PLANETS or another solar system picture). ➤ Explain that it is difficult to determine the true size of the

MODIFICATION
Middle and high School Students can create a more scaled model. The link below will provide a modify lesson for teachers to prepare.
http://www.lpi.usra.edu/education/explore/solar_system/activities/bigKid/dunking/

	<p>planets, so they should just make the Sun the biggest. Then make Jupiter, Saturn, Uranus, and Neptune a bit smaller than the Sun. With the remainder of the planets much smaller. Remind them that Saturn has beautiful rings (point this out on the pictures).</p> <ul style="list-style-type: none"> ➤ Place the sun near the left edge of the poster board. The Planets will move in order from the sun back toward the center of the board. ➤ Using the cup, draw the orbits of the 8 planets the first 4 planets orbit relatively close to the Sun, then there is a gap (this is where the asteroids orbit). Then the last 5 planets orbit very far from the Sun (point this out on the picture on page 10 of the National Geographic book). ➤ Place the planets on the board. Use string to represent the orbits that the planets rotate on around the sun. <p>Wrap-Up:</p> <ul style="list-style-type: none"> ➤ After students complete the engagement assignment invite 2-3 volunteers to show their model, with close attention to identifying the name of each planet. ➤ Finally, as an entire group have students add to the “L” column on the KWL chart listing what they’ve learned. ➤ Guide students into naming the planets under the L column.
<p>CAREER and COLLEGE READINESS</p>	<p>Introduce the guest speaker from the community that works in space science, preferably a speaker from NASA who will present to the students information about their career.</p> <ul style="list-style-type: none"> ➤ Guest Speaker can also read...The Magic School Bus: Get Lost In Space ➤ Discuss with the class after the reading those elements of the story that were real. ➤ The guest will have an opportunity to compare the book to his/her real life job. ➤ Allow for Question and Answers...

SAMPLE KWL Chart

K What you know	W What you want to know	L What you learned

Mission “Patch”...Should You Choose to Accept It.

Lesson 2 Topic: Mission Patches and Astronauts

Lesson Objective: Students will explore the roles of astronauts and their professional missions through basic research strategies.

Targeted Grade Level: 2nd -5th

Anticipated Time: 45 minutes

Activity	Description
TEKS ALIGNMENT	112.10 Science 3(C) explore that scientists investigate different things in the natural world and use tools to help in their investigations. 4 (A) collect information using tools, including computers and hand lenses. 3(C) describe what scientists do. 2(D) record and organize data using pictures, numbers, and words 3 (C) identify what a scientist is and explore what different scientists do
MATERIALS/ SET UP	<ul style="list-style-type: none"> ➤ Writing utensils – one utensil per student ➤ Pencils ➤ cup ➤ Crayons ➤ KWL chart ➤ Construction paper, white paper, poster board ➤ Markers ➤ Poster Activities from Lesson 1 ➤ Mission Patch Sample (Supplements) ➤ Notebook or White notebook paper <div style="background-color: #f4a460; padding: 2px;">CLASSROOM SET UP</div> <ul style="list-style-type: none"> ➤ Set room so students can easily see the whiteboard, chalkboard, or overhead projector. ➤ Set materials for day’s class on a table where they can be easily accessed. ➤ Create a model of the solar system, so that the students will have a visual example.
REVIEW	<ul style="list-style-type: none"> ➤ Provide students with a journal notebook or notebook paper and have students write a fictional journal themed “If I could travel to outer space...” ➤ The only criteria for the journal is that students must name the planets learned in the last lesson in their journal story
INTRODUCTION	<div style="background-color: #f4a460; padding: 2px;">GUIDED QUESTIONS:</div> <ul style="list-style-type: none"> ➤ Teacher should ask students the following questions to probe for pre-knowledge: ➤ Who travels out of space to studies the solar system and planets? ➤ What do you know about astronauts? ➤ Can you name an astronaut? ➤ Create a KWL chart on a poster board, flip chart paper or interactive smart board if accessible and “you” the teacher are comfortable with utilizing it. ➤ Have students voluntarily list in the “K” column what they already know about astronauts. Some of the information may not be accurate; however, this is not the time to correct them. The goal is to encourage reflection.

Teacher Note

If internet activity is not available teacher can utilize the information from the websites to make astronaut profile sheets to include a picture, and career facts to provide to the students.

TEACHER NOTE

www.jsc.nasa.gov is suitable for middle and high school students.

MODIFICATION

Have students select an astronaut and complete a 2 page research paper to include pictures and if accessible utilize technology to create a 5 slide profile presentation.

	<ul style="list-style-type: none"> ➤ After 3 minutes have students list in the “W” column what they <i>want</i> to learn about the Solar System.
ENGAGE	<p>INTRODUCTION:</p> <ul style="list-style-type: none"> ➤ Teacher should explain that today’s lesson will focus on learning about famous astronauts and their professional experiences. ➤ Using the websites below, students should complete the astronauts profile supplement sheet: http://www.esa.int/esaKIDSen/Astronauts.html or http://www.jsc.nasa.gov/Bios/astrobio_former.html ➤ Once the students complete the profile sheets have them choose one of the astronauts and to design a poster. ➤ Provide mini poster boards or white construction paper ➤ Teacher can provide pre-printed pictures of the astronauts or if computer access is available allow students to print a picture of their astronaut. ➤ The poster should detail name of astronaut, name and date of one of the astronauts space mission, name of space shuttle traveled on, and at least 3 other details about astronauts’ accomplishment. <p>WRAP UP</p> <ul style="list-style-type: none"> ➤ Explain to students that astronauts have been responsible for much of what we know about space. As we continue to learn more about the solar system we will become resident astronauts. ➤ Allow students an opportunity to add to the “L” column of the unit KWL chart that was started during lesson one. ➤ If time permits, allow student volunteers to share their Astronaut posters.
CAREER and COLLEGE READINESS	<ul style="list-style-type: none"> ➤ Students should research the collegiate degrees that would qualify someone to become an astronaut. ➤ Teacher should advocate for students to utilize basic and advanced research skills to research collegiate degrees.
SERVICE LEARNING And PARENT ENGAGEMENT	<ul style="list-style-type: none"> ➤ Now that the students have learned about astronauts and have constructed a solar system replica, they must prepare their “Mission Patch” to wear on the cool space suits that astronauts wear. Explain, that astronauts wear patches on their uniforms just as firefighters, police officers etc. (Teacher can show an picture) ➤ Provide students with the Patch template to complete at home with parent. Patches should represent an environmental “cause” that is special to the family.

Astronauts Profile Findings

DIRECTIONS: Students will utilize <http://www.esa.int/esaKIDSen/Astronauts.html> to select three different astronauts to profile using the blocks below.

Astronaut: _____
Name of Mission: _____
Career Achievements : _____

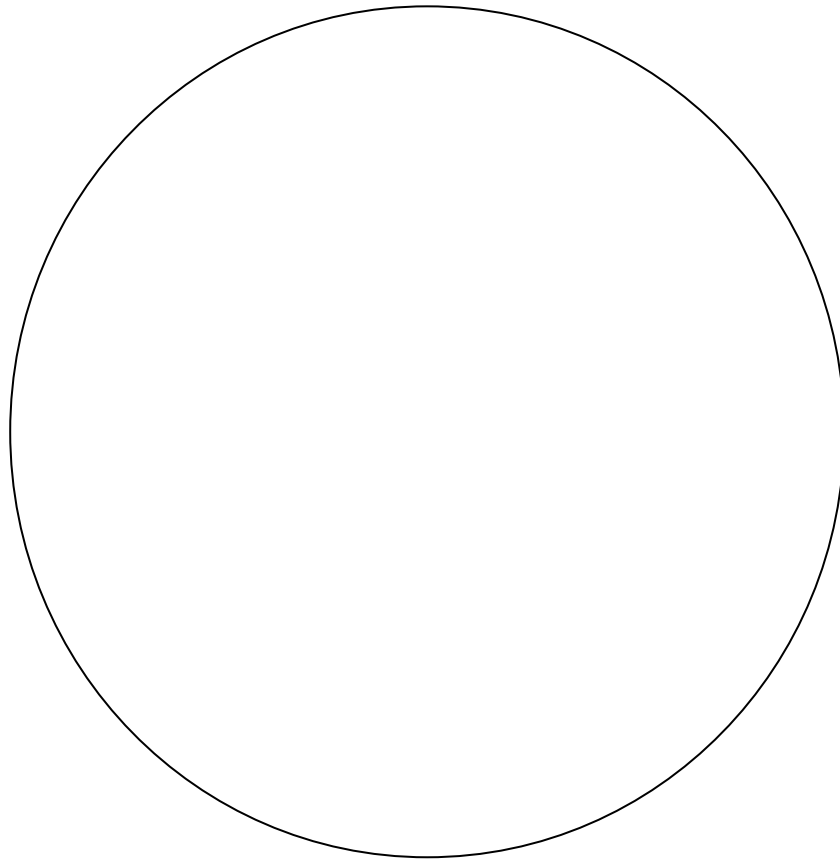
Astronaut: _____
Name of Mission: _____
Career Achievements : _____

Astronaut: _____
Name of Mission: _____
Career Achievements : _____

MISSION "PATCH" ...SHOULD YOU CHOOSE TO ACCEPT IT

Lesson 2

Directions: Over the next 8 weeks you will engage in space explorations while learning about the solar system. Your parents will play a vital role in your weekly missions. This week all "SPACE KIDS" astronauts must design a patch to wear during their space explorations. The mission however, is to work with your parents to complete the task.



ALL SUN...ALL FUN!!

Lesson 3 Topic: The Sun

Lesson Objective: Students will understand specific functions of the Sun, its purpose, and other characteristics.

Targeted Grade Level: 2nd -5th

Anticipated Time: 45 minutes

Activity	Description
<p align="center">TEKS ALIGNMENT</p>	<p>112.10 Science 8(C) observe, describe, and illustrate objects in the sky including the Sun. 3 (C) represent the natural world using models such the Sun and identify its limitations, including size, properties, and materials 8 (B) describe and illustrate the Sun as a star composed of gases that provides light and heat energy for the water cycle</p>
<p align="center">MATERIALS/SET UP</p>	<ul style="list-style-type: none"> ➤ Computers with Internet access ➤ Markers, colors and or map pencils ➤ Pencils ➤ Pre-made flip books or mini books ➤ The Sun, A Real Star Video: http://www.neok12.com/php/watch.php?v=zX5a757b4455546940600145&t=Sun ➤ National Geographic “Planet” Book Level 2 (purchasable for \$3.00 on amazon) ➤ The Sun by: Seymore Simon (search in library, or via approved vendor) <p>CLASSROOM SET UP</p> <ul style="list-style-type: none"> ➤ Set room so students can easily see the whiteboard, chalkboard, or overhead projector. ➤ Set materials for day’s class on a table where they can be easily accessed. ➤ Create a model of the solar system, so that the students will have a visual example.
<p align="center">REVIEW</p>	<ul style="list-style-type: none"> ➤ Allow students to share their patch with the group and or additional students should review their astronaut poster from the previous lesson. ➤ Create a KWL chart on a poster board, flip chart paper or interactive smart board if accessible and “you” the teacher are comfortable with utilizing it. ➤ To begin the lesson, have students voluntarily list in the “K” column what they already know about Sun. Some of the information may not be accurate; however, this is not the time to correct them. The goal is to encourage reflection. ➤ After 3 minutes have students list in the “W” column what they <i>want</i> to learn about the Sun.
<p align="center">INTRODUCTION</p>	<p>GUIDED QUESTIONS</p> <ul style="list-style-type: none"> ➤ If students are having difficulties completing the KWL chart teacher should ask the following questions to access students previous knowledge: <ol style="list-style-type: none"> 1.) What is the role of the Sun in the Solar System? 2.) How hot is the Sun? ➤ To introduce the lesson, the teacher or a selected student volunteer can read one or both of the books below: ➤ Read page 8-9 of the National Geographic book (if available) ➤ Read aloud, <i>The Sun</i> by Seymore Simon (if available)

TEACHER NOTE
 If technology is accessible websites can be accessed during the session. However, teacher should prepare facts prior to the start of class if technology is not accessible. Facts can be prepared on a poster board, or included in a power point presentation.

TEACHER NOTE
 If accessible, make The National Geographic Magazine level 2 and www.kidsastronomy.com and www.Squidoo.com/un-facts-for-kids available for students to review for Sun facts for their book

ENGAGE	<p>INTRODUCTION</p> <ul style="list-style-type: none"> ➤ The teacher should explain, that the Sun is a major feature of the solar system, today we will analyze facts about the sun and create a mini book to share with our friends. ➤ Divide students into small groups and have students list what they already know or think they know about the sun on the front of a piece of construction paper. Title this side <i>SUN PREDICTIONS!</i> ➤ On the other side of the construction paper have students write <i>SUN FACTS</i> as the title; which will be used to list facts learned from the following video. ➤ Inform the students that they will watch a quick video. “<i>The Sun, A real Star</i>” http://www.neok12.com/php/watch.php?v=zX5a757b4455546940600145&t=Sun ➤ During the reading have students create a new list of facts about the sun. ➤ Following the video provide students with premade blank flipbooks or white computer paper to create a miniature book (5 pages). ➤ Explain that students are to create an ALL SUN, ALL FUN mini book to include illustrations/pictures in story format that details facts about the sun. The front outer page should be a cover title page. (note the level of sentence structure will vary according to grade) ➤ Teacher should encourage creativity.
	<p>WRAP UP</p> <ul style="list-style-type: none"> ➤ Conclude the lesson allowing students an opportunity to share their books with the class. Books should be submitted to teacher and will be displayed at a final Space Science event. (if applicable). ➤ In the “L” column on the unit KWL chart, have students add a few facts about what they learned during today’s lesson.

Modifications
Middle and High School Students can research the Sun via the internet and create a modern song or poem for either their peers or younger elementary students. They will utilize http://www.teachertube.com/viewVideo.php?video_id=132031 as model for the creation.

Teacher Note:

***Flipbook Assignment:** If technology is accessible teachers can encourage students to utilize <http://www.readwritethink.org/files/resources/interactives/flipbook/> to title and create interactive online flipbooks.

Calling Planet Earth

Lesson 4 Topic: Natural features of the Earth

Lesson Objective: Students will learn natural features of planet earth by developing earth replicas.

Targeted Grade Level: 2nd-5th

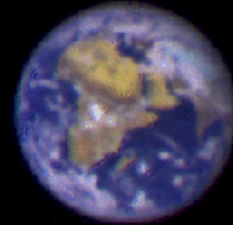
Anticipated Time: 45 minutes

Activity	Description
TEKS ALIGNMENT	<p>112.10 Science</p> <p>3 (C) explore that scientists investigate different things in the natural world and use tools to help in their investigations.</p> <p>3 (C) represent the natural world using models such the Earth and identify its limitations, including size, properties, and materials.</p> <p>7 (D) explore the characteristics of natural resources that make them useful in products and materials such as clothing and furniture and how resources may be conserved.</p> <p>7 (C) identify and classify Earth's renewable resources, including air, plants, water, and animals; and nonrenewable resources, including coal, oil, and natural gas; and the importance of conservation.</p>
MATERIALS/ SET UP	<ul style="list-style-type: none"> ➤ Recycled Card board ➤ Construction paper ➤ Markers, colors, pencils, ➤ Newspaper ➤ Coffee filter ➤ Blue and green Crayola washable markers ➤ Squirt bottle or small glass of water ➤ Black construction paper ➤ Glue ➤ KWL chart from unit 1 or 2 supplement section ➤ Journal notebook or white notebook paper <p style="background-color: #f4a460; margin: 5px 0;">CLASSROOM SET UP</p> <ul style="list-style-type: none"> ➤ Set room so students can easily see the whiteboard, chalkboard, or overhead projector. ➤ Set materials for day's class on a table where they can be easily accessed. ➤ Create a model of the Planet Earth, so that students will have a visual example.
REVIEW	<ul style="list-style-type: none"> ➤ Today's review will require students to write a creative journal. ➤ Instruct students to write a journal about the benefits of the Sun on Planet Earth. Teacher should explain that the journal can be written creatively though facts include must be accurate. ➤ Create a KWL chart on a poster board, flip chart paper or interactive smart board if accessible and "you" the teacher are comfortable with utilizing it. ➤ To begin the lesson, have students voluntarily list in the "K" column what they already know about The Earth. Some of the information may not be accurate; however, this is not the time to correct them. The goal is to encourage reflection. ➤ After 3 minutes have students list in the "W" column what they <i>want</i> to learn about the Earth.
INTRODUCTION	<p style="background-color: #f4a460; margin: 5px 0;">GUIDED QUESTIONS</p> <p>Teacher should ask the following questions:</p> <ul style="list-style-type: none"> ➤ How many planets away from the Sun is Earth? ➤ What is the primary color of Planet Earth?

	<ul style="list-style-type: none"> ➤ Why do you think this is the case?
ENGAGE	<p>INTRODUCTION</p> <ul style="list-style-type: none"> ➤ Explain to students that today they will learn detailed information about Earth and create miniature replicas of planet earth. ➤ To review facts about earth visit http://www.kidsastronomy.com/earth.htm or http://www.teachertube.com/viewVideo.php?video_id=118737 ➤ Before making earth replicas, the teacher should discuss at minimum the size of the earth, what the earth is made of and how life exist on earth. (see Planet Earth Fact Sheet/Article) ➤ Utilizing the earth fact sheet in the supplements section, participate in a read aloud to discuss the facts. ➤ While discussing the facts, teacher should show a picture of the earth’s surface. ➤ Once the Earth review is complete provide students with the materials to complete the earth’s replica designs ➤ Provide each student with the newspaper to cover their work area. ➤ Also provide coffee filter, and markers ➤ Flatten out a coffee filter on a plate. ➤ Scribble the filter with blue and green washable markers. ➤ Use a squirt bottle to spray the coffee filter 2 or 3 times in the center. Do not over water! ➤ Let dry for about 1/2 an hour. ➤ Splatter paint on a piece of black construction paper with blue and green paint ➤ Dip a toothbrush into white paint and tap it off to get rid of the excess. ➤ Hold it over the black paper and lightly rub the edge of the popsicle stick against the toothbrush to splatter dots of white paint onto the paper. ➤ Repeat until your black paper looks like a star filled universe. ➤ Set aside to dry ➤ Glue your earth to a piece of black construction paper (or to a splatter painted piece of black construction paper <p>WRAP UP</p> <ul style="list-style-type: none"> ➤ Have students display their replicas and share 2 facts about Planet Earth and what they learned. ➤ Again, add learned facts under “L” on the unit KWL chart.
SERVICE LEARNING and PARENT ENGAGEMENT	<ul style="list-style-type: none"> ➤ Students are required to develop a Planet EARTH SAFE idea with their parents, detailing an idea to keep Planet Earth Safe. ➤ Students and family can develop a poster presentation to expand the nature of this project.

MODIFICATIONS
Teachers should allow middle and high school students to create a PLANET EARTH PSA detailing facts that they learned about Planet earth. After researching both planet earth facts, students can view sample PSA’s at http://www.nasa.gov/multimedia/hd/planet51_psa.html

Earth



Earth is the third planet from the sun. It is the largest of the four inner planets. These planets are Mercury, Venus, Earth and Mars. The inner planets are also called the rocky planets, because they are made of rocks.

Earth is often called the "Water Planet" because it is the only planet in our solar system which has liquid water on its surface. About 70% of the surface of Earth is covered by water! The other part of Earth is made up of continents and islands which have different landforms on them. Examples of landforms are mountains, and plains. Because Earth has so much water, plants and animals can live on Earth.

Earth spins very quickly compared to other planets. It only takes Earth 24 hours to spin around its axis one time. One Earth day is 24 hours long!!! Earth orbits the sun in 365 days! This makes one Earth year 365 days long!!!



Earth has big oceans and a lot of water vapor in the air. Earth has clouds made of water vapor. Earth has an atmosphere with a lot of oxygen in it for us to breathe. The rest of our "air" is made up of nitrogen, carbon dioxide and other gases.



Earth is the only planet in our solar system which has all the conditions that are needed for animals, plants, and humans to live on it.

There is plenty of water for them to drink, and/or live in. Earth has air which plants and animals can breathe. The temperature on Earth is just right for plants, animals, and humans. Different parts of Earth have different temperatures, but plants, animals, and humans can live in almost all areas of Earth.

Like the other inner planets, Earth has volcanoes. Earth's volcanoes are different from those on other planets, because they still erupt. Scientists think that there may be volcanoes on other planets and moons in our solar system that may still be active. They are still studying this.



Earth has one moon which we call "The Moon". Its surface has many craters on it from where meteorites have hit it. It has many volcanoes on it which do not erupt anymore. We can see the moon at night without using a telescope. It is the closest space object to our planet. Click on the picture of the moon for more information!

(All Pictures of planets and sun on this page and the pages that follow are courtesy of NASA) (Movie clip courtesy of NASA/ISAS)

Operation SAFE: On Planet Earth

Lesson 4

(Parent Engagement and Service Learning Activity)

1.) Describe your Opeartion Safe Idea. How are you going to make earth safe?

2.) How are you going to get started?

3.) Is there a professional that you can reach out to help you?

4.) How Is your project going to benefit Planet Earth?

5.) What did you learn new while researching your SAFE Project?

Inner/Outer...Planets Galore

Lesson 5 Topic: Students will discover the features of the other seven planets in the solar system and identify important characteristics of each.

Lesson Objective: Students will learn

Targeted Grade Level: 2nd -5th

Anticipated Time: 45 -60 minutes

Activity	Description
TEKS ALIGNMENT	<p>112.10 Science</p> <p>8(C) observe, describe, and illustrate objects in the sky</p> <p>2 (A) ask questions about organisms, objects, and events during observations and investigations; (D) record and organize data using pictures, numbers, and words; (E) communicate observations and justify explanations using student-generated data from simple descriptive investigations</p> <p>2 (F) communicate valid conclusions supported by data in writing, by drawing pictures, and through verbal discussion</p> <p>8 (D) identify the planets in Earth's solar system and their position in relation to the Sun.</p>
MATERIALS/SET UP	<ul style="list-style-type: none"> ➤ Solar System poster (worked on in lesson 1 and 2) ➤ National Geographic "Planet" Book ➤ Computers with Internet access ➤ Markers, colors and or map pencils ➤ Pencils ➤ Pre-made flip books ➤ The Sun by: Seymore Simon ➤ All Sun, All Fun Scavenger Hunt <p style="background-color: #f4a460; margin: 5px 0;">CLASSROOM SET UP</p> <ul style="list-style-type: none"> ➤ Set room so students can easily see the whiteboard, chalkboard, or overhead projector. ➤ Set materials for day's class on a table where they can be easily accessed. ➤ The Solar Systems created in Lesson 1.
BRIDGE And/or REVIEW	<ul style="list-style-type: none"> ➤ This week we are going to look a little further into the major planets. ➤ First however, teachers should pass out the Planet Fact Chart ➤ Have students make predications: Using the provided Fact chart predicate details about each planet. Students can also predicate facts and/or similarities and differences between Earth and other planets.
INTRODUCTION	<p style="background-color: #f4a460; margin: 5px 0;">INTRODUCTION</p> <ul style="list-style-type: none"> ➤ Teacher should explain that we are going to learn more about the other planets and direct their attention to the following video: ➤ Solar System (All Planets) Interesting Facts for Kids: http://www.youtube.com/watch?v=Ktd4XDBT_0M ➤ During the video students should write facts in the appropriate during/after column. <p style="text-align: center; background-color: #ffff00; margin: 5px 0;">TEACHER TIP</p> <p style="text-align: center; background-color: #ffff00; margin: 5px 0;">(Teacher should stop the video at important points and allow students to write down information and or highlight important facts)</p>

MODIFICATIONS

Life on other planets, especially Mars is of particular interest to space scientists. Middle and High School students can research the scientific search for life on Mars and develop a visual timeline, or illustration of the scientific accounts.

Adapted from:

Discovery Education

<p>ENGAGE</p>	<p>3.) When the video is complete, provide students with their Lesson 1 Solar System project.</p> <p>4.) Teacher will provide 8 index cards to each student.</p> <p>5.) Students will utilize the PLANET FACT SHEET to create a PLANET Placard for each planet and glue it under the appropriate planet on their board.</p> <p>6.) The Planet Placards should include important information about each planet</p> <p>7.) In addition to using the movie clip, students can also use the National Geographic Planets Magazine (pgs, 12-13, pg. 16-17, pg. 20-21 (if available) or copies of the Solar System fact sheet.</p> <p>8.) Once complete students should turn their boards back in to the teacher.</p> <p>WRAP UP</p> <ul style="list-style-type: none"> ➤ In closing review with the students characteristics about several of the planets by asking the following questions: <ul style="list-style-type: none"> a.) Which Planet is closest to the sun b.) Which planet is the largest planet in the solar system c.) Which planet is the smallest in the solar system
<p>SERVICE LEARNING And/or PARENT ENGAGEMENT</p>	<ul style="list-style-type: none"> ➤ Students will work with their families to complete the lesson Scavenger Hunt. ➤ Access www.kidsastronomy.com to complete the scavenger hunt.

TEACHER NOTE

Additional site to learn about the planets. This site includes Pluto which is no longer a planet!

<http://kids.nineplanets.org/intro.htm>

*PLEASE BE CERTAIN TO ASSIST YOUNGER STUDENTS

TEACHER NOTE

The Scavenger hunt can also be complete in the after school session when technology is accessible.

The Solar System Facts

The Sun

- A star at the center of our solar system.
- It is 5,000,000,000 years old.
- It is the closest star to our planet Earth.
- The sun holds all of the planets in space and gives them light and heat.
- Our Sun supports life on Earth and affects our climate, weather, and our seasons.
- The sun is made up of gases called hydrogen and helium.
- The sun is the hottest thing in our Solar System. It can reach 15 million degrees.
- If the sun were a hollow ball, over one million planets the size of the Earth would fit inside of it.
- We should never look directly at the sun.
- The four planets closest to the Sun are called the Terrestrial Planets or the Inner Planets. They are Mercury, Venus, Earth and Mars.

Mercury

- The planet closest to the Sun. Mercury is about one third the size of the Earth. Mercury is covered with a fine grained soil. It has a heavily cratered surface. It is very hot during the day because it is so close to the sun (427 degrees C.) but it is very cold on the night side of the planet. -183 degrees C. There is no atmosphere (air) or water on Mercury. It is a dry, dead, desert world. Mercury looks very much like Earth's Moon.

Venus

- Venus is the second planet from the sun. Venus is the hottest planet in the Solar System. Venus is one of the brightest planets in the Earth's sky and can be seen quite easily with the naked eye. Venus is covered with thick clouds made of sulfuric acid. The atmosphere (air) on the planet Venus is made up of Carbon Dioxide gas. It forms a thick blanket over the planet much like what we call smog only much worse. This traps the heat near the surface of Venus and makes it very hot. (Use a car in the summer as an example). The surface of Venus is dry, rocky and very, very hot. The winds on Venus can blow a mighty 250 miles per hour, greater than any Earth hurricane or tornado. Humans would not be able to live on the planet called Venus.

Earth

- Our Earth is the third planet closest to the Sun. Our planet has water and an atmosphere. It is made up of oxygen and nitrogen and small amounts of other gases. Our atmosphere protects us from the deadly rays from the sun. Our Earth has a 24 hour day and 365 days in a year. Even though our atmosphere protects us from most outer space objects, we have been hit by meteorites sometimes. We have some craters on our planet but not as many as Mercury. Our Earth has one moon called the Moon.

Mars

- Mars is the inner planet furthest from the sun. Mars is called the Red Planet because it is made of red rocks. It has a pink sky and looks red through a telescope. Mars has volcanoes, lava fields, canyons and cracks in its crust just like Earth. Mars has two very small moons. Mars has many craters. Scientists know there was water on Mars many years ago. Mars is always very cold. Mars has the largest volcano in the Solar System called Olympus Mons but it is not active anymore. Mars seems to have seasons but they are not the same length of time.

Asteroid Belt

- In between the inner planets and the outer planets there is an asteroid belt.
- It is made up of many rocks called asteroids.
- The belt is between Mars and the planet Jupiter and it revolves around the sun in an orbit just like the planets. The asteroids range in size from a pebble to as big as a skyscraper.

Jupiter

- Jupiter is the largest planet in our solar system.
- Jupiter has a distinctive landmark called the Giant Red Spot which is in its lower hemisphere.
- The Great Red Spot is made up of swirling gases like a huge hurricane that never stops moving.
- Jupiter is the only other planet besides Venus and Earth that has active volcanoes.
- Jupiter has 16 moons compared to Earth's one moon. It takes Jupiter 12 of our Earth years to revolve around the Sun.

Saturn

- Saturn is the second largest planet in our Solar System.

- Saturn has the largest amount of satellites. Twenty-three have been discovered. Saturn is less dense than water. This means if we could put it in a huge bathtub, it would float. It is made up of gases.
- Saturn has many beautiful rings around it. The rings are made up of rocks and ice. Other planets have rings but Saturn's are the largest.
- Jupiter, Saturn, Uranus and Neptune are the four outer planets of the Solar System. They are dark frozen planets because they are so far from the Sun.

Uranus

- Uranus is the seventh planet from the Sun.
- It was the first planet to be discovered with a telescope.
- Uranus is different the other planets because its orbit is on the same plane as its orbit around the sun. In other words, it "rotates on its side". It appears to be "lying down" as it spins rather than "standing up" like the other planets.
- Uranus is a blue color because its atmosphere is mostly frozen methane gas.

Neptune

- Neptune is the eighth planet from the Sun.
- Neptune, like all the giant planets also has rings.
- Neptune was not discovered until 1846.
- It is the last of the gas giant

PLANET Fact CHART
Lesson 5 Space Science Supplement

Planet	Predications before Video	Facts during/after Video
Mercury (Inner Planet)		
Venus (Inner Planet)		
Earth (Inner Planet: OUR PLANET)		
Mars (Inner Planet)		
Jupiter		
Saturn		
Uranus		
Neptune		

INNER/OUTER PLANET PARENT SCAVENGER HUNT
Lesson 5 Space Science Supplement (Answer Key)

Directions: Students with the assistance of their parents or family member should complete the following scavenger hunt questions. Families should visit www.kidsastronomy.com (select solar system) to help answer their questions. Scavenger Hunt should be returned to after school teacher.

Which Planet is closest to the sun? Mercury	Johann Galle and Heinrich D'Arrest discovered this planet in 1846. Neptune	The largest planet in the solar system? Jupiter
This planet means the Roman Goddess of love and beauty? Venus	This planet is the second largest planet in the solar system? Saturn	This planet means the Roman God of war of agriculture? Mars
The one planet that spins on his side. Uranus	The largest planet of all. Earth	The smallest planet of all the gas giants in our Solar System. Neptune
Planet called the morning star. Mercury	The planet known for its rings. Saturn	The sister planet to Earth. Venus

Parent Signature: _____ **Date:** _____

Student Signature: _____ **Date:** _____

INNER/OUTER PLANET PARENT SCAVENGER HUNT
Lesson 5 Space Science Supplement

Directions: Students with the assistance of their parents or family member should complete the following scavenger hunt questions. Families should visit www.kidsastronomy.com (select solar system) to help answer their questions. Scavenger Hunt should be returned to after school teacher.

Which Planet is closest to the sun?	Johann Galle and Heinrich D'Arrest discovered this planet in 1846.	The largest planet in the solar system?
This planet means the Roman Goddess of love and beauty?	This planet is the second largest planet in the solar system?	This planet means the Roman God of war of agriculture?
The one planet that spins on his side.	The largest planet of all.	The smallest planet of all the gas giants in our Solar System.
Planet called the morning star.	The planet known for its rings.	The sister planet to Earth.

Parent Signature: _____ **Date:** _____

Student Signature: _____ **Date:** _____

MOON MADNESS

Lesson 6 Topic: Moon Phases

Lesson Objective: Students recognize that moon’s position as it revolves around the Earth by developing an understanding of the Moon’s phases and patterns.

Targeted Grade Level: 2nd -5th

Anticipated Time: 45 minutes

Activity	Description
TEKS ALIGNMENT	<p>112.10 Science</p> <p>4 (A) use senses as a tool of observation to identify properties and patterns of objects, and events in the environment; 8(C) observe, describe, and illustrate objects in the sky such as the Moon</p> <p>3 (B) make predictions based on observable patterns</p> <p>2(A) ask questions about objects, and events during observations and investigations;</p> <p>(D) record and organize data using pictures, numbers, and words</p> <p>(E) communicate observations and justify explanations using student-generated data from simple descriptive investigations</p> <p>3 (F) communicate valid conclusions supported by data in writing, by drawing pictures, and through verbal discussion</p> <p>3 (C) represent the natural world using models such as the Moon and identify its limitations, including size, properties, and materials</p> <p>8 (C) construct models that demonstrate the relationship of the Sun, Earth, and Moon, including orbits and positions;</p> <p>8 (C) collect and analyze data to identify sequences and predict patterns of change in shadows, and the observable appearance of the Moon over time.</p>
MATERIALS/ SET UP	<ul style="list-style-type: none"> ➤ Journal Notebook or Paper ➤ National Geographic “Planet” Book (if available) ➤ Phases of the Moon: http://www.wonderville.ca/asset/phases-of-the-moon ➤ Computers with Internet access ➤ Markers, colors and or map pencils ➤ Moon’s Fact Sheet ➤ Pencils ➤ Post-It Notes ➤ Construction Paper ➤ Oreo Cookies <p style="background-color: #f4a460; margin: 5px 0;">CLASSROOM SET UP</p> <ul style="list-style-type: none"> ➤ Set room so students can easily see the whiteboard, chalkboard, or overhead projector. ➤ Set materials for day’s class on a table where they can be easily accessed. ➤ Create a model of the moon phases portfolio
REVIEW	<ul style="list-style-type: none"> ➤ Provide students with a journal paper or notebook and have students write a journal “If I could live on any planet, I would live on planet. . . .” ➤ Allow volunteers students to share with the group.
INTRODUCTION	<p>Teacher should facilitate a group reading, and or a web clip:</p> <ul style="list-style-type: none"> ➤ Group Reading: Direct students to their national Geographic “Planet” Book (pg. 22-25) or the supplement Moon Phases page. Read pages 22-25 a loud. You can call on reading volunteers or you as the teacher can read. ➤ Discussion: Discuss the pictures, and the definitions provided on each page. Teacher should also initiate the Brain teaser “Q” on page 25 of the magazine ➤ Wonderville Phases of the Moon: http://www.wonderville.ca/asset/phases-of-the-moon (teachers can visit teachertube.com for other videos)

MODIFICATION

Moon Madness for Middle and High School students can be expanded into a magazine that covers everything from space explorations on the moon to the phases of the moon and everything in between. Allow students to engage in creating a design based on researched information and documented scientific facts .

<p>ENGAGE</p>	<p>INTRODUCTION</p> <p>Teacher should ask the group if they have ever seen a full moon, or a half moon. Today students will learn about the different stages of the moon.</p> <ul style="list-style-type: none"> ➤ Teacher should question the students: <ul style="list-style-type: none"> 1.) Would you like to go to the moon? Why or why not? 2.) If you went to the moon, who would you take with you? 3.) What do you think it would be like if we had two moons? How could we tell them apart? 9.) Explain that the Moon has different phases and which will be explained in the next video. 10.) http://www.neok12.com/php/watch.php?v=zX0a57724360404e605e4363&t=Moon 11.) In lieu or in conjunction with the video, the teacher can also read The Moon Phases Article provided in the supplement section. <ul style="list-style-type: none"> ➤ Following the video, have students create a Moon Phases Portfolio covering the Main 4 moon phases: New Moon, Quarter Moon, Full Moon, and Last Quarter Moon.
<p>CAREER and COLLEGE READINESS</p>	<p>12.) Guided Question: We have learned about the moon today, but it would be interesting to know who studies the moon every day. Have you all heard of an Astronomer?</p> <p>13.) Teacher should explain: Astronomers Observe, research, and interpret astronomical phenomena to increase basic knowledge and apply such information to practical problems.</p> <p style="text-align: center;">Teacher Tip: Astronomers research space phenomena's.</p>
<p>WRAP UP</p>	<ul style="list-style-type: none"> ➤ On a post it note answer the following questions: <ul style="list-style-type: none"> 1.) Name 3 facts about the moon 2.) The first quarter moon is also known as? ➤ As students exit students can take an oreo cookie and carve out a moon phase in the icing.
<p>PARENT ENGAGEMENT</p>	<ul style="list-style-type: none"> ➤ For the next week, students will work with their parents to chart the Moon Phases. Teacher should provide students with the supplemental Moon Phases worksheet.

The Moon's Phases

Source: *The National Aeronautics and Space Administration (NASA)*

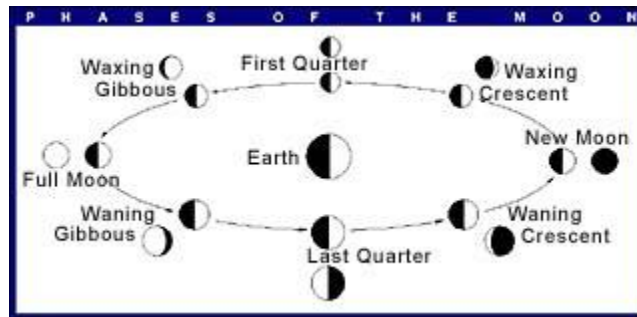
The lunar month is the 29.53 days it takes to go from one new moon to the next. During the lunar month, the Moon goes through all its phases. You can see the phases drawn in the image below. Just like the Earth, half of the Moon is lit by the Sun while the other half is in darkness. **The phases we see result from the angle the Moon makes with the Sun as viewed from Earth.**

At new moon, the Moon is lined up between the Earth and the Sun. We see the side of the Moon that is not being lit by the Sun (in other words, **we see no Moon at all**, because the brightness of the Sun outshines the dim Moon!) When the Moon is exactly lined up with the Sun (as viewed from Earth), we experience **an eclipse**.

As the Moon moves eastward away from the Sun in the sky, we see a bit more of the sunlit side of the Moon each night. A few days after new moon, we see **a thin crescent** in the western evening sky. The crescent Moon **waxes**, or **appears to grow fatter**, each night. When **half of the Moon's disc is illuminated**, we call it **the first quarter moon**. This name comes from the fact that the Moon is **now one-quarter of the way through the lunar month**. From Earth, we are now looking at the sunlit side of the Moon from off to the side.

The Moon continues to wax. Once more than half of the disc is illuminated, it has a shape we call **gibbous**. The gibbous moon **appears to grow fatter** each night until we see the full sunlit face of the Moon. We call this phase **the full moon**. It rises almost exactly as the Sun sets and sets just as the Sun rises the next day. **The Moon has now completed one half of the lunar month.**

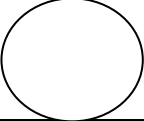
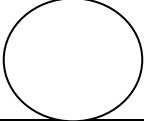
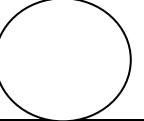
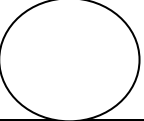
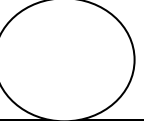
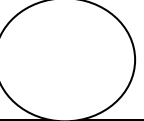
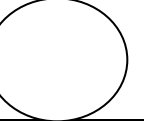
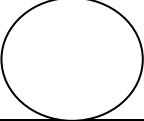
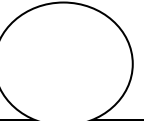
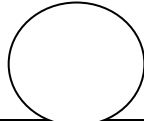
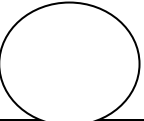
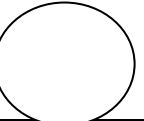
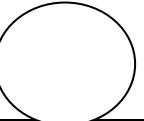
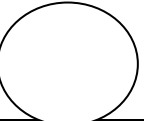
During the **second half of the lunar month**, the Moon grows thinner each night. We call this **waning**. Its shape is still gibbous at this point, but **grows a little thinner** each night. As it reaches **the three-quarter point in its month**, the Moon once **again shows us one side of its disc illuminated** and the other side in darkness. However, the side that we saw dark at the first quarter phase is now the lit side. As it completes its journey and **approaches new moon again**, the Moon is a **waning crescent**.



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MOON PHASES CALENDAR



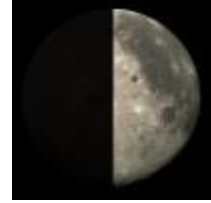



Draw a picture of your moon each night in the first columns. Parents draw your interpretation of the moon in the bottom

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						
						

Student Signature: _____ Date: _____

Parent Signature: _____ Date: _____

SAMPLE MOON PHASES

	<p>New Moon</p>	<p>This is the first of the moon phase</p>
	<p>Waxing Cresecent Moon</p>	<p>"Waxing" means growing and refers to the size of the illuminated part of the moon that is increasing.</p>
	<p>First Quarter Moon</p>	<p>Third quarter of the moon phase and is well known at the HALF Moon.</p>
	<p>Full Moon</p>	<p>The full moon occurs when the Moon lies on the opposite side of Earth from the Sun.</p>
	<p>Last Quarter Moon</p>	<p>The last stage of the moon cycle, with only half the moon illuminated.</p>
	<p>Waning Cresecent Moon</p>	<p>In the northern hemisphere, if the right side of the Moon is dark, the light part is shrinking: the Moon is waning (moving towards a new Moon).</p>

Gravity Pulls Us Down Again

Lesson 7 Topic: Gravity

Lesson Objective: Students will investigate the force of gravity and recognize it as a constant pull here on earth. Students will evaluate situations when gravity is altered.

Targeted Grade Level: 2nd -5th

Anticipated Time: 45 minutes

Activity	Description
TEKS ALIGNMENT	112.10 Science Second Grade 6(C) trace the changes in the position of an object over time such as a cup rolling on the floor and a car rolling down a ramp. Third Grade 6 (C) observe forces such as gravity acting on objects. Fourth Grade 6 (D) design an experiment to test the effect of force on an object such as a gravity.
MATERIALS/SET UP	<ul style="list-style-type: none"> ➤ 22 Binder clips ➤ Stop watches ➤ 10 plastic shopping bags with handles ➤ 10 sheets of 9"x12" newsprint paper ➤ 6 paper lunch bags ➤ 10 paper napkins ➤ 10 rolls of clear tape ➤ 30 or more 8" pieces of string ➤ Scissors <div style="background-color: #f4a460; padding: 2px;">CLASSROOM SET UP</div> <ul style="list-style-type: none"> ➤ Set room so students can easily see the whiteboard, chalkboard, or overhead projector. ➤ Set materials for day's class on a table where they can be easily accessed.
REVIEW	<ul style="list-style-type: none"> ➤ Remind students that yesterday's video briefly discussed gravity. ➤ Provide students with an index card. Have them answer the following pre-assessment questions: <ol style="list-style-type: none"> 1.) What is gravity? 2.) Is there gravity in space? 3.) How do you know?
INTRODUCTION	<ul style="list-style-type: none"> ➤ Explain to students that Gravity: is an invisible force that pulls objects toward a planet (Planet Earth) or star. It pulls us back toward the center of the earth.
ENGAGE	<div style="background-color: #f4a460; padding: 2px;">Introduction:</div> The teacher should explain that today we are going to investigate how we can slow down the fall of a binder clip? <ul style="list-style-type: none"> ➤ Divide students into groups. ➤ Once divided call have the students watch the following demonstration. ➤ Drop a binder clip from the height of your head. ➤ The teacher should ask the following question: "What made the binder clip fall to the ground?" (allow students to answer) ➤ Explain that gravity is the reason for the binder clip falling to the ground. ➤ Tell the students that you will drop the clip again and ask them to pay attention to how fast the clip falls. Invite a volunteer to record the time as the clip drops. *Important to count the drop off (on the count of 3) to ensure that the timer is also set on

Teacher Note

In preparation for this lesson, teachers can watch this lesson to gain valuable insight on the topic prior to the lesson:

<https://www.teachinchannel.org/videos/teaching-mass-weight-gravity>

the count of 3 and stopped as soon as the clip hits the floor. Drop the clip again from the same height.

- Tell the students that today they will act like scientists to try to really evaluate the question above: What made the binder clip fall to the ground and how was it impacted by the added material?"
- Show them the material you have set out, explain that they will work in groups and they will choose some material and attach them to a binder clip to try to slow its fall.
- Pass out 2 binder clips to each group. Talk about which materials to attach to one of the binder clips.
- Gather some materials and attach them to one of the clips. The other clip will be left as it is with no materials attached.
- Drop the clip with the materials attached.
- At the same time, drop a plain clip from the same height.
- See which clip hits the ground first.
- Talk about what they observe, and talk about another way to slow down a binder clip's fall. Collect more materials and find as many ways as they can to slow the fall of the clip.
- **DURING these time trial runs, students should chart their observations and times utilizing the Gravity observation sheet.**

Wrap Up

Teacher should address the group and ask:

- **Question:** What makes a clip with materials attached fall more slowly?
- For now accept all ideas. If the students mention something along the lines of air resistance, tell them they'll be talking more about that in the next lesson.

MODIFICATIONS

Middle and High School Students can design a home that defies gravity. If given an opportunity to build a home in space how what functional components would be used to keep kitchen plates from floating or keep individuals in the bed at night etc. Allow students to create a list of functions that are important. They can select a specific room or do an overview of the entire living space. Students can work in groups or as individuals. Teacher can require that an illustrations be completed or a full build out.

Adapted from:
Discovery Education

Comparing Parachutes

Lesson 8 Topic: Air Resistance

Lesson Objective: Students will investigate the process of air resistance and its relations to space flights.

Targeted Grade Level: 2nd -5th

Anticipated Time: 45 minutes

Activity	Description
TEKS ALIGNMENT	<p>112.10 Science Kindergarten and First Grade 3 (C) explore that scientists investigate different things in the natural world and use tools to help in their investigations.</p> <p>First Grade 8 (B) observe and record changes in the appearance of objects in the sky such as clouds, the Moon, and stars, including the Sun</p> <p>Third Grade 3 (D) connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.</p>
MATERIALS/SET UP	<ul style="list-style-type: none"> ➤ Stop watches (enough for the group) or some time tracker to count seconds ➤ 20 coffee filters ➤ 10 binder clips ➤ 30-40 8' piece of string ➤ Scissors ➤ Clear tape <p style="background-color: #f4a460; margin: 5px 0;">CLASSROOM SET UP</p> <ul style="list-style-type: none"> ➤ Set room so students can easily see the whiteboard, chalkboard, or overhead projector. ➤ Set materials for day's class on a table where they can be easily accessed. ➤ Create a model of a parachute, so that the students will have a visual example.
REVIEW	<ul style="list-style-type: none"> ➤ Review with students the force of gravity. Inform students that gravity on earth is so heavy because it is so BIG!!! In comparison to other parts of space, like the sun, other planets and stars that are so small there is really no gravity to pull keep you down. ➤ Teacher should ask students how many of them have seen pictures of astronauts floating? Explain that in space the space suits serve in the same way as the materials used in the last lesson. ➤ Teacher should reinforce that like gravity there are so many neat things to study about space and the solar system.
INTRODUCTION	<p style="background-color: #f4a460; margin: 5px 0;">GUIDING QUESTIONS</p> <ul style="list-style-type: none"> ➤ What two factors most impact gravity and air resistance? ➤ Teacher should look for answer such as size and shape.
ENGAGE	<p style="background-color: #f4a460; margin: 5px 0;">INTRODUCTION</p> <p>Explain that today students are going to investigate the effects of air resistance on student made parachutes.</p> <ul style="list-style-type: none"> ➤ Divide students into groups. ➤ Once gathered mention that in the last session they eventually slowed down the fall of a binder clip. Ask: <ul style="list-style-type: none"> ○ Question: What materials did you attach to a binder clip to make it fall more slowly? ○ Question: How do you think that the materials slowed the fall of the clip? ➤ Students may say for example, that “the paper caught more air” or “the air pushed up the bag.” ➤ Explain that when something moves through air, the air pushes against it. This is called air resistance. The clip with materials attached has more air resistance than the clip by

itself, and air resistance is what slows its fall.

- Explain to students how air resistance is related to flight.
(an increase in air resistance decreases the speed of the object in flight).
- Quickly demonstrate air resistance using two coffee filters.
Crumple one of the filters and ask:
 - **Question:** If I drop these two filters at the same time, which one do you think will hit the ground first?
Why do you think that?
- Give the students a moment to think, and then drop the two filters from the same height. Ask:
 - **Question:** Why do you think the crumpled up filter hit the ground first?
- Help the students use the word air resistance as they explain their ideas. Tell the students that today they will be learning about air resistance by making parachutes. Ask:
 - **Question:** What is a parachute? Who uses a parachute?
- If the students do not mention it, explain that a parachute makes something fall more slowly. Ask:
 - **Question:** How does a parachute slow a person's fall through the air?
- If it doesn't come up naturally, tell the children that a parachute's wide shape has a lot of air resistance; the air pushing against the parachute slows its fall.
- Hold up your sample basic parachute and explain that each group of students will work together to make one. Explain the steps for making a parachute.
 - Tape 3 strings to the inside of a coffee filter, making sure that the strings are evenly spaced.
 - Clip the loose string ends together with a binder clip.
- Direct students to the location where they may drop the parachutes and caution them not to throw them.
- Ask one group member to pick up the materials. Once the students are all back in their groups. Ask:
 - **Question:** How can partners in each group share the work of making and testing their parachute?
- **Question:** What does air have to do with how a parachute works?
- Make sure they understand that air pushing up against the parachute makes it fall more slowly. Be sure to use the words air resistance.
- Have students make their parachutes and complete 3 time trials recording the time it takes for the parachute to fall from the designated location to the ground.
- When all pairs have tested their basic parachutes, call the group together. Ask a volunteer to read aloud the question for this lesson "**How can we design a parachute so it will fall more slowly?**"
- Explain that each group will keep their basic parachute and make a second one that they think will fall more slowly.

MODIFICATIONS

Middle and High School students should be provide an opportunity to research parachutes designs and work in partners to design a parachute that will securely package an egg through a flight. Students should record their attempts and the observation of each flight .

	<p>Ask:</p> <p>Question: “What is the best way to test which parachute falls more slowly?”</p> <ul style="list-style-type: none">➤ List their responses on the board, and if students do not come up with it naturally, explain that they should drop both parachutes at the same time and from the same height. This way they can see which one falls more slowly.➤ Point out the extra coffee filters, binder blips, string, tape and scissors that the students will use to build their second parachutes.➤ Walk around as the students create their second parachute.➤ Have students test their new parachute with 5 trial runs. <p>WRAP UP AND REVIEW</p> <ul style="list-style-type: none">➤ Bring the groups back together. Have each group to bring their parachutes with them.➤ Ask two volunteers to show their parachutes and have them explain what is different about their new designs compared to the basic parachute?➤ Ask volunteers to drop both at the same time. Ask:<ul style="list-style-type: none">○ Question: “Why do you think your new parachute fell more slowly than your other one?”
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**PARACHUTE TIME TRIAL
Observation Form**

Trial Description	Time	Detail observations
Trial 1: Regular Parachutes		
Trial 2: Regular Parachutes		
Trial 3: Regular Parachutes		

Place a check mark in the column to determine which landed first. An alternative would be to have students write the time that it took for each parachute to land on the ground.

Trial	Regular Parachute	New Parachute	Observations
Trial 1			
Trial 2			
Trial 3			
Trial 4			
Trial 5			
Trial 6			
Trial 7			

Telescope Mania

Lesson 9 Topic: Exploring Space...Through the Lens of a Telescope

Lesson Objective: Students will apply the processes of inquiry in building a telescope. And they will be able to describe the objects seen through the telescope.

Targeted Grade Level: 2nd -5th

Anticipated Time: 45 minutes

Activity	Description
TEKS ALIGNMENT	<p>112.10 Science</p> <p>Kindergarten and First Grade 3 (C) explore that scientists investigate different things in the natural world and use tools to help in their investigations.</p> <p>First Grade 8 (B) observe and record changes in the appearance of objects in the sky such as clouds, the Moon, and stars, including the Sun</p> <p>Third Grade 3 (D) connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.</p>
MATERIALS/SET UP	<p><u>Necessary Equipment</u></p> <ul style="list-style-type: none"> ➤ Thick Double convex lens (multiple for individuals) ➤ Thin double convex lens (multiple for individuals) ➤ Polyvinyl tape ➤ 5" x 9" sheet of black construction paper ➤ Paper towel roll ➤ Stickers <p style="background-color: #f4a460;">CLASSROOM SET UP</p> <ul style="list-style-type: none"> ➤ Set room so students can easily see the whiteboard, chalkboard, or overhead projector. ➤ Set materials for day's class on a table where they can be easily accessed. ➤ Create a model of the telescope, so that the students will have a visual example.
REVIEW	<ul style="list-style-type: none"> ➤ Ask students to write a brief paragraph about space, gravity and air resistance. ➤ Allow them to share their paragraph with the class. Encourage students to utilize terms learned in the previous two lessons.
INTRODUCTION	<ul style="list-style-type: none"> ➤ The teacher should explain that over the course of the unit we have investigated many features of space but there is nothing more powerful than physically examining these features with our own eyes. Teacher should ask: <p style="background-color: #f4a460;">GUIDING QUESTIONS</p> <p>Engage students by inquiring and analyzing their previous knowledge with the following questions.</p> <ul style="list-style-type: none"> ➤ What is a telescope? ➤ What is a telescope used for? ➤ Have students discuss their experiences with telescopes in books, movies, or use. Encourage them to share personal stories about observations they made or would like to make through a telescope. (some students may not have a contribution, however this is an opportunity to pretest knowledge and account for students with some prior knowledge)
ENGAGE	<p style="background-color: #f4a460;">INTRODUCTION</p> <ul style="list-style-type: none"> ➤ Teacher should explain that today students will learn how to build a telescope, that they are encouraged to use to further investigate features of space.

TEACHER NOTE:

To modify your lesson with a video clip visit <http://www.neok12.com/Telescope.htm>

MODIFICATIONS

Allow high school and middle school students an opportunity to design their own telescope and record observations of the stars.

	<ul style="list-style-type: none"> ➤ Explain the following to your students: Maybe you've been out looking at the stars in the night sky, searching for constellations; or maybe you've already learned your way around the constellations. Maybe, now you'd like to take a closer look at objects like the moon, planets or stars with the aid of a telescope. ➤ In its essence, a telescope is an instrument that makes a far away object look closer. To do this, a telescope has a device that collects light from a distant object (objective lens or primary mirror) and brings that light (image) to a focus where a second device (eyepiece lens) magnifies the image and brings it to your eye. ➤ For the next part of the lesson, the teacher will work with the students to create their own telescope. ➤ Measure the size of a magnifying glass by wrapping the paper around and drawing a line to mark the diameter. ➤ Add 1 1/2 inches to allow space to close the tube, and then cut the paper lengthwise. ➤ Next, cut the width of the paper in half, making two 12-inch pieces. ➤ Wrap a piece of paper around each magnifying glass to make a tube and glue each tube securely. ➤ The second tube should be a bit wider than the first to make adjusting the telescope easier. ➤ Put the smaller tube inside the larger tube with the magnifying glasses on either end. ➤ Kids can decorate their telescopes with markers or felt pens.
<p style="text-align: center;">WRAP UP/REVIEW</p>	<ul style="list-style-type: none"> ➤ In conclusion, have students discuss the importance of studying space. Remind them that telescopes are excellent tools needed to see stars, asteroids and other objects in the sky or space. ➤ On an index card, have students complete exit cards by describing what specific object in space are they most interested in studying with their telescope and why. Students should submit exit cards to teacher prior to leaving the classroom.
<p style="text-align: center;">SERVICE LEARNING And PARENT ENGAGEMENT</p>	<ul style="list-style-type: none"> ➤ In an effort to engage parents and students this home project is encouraged. The project requires students and parents to design and build their own "GO GREEN" spaceship, space station or satellite. They should identify: <ul style="list-style-type: none"> 1.) What "features" will you add to make your creation safe for the environment as it travels in space? 2.) What Go GREEN materials can be used to make their space ship environmentally friendly? ➤ This is a fun space activity for students that will challenge their imagination, research skills and enhance their knowledge of space.