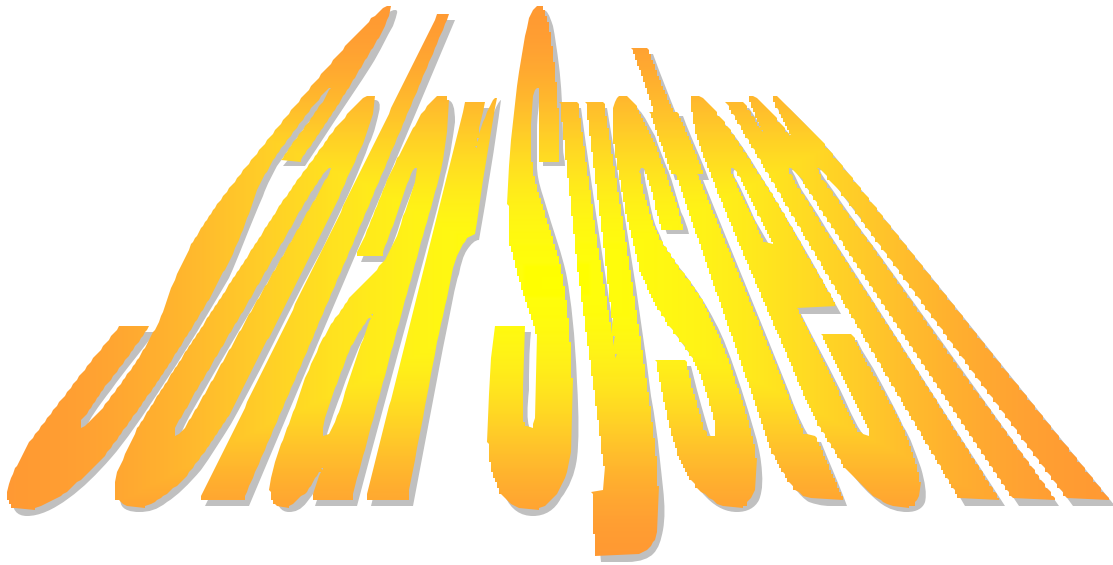


A Third grade Module

The



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And
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With input from
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Solar System

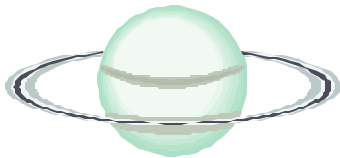
We live on the planet, Earth. Earth is a part of the Solar System. The Solar System consists of the Sun and the objects that orbit the Sun. The Sun is in the center of our Solar System. The Sun is a medium size star. There are nine known planets that revolve around the Sun. Seven of the planets have moons (satellites) that orbit the planet as they revolve around the Sun. The four planets closest to the Sun are smaller rock planets. They are called the Inner Planets or Terrestrial Planets. The next four are giant gaseous planets with rings. They are sometimes referred to as the Outer Planets or Jovial Planets. The last planet is Pluto. Pluto is not a rock planet of a giant gas planet. Pluto is still a mystery. It is the only planet that spacecraft has not yet visited. The planets in our solar system have planets have very unique characteristics.

The Solar System

Grade Level Objectives:

- 🌍 Students will be able to identify the planets.
- 🌍 The students will identify the order of the planets from the Sun.
- 🌍 Students will report the distances of the planets from the sun.
- 🌍 The students will be able to differentiate between orbit, revolve, rotate, and axis.
- 🌍 Students will describe how gravity works.
- 🌍 Students will identify the nine planets and investigate their orbital path.
- 🌍 Students will identify that seven of the nine planets have one or more moons.
- 🌍 Students will describe the path of the Moon and the planets
- 🌍 Students will investigate the orbits of the planets.
- 🌍 Students will observe, predict, and compare data collected during the orbit investigation.
- 🌍 The students will make a conclusion using the data obtained in their investigation.
- 🌍 Students will describe the three forms of matter, gas, liquid, and solid.
- 🌍 The students will report facts about each of the nine planets. This will include the variance in the different sizes of the planets. The facts will be discovered by viewing and comparing the planets that will be scaled down to the measurements given on the next page in this unit.
- 🌍 Students will describe the concept of relative size of objects, including but not limited to, the moon, planets, and Sun.

Grade Level: Grade 3 and may be easily adapted for grades 4-6



Is Earth bigger than the Sun and Moon? Is the Sun the same size as the Moon?

Advanced Preparations and Materials:

2 Soft balls 4"

2 cones or disks to hold ball still

2 bouncy balls 1 1/2 "

Time: 20 minutes

Procedure:

- * Before the students enter the classroom find an area to place the softball. At 9 feet away from the softball, place the smaller ball. From the smaller ball measure 5 feet and mark this location for students. Have the students look, so the balls are at eye level, from this marked location at the size of the two balls.
- * Ask students to show each other the size of the Moon, Sun, and Earth. Is the Moon the same size as the Sun? Why or why not?
- * Explain: objects far, far, away will appear small. The closer the object gets to you, the larger it becomes. The Sun is extremely big and so far away that it appears to be the same size as the much smaller and much closer Moon. Once the students each view the balls from the mark. Bring the two balls together to show the size difference.
- * Is the Sun the same size as the Moon? Is Earth bigger or smaller than the Moon?
- * Let's find out!



Amber Chambers and Vone Buckels teaching relative size

If we shrunk the Solar System to fit the planets in the classroom ...

Introducing the Solar System

🌐 **Advance Preparation/ Materials:** Planets scaled down in size (measurements below). There are few ways to prepare for this project.



- ★ Have the class paint the planets and Sun together- need a large area to paint (outside), paper cut to size and taped down, sponges and paint in trays, smocks.
- ★ Make them yourself
- ★ Have them done by a graphic artist
- ★ Take photos of the planets to a color copy company to have made to size.

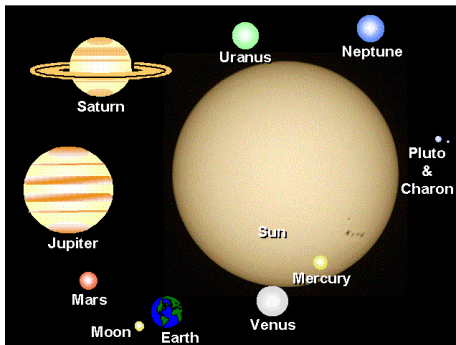
Great sites to get photos:

<http://photojournal.jpl.nasa.gov/>

<http://www.google.com> at images.

1. Solar System packets that include, but not limited to, the following: *Our Solar System Facts*, *Fun Facts about the Solar System*, *Solar System Word Search with Words to Discover*, and *Vocabulary*. Also, planet facts cards are helpful for the students. The students seem to use the index card with planet facts more than referring to the paper with the same type of information. Having both the paper and cards of information can be helpful.

ψ Each planet has a separate 5"X 8" index card. On one side paste a realistic image of each planet on a card. On the same side write the size of planet, distance from the Sun, and temperature. On the other side of the card place all the *Fun Facts* about the planet. Each student gets (or makes) a complete set of the cards.



Handouts and work sheets: pages 16-20

Assessments: pages 21-22

The answer sheets: pages 23-26

Γ To reduce the planets down to scale in proportion to each other, use the formula, diameter/3000 = inches for the diameter of each planet poster.

Planets (posters) in scale using the diameter in kilometers

Sun	464.18"
Mercury	1.63"
Venus	4.03"
Earth	4.25"
Moon	.86"
Mars	2.26"
Jupiter	47.50"
Saturn	40.00"
Uranus	16.93"
Neptune	16.20"
Pluto	1.26"



Melissa Baker and Vone Buckels showing the planet Jupiter.
Amber Chambers asking students facts about the planet.

★ The book, "The Magic School Bus Lost in the Solar System" by Joanna Cole- ISBN #0-590-41429-1- Scholastic Inc

Time: 40 minutes

Grouping: Class as one group.

Procedure: Ask the students what they want to know about the Solar System. Take notes on their questions and make sure by the end of the unit all have been answered.

Ask the class what they know about the Solar System?

Who can name other planets?

What else can you tell us about planets?

Explain the idea of shrinking the solar system all at the same rate to fit the planets into the classroom.

Which planet do you think is the biggest? Why?

If time allows, have class read the story. "The Magic School Bus Lost in the Solar System" by Joanna Cole

Introduce each planet. In the following order: Earth, Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto, and then, The Sun. Remember to explain which planets are the Giant Gas and the rocky planets.

Refer back to Earth. Emphasize the distance from the sun, size, and temperature of the planets.

Our Place in Space

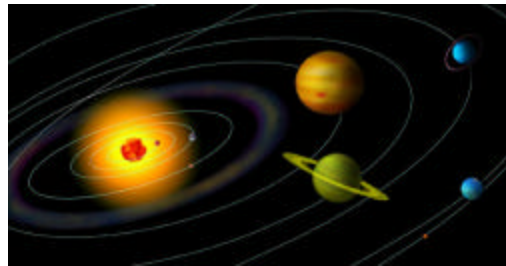
If we could shrink the Solar System to be so small that we could fit it on the playground, most of the planets would be seen only with a magnify glass. The distances from the Sun are listed below with the formula used to calculate the distances. Investigating the planets orbits around the sun and the distance between the planets is so exciting. This will review the information about the planets as well as teach new concepts.

Advanced Preparations:

- ★ Distances from the sun. $AU \times 2.5 = \text{feet planet is away from the Sun.}$
- ★ Adapt measurements by multiplying the AU by 2 or 3. Or Divide the Ft from the Sun by 2. The orbits do not have to be a circle. Remember orbits are elliptical (oval). Adapt to the area you have for the orbit paths.

Note: AU = Astronomical Unit - One AU is the distance Earth is from the Sun.

	AU	X	2.5	= ft from the sun
Mercury	.39	X	2.5	= .975
Venus	.72	X	2.5	= 1.8
Earth	1.0	X	2.5	= 2.5
Mars	1.52	X	2.5	= 3.8
Jupiter	5.20	X	2.5	= 13
Saturn	9.54	X	2.5	= 23.85
Uranus	19.19	X	2.5	= 47.975
Neptune	30.06	X	2.5	= 75.15
Pluto	39.44	X	2.5	= 98.6



OPTION: Using the numerical data listed above, students will measure and compare the planets and their distances from the Sun. Round off the numbers if needed.

Materials

- ★ Measuring strings, sticks, or tape
- ★ Sidewalk chalk (fun to make, recipes is included at the end of the Unit)
- ★ A blacktop or cemented area - adapt the measurements to space available. If only grass area is available use field marking chalk or paint.
- ★ Draw orbit rings on play ground

Time: 60 minutes - May be taught on one day or different days.

Grouping: Pairs, two students per planet including the Sun.

Suggestions-

Have the student work with the person they sit with in class.

Have class line up in two lines to go out to play ground. Pair the first student in line one with the last student in line two.

Assign the partners before lesson day.

Procedure:

- ★ Have one student from each pair draw a planet name from a container to pick the planet or sun. Or have planets assigned before the activity.
- ★ Have the two students who will represent the Sun move to the middle of the activity area.
 - ! Each pair of students measures out their distance from the Sun.
 - ! Another idea is to have distances marked already and students draw their orbit.
 - ! Or, Have the orbits already drawn.
- ★ Once all the students are in their order, they will list 2-3 facts along the planets orbital path.
- ★ If time permits, begin talking about gravitational pull, orbits and revolving.
- ★ Talk about rotation and axis.
- ★ Next activity...



Investigating Orbits

- ★ Which planet will orbit the Sun first? Last? Most revolutions in 2-3 minutes? Least?
 - * Have one student from each pair come out of the activity area
 - * Explain to each group their roles for the activity
 - * This group of students will be investigating the orbits by observing the other students in the activity.
 - * The students will predict, compare, and come to a conclusion.
- ☠ Each of the students will walk in orbit, one step per second for two- three minutes.
- ☠ Then have the student pairs switch roles and do activity.
- ☠ Return to classroom for discussion about observations.
- ☠ Have the students who were watching tell what they observed.
- ☠ Ask who revolved around the sun first? Why? Who was the last?
- ☠ How many times did each revolve?

BLAST OFF!

Materials and Preparation: Poster board, library card envelopes or construction paper and scissors, 3x5 index cards, glue, pencil, *Sharpie* marker in a dark color, stickers, and content.

On a poster board attach library card envelopes four rows down and five columns across. Space the envelopes so that the 3x5 card can fit into each envelope with out over lapping each other. Leave room on the top for the name of the game and the categories.

Vocabulary	Rocky	Gaseous	Distance	Names
100	100	100	100	100
200	200	200	200	200
300	300	300	300	300
400	400	400	400	400

Blast Off

On the index cards write questions and answers according to the category chosen. Include the category and the point value (100, 200). Flip the card over and on the backside put a sticker on the top half. Place cards in the envelopes on the board with the sticker down so it cannot be seen. After a correct answer is given the card is placed with the sticker side up. If the sticker is shown the students will know not to pick the same question after the correct answer is given.

Group class into teams of 4-6 students per group:

The students may use all the resources available to answer the questions. One member raises hand to answer the questions. Any called out answers from a group member will be counted as the group answer. Whether correct or not. Points will be added or subtracted accordingly.

Once the students are grouped, begin with the rules. The first group will pick a category and point value. "Rocky for 300." Then, the teacher will read the card. "This rocky planet rotates in the opposite direction". Give the students time to figure the answer. Remind the rest of the class to listen to the question and answers because if the answer is incorrect it will be placed back on the board and may be picked until the correct answer is given.

The group receives the point value indicated on the envelope for each correct answer and they lose the valued amount for each incorrect answer.

Play until all cards are answered or for a given time limit.

Example questions and answers for the 5 categories:

Vocabulary-

- 🍄 100- A pulling force between two planets- gravity
- 🍄 200-Hot balls of gases that give off energy- stars
- 🍄 300-A bowl-shaped hole in the surface of a planet or moon- crater
- 🍄 400- A layer of gases that surrounds a planet - Atmosphere

Rocky-

- 🍄 100-This planet is the only planet that has drinkable water- Earth
- 🍄 200- This rocky planet rotates in the opposite direction- Venus
- 🍄 300- This rocky planet is red in color because of Iron-Mars
- 🍄 400- This rocky planet has very little atmosphere- Mercury

Gaseous-

- 👤 100- This planet is heavier than all the planets combined- Jupiter
- 👤 200- If there was an ocean big enough, this planet would float - Saturn
- 👤 300- This planet rotates on its side- Uranus
- 👤 400- This planet's rings are made of black dust which makes them hard to see- Neptune

Distance-

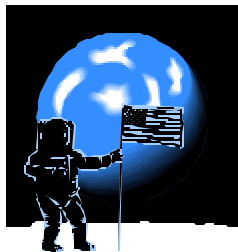
- 👤 100- This planet is the second hottest and second coldest planet - Mercury
- 👤 200- Name the 4 rock planets in order beginning with the closest to the sun
- 👤 300- This planet takes 10 hours to spin at 7 miles per second- Jupiter
- 👤 400- This planet orbits the sun only once in a life time- Uranus-
 - If correct answer is given ask the bonus question
 - Bonus question for all groups to answer- group who raises hand first and answers correctly gets 50 pts.
- 👤 Bonus- how many years does it take to revolve? - 84 years

Names-

- 👤 100- This planet has two potato-shaped moons- Mars
- 👤 200- The star closest to Earth- The SUN
- 👤 300- This planet is a double planet - Pluto
- 👤 400- Which planet has the fastest winds- Neptune

This game is a fun and exciting. It is a way to keep the class learning and to help review before an assessment.

Questions are to be adjusted to address the content taught in each classroom.



Teacher Resources:

Books:

Scholastic Encyclopedia of Space- Jaqueline Mitton and Simon Mitton, 1998
ISBN 0-590-59227-0

Solar System-Gregory Vogt, 2001
ISBN 0-439-38247-5

How the Universe Works - Heather Couper and Nigel Henbest, 1994
ISBN 0-98577-576-X

Black Holes and other space phenomena-Philip Steele, 1995
ISBN 0-590-63254-X

The History News In Space- Michael Johnstone
ISBN 0-439-13142-1

Essential Atlas of Astronomy - Barron's, 2002

The 3D Solar Systems Book - Jane Brierley, 2001

The Magic School Bus Lost in the Solar System - Joanna Cole, 1990
ISBN 0-590-41429-1

Don't Know Much about the Solar System - Kenneth C. Davis, 2001
ISBN 0-06-028613-X

Exploring the Planets Grades 3-6 - Bonnie Sachatello- Sawyer, Scholastic
ISBN 0-590-59928-3

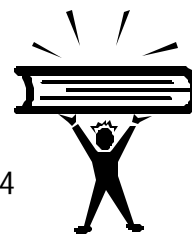
Destination Jupiter - Seymour Simon, 1998
ISBN 0-688-15620-7

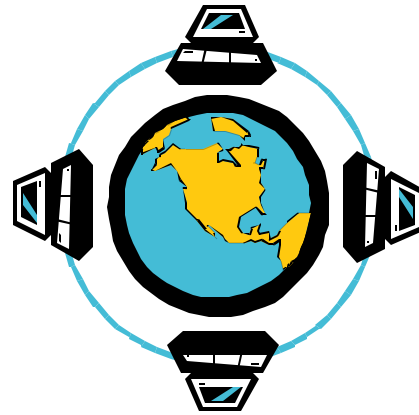
Destination Saturn - Seymour Simon, 1985
ISBN 0-688-05799-3

Destination Space- Seymour Simon, 2002
ISBN 0-439-46783-7

The Usborne Internet -Linked Library of Science-Laura Howell, Kirsteen Rogers and Corinne Henderson, 2001- ISBN# 0-439-44145-5

Seeing Earth From Space- Patricia Lauber, 1990
ISBN#0-590-68691-7





Websites:

http://passporttoknowledge.com/sun/star/sun_star.html

<http://www.EnchantedLearning.com/subjects/astronomy/>

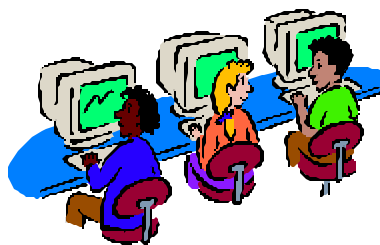
<http://starchild.gsfc.nasa.gov/docs/StarChild/StarChild.html>

<http://starchild.gsfc.nasa.gov/docs/StarChild/StarChild.html>

<http://spaceplace.jpl.nasa.gov/spacepl.htm>

<http://www.stargazers.freemove.co.uk/>

<http://www.solarviews.com/eng/solarsys.htm>



Sidewalk Chalk/Plaster Molds



Items Needed:

- ★ Molds (sand toy molds, muffin tins, paper cups, whatever you can find, be creative)
- ★ A large bowl and spoon
- ★ Vegetable oil (enough to grease the molds)
- ★ Tempera Paints
- ★ Water
- ★ Plaster of Paris (available at hardware stores and craft stores)

How to make it

- * Grease the molds with vegetable oil. This helps to remove chalk out of the molds when dry.
- * Pour plaster into the large bowl. Adjust to the amount on how much you want to make. After you make one batch you wont need this paper anymore.
- * Make it 3 cups of plaster
- * Add water (it'll be around 2 1/2 or 3 cups of water). Pour and stir to make the mixture creamy like cake batter. If too much water gets added then just add more plaster.
- * Mix in Tempera paint to get desired color. More paint the darker is the color.
- * Quickly before it hardens pour into molds.
- * Let dry- depending on the weather and temperature, could dry as fast as 20 min. or as long as 24+ hours.
- * To remove- turn mold over then tap mold against ground or table a few times and it should slowly slip out.

Working with Plaster of Paris you can plan to get messy. Making chalk is best done out side where you can hose down the mess. If you are a tidy teacher then inside is okay. I tend to be messy.

***Note for clean up: Never pour Plaster of Paris down the sink. It will harden and clog the pipes. Let it dry and you should be able to chip or flake it out of the bowl.**

Vocabulary:

Γ	Rotate-	To spin or turn around
Γ	Moon-	A satellite
Γ	Satellite-	An object that orbits a larger object in space
Γ	Revolve-	Move in a circle around an object
Γ	Gravity-	A pulling force between two objects
Γ	Temperature-	A measurement for hot and cold
Γ	Year-	The length of time it takes Earth to revolve around the sun
Γ	Day-	The time it takes for Earth to rotate once it's axis.
Γ	Axis-	A real or imaginary line through the center of an object that is spinning
Γ	Stars-	Hot objects of gases that gives off energy
Γ	Sun-	The hot gaseous object that is closest to Earth
Γ	Atmosphere-	A layer of gases that surrounds a planet
Γ	Telescope-	A tool that gathers light to make a faraway object appear closer
Γ	Orbit-	A path an object follows as it revolves
Γ	Crater-	A hollow hole in the ground
Γ	Phase-	The noticeable change in the Moons shape
Γ	Asteroids-	Small chunks of rock that orbit the Sun



