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Space Illustrated: There and Back

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Introduction

The purpose of my unit is designed to engage fourth grade students in obtaining useful information about the four inner planets and to explore future space travel. In this unit students will not only study the planets Mercury, Venus, Earth and Mars, but they will also build a spacecraft to explore their imaginary trip into outer space. These activities will coincide with the final activity of a pretend interview with an astronaut and publishing a magazine called "Space Illustrated: There and Back." The imaginary space trip, the making of a spacecraft and the publishing of their own magazine will make this a very exciting unit.

This unit coincides with the New Haven Science Strands. This unit meets many of the New Haven science curriculum standards, but expands the usual themes covered by most science textbooks by including a writing element and space travel activity. Studying Earth Science and Physical Science are part of the curriculum; the primary focus is usually on the eight planets and the night sky. This unit will extend the study of the atmosphere to include space travel. Students will also develop skills in Scientific Inquiry such as forming an inference from observation and observing events in Space to predict an occurrence. Students will also develop information on motion and design as outlined in the Physical Science standards.

Rationale

My unit is intended for fourth grade students, but could easily be modified to educate other grade levels. The students who will be participating in this unit directly are students at Davis Street Interdistrict Magnet School. While the students in my classes range in academic performance, they all love science. My classroom is an inclusion setting where special education students are mainstreamed to full participation in the general education curriculum with modifications. My special education students will receive lower leveled books on space, picture cards for vocabulary words (See Appendix 1) and other means to assisting their learning such as graphic organizers and T charts. (See Appendix 2) The classroom also has students in TAG (Talented and Gifted) who receive modifications such as higher leveled books or become leaders. A peer leader assists other students who might struggle with the reading and writing section of an activity.

Students will have the opportunity to do research and report writing. At Davis Street Interdistrict Magnet School. our mission statement is:" We Celebrate Learning through the Arts, Technology, and Multiculturalism". I will utilize the computers and laptops we have in our classroom, along with the resources in the library. Students, for this Space unit, will begin by generating ten questions about Space Travel. Once they have the questions, they will begin their research. The final project will be a question and answer book that will look like a magazine. The magazine will include the ten questions, the answers, and illustrations. The students will publish their magazine, bind them, and present them to the entire classroom during our Publishing Party. At Davis we celebrate literacy with Publishing Parties three times a year.

Objective

My unit is taught in four sections, with an activity corresponding to each section. I feel the students will not only learn the information, but they will remember this unit for a very long time. With a visual and hands-on approach, the students will not feel as if I'm lecturing to them. One modification that is helpful to special education students, with general education students also benefiting, is a hands on approach. The first section, which I call "The Fantastic Four", will allow both the students and me the opportunity to explore and learn about the four planets chosen. We will participate in a variety of inquisitive discussions, and research through books, internet and library visits. This basic background information will assist them when completing the activities at the end of the unit.

The students will receive information on the four planets, Mercury, Venus, Earth and Mars. They will research the planets on the internet, and watch videos about the planets. Each student will receive a space notebook to record their notes and to refer to when asking questions to the astronauts. During this section students will gather information about the planets such as distance from Earth and the Sun, temperature, size, rotation, air quality, color, and many other facts relevant to the four inner planets. (See Appendix 2)

The next section I have named "Silver Surfer." This section involves research on space travel, Shuttles, and other launchers. Students will engage in various activities to develop a better understanding of how we get into space, how we stay there, and how we get back to Earth safely. After reviewing past Space History (See Appendix 3) and exploring new ways into Space, my students will design and build their own imaginary Space Rocket. We will discuss the elements needed to make a safe and reliable vehicle. As an evaluation we will take the Space Rockets outside to the playground or ball field, and launch them into outer space to see which ones make it through our atmosphere and land safely on their planet!

Were you thinking it was a real planet? Good! The students will launch their Space Rockets onto the baseball field that will be a replica of the Solar System. I call this section "Planet Hollywood." I think the students will enjoy this activity for two reasons. It is time to be outside to show their inventions, and a concrete visual aid to help them understand the size of our Solar System. When the students are on the baseball field, I will discuss the objects representing the planet and the distance. I will have a chart with the measurements of the distance from the Sun to each planet. I will also explain the spatial relations between the real planet and the object that is representing it. After the students observe the size of each planet and its distance from the Sun, students will use a tape measure and place the objects (planets) the correct distance from the Sun. I will also explain that the Sun is much larger than the infield home plate that represents it. Then each student will have the opportunity to launch their Rocket into Space! It is very important to emphasize the size of the Sun

compared to the replica of the home plate on the baseball field. The Sun is 1,391,980 K (864,938 miles) in diameter, making it ten (Prince, 2003) times larger then Jupiter, and 109 times larger then Earth.

I hope that this unit will encourage students to continue with their education. I hope to inspire them to one day become an astronaut, astronomer or physical engineer, and travel to space or even build a new and improved space vehicle! With a combination of research and hands-on activities, students will feel they have accomplished something, and successfully participated in a unit that they can then remember for the rest of their lives.

The Fantastic Four

Space travel has been an adventure that young students have fantasized about for many years. When space travel began we all wanted to go to the Moon, but today, "been there, done that," so onward and upward we go! This unit will provide students with the adventure of space travel to the four inner planets. These planets are Mercury, Venus, Earth and Mars. They are together in this group because they all have something in common. The four planets are all made out of rocks. Sometimes they are called the Terrestrial Planets. The word terrestrial means "earthlike." Even though that is their group name, Earth is very different from Mercury, Venus and Mars. This section will discuss the similarities and the differences, size, the revolution around the Sun along with its own rotation/spin, the distance to the Sun and from Earth, temperature and many other facts.

The four outer planets, Jupiter, Saturn, Uranus and Neptune are made of cold liquid gases. They are called the Gas Giants. This unit emphasis is on the Inner Planets. However at a later time students may want to explore these outer planets.

Mercury

Mercury is named after a Roman God. Mercury literally means," Speedy messenger god," or "the winged messenger." Early astronomers observed Mercury's speed and therefore gave it this name. Mercury's observation from Earth has been recorded by early astronomers. Mercury travels around the Sun at 30 miles per second. It is the closest planet to the Sun and the smallest planet in size. Mercury is 4,878 km (3,032 miles) in diameter.

Pluto used to be classified as (the smallest) planet. However, in August 2006, the

International Astronomical Union modified the definition of the Solar System (Willard 2006). With this change, Pluto is no longer a planet. With the fall of Pluto from a planet to a dwarf planet, that means Mercury is now the smallest planet!

Mercury has a short orbit. We compare other planets to Earth, so Mercury has a period of revolution around the Sun of 88 days, compared to 365 ¼ days for Earth. On the other hand, it spins around its own axis once every 58.7 Earh days. This unusual spin-orbit combination causes Mercury to face the Sun for 176 Earth days followed by the same amount of days in the dark. This causes the vast range in the surface temperature of the planet. Since the rotation and the orbital periods are different, Mercury cannot show the same face to the Sun all the time. The Sun on Mercury does rises in the east and sets in the west. (Willard 2006)

Mercury is the closets planet to the Sun. It is 57.9 million km (36 million miles) from the Sun making the side facing the Sun a very hot planet. The temperature of Mercury in the Sun-lit side can reach 427 C (870 F)! On the other hand, the night can reach a cool -173 C (-300 F) temperature. Now that is cold! (Weiner 1999)

Mercury has a rocky cratered surface. Craters form when comets, meteorites or asteroids crash into a planet or moon. Since Mercury has no air, it would be impossible for life to survive without specialized breathing equipment. Air does not prevent rocks, asteroid or comet from hitting a planet. The reason that the craters show, like on the Moon, is that the surface is nor geologically active. This means that the surface of the planet looks the same over time, and when a crater is made it stays there forever. On Earth the motion of the Earth's crust covers over a lot of impacts making the surface look newer. There are many craters on Mercury, but the largest one is called Caloris Basin. This basin is 800 miles in diameter, making it the largest surface feature we know on Mercury today. To understand the size of the crater, think of the state of Texas! That is the size of the crater. This crater was formed over four billion years ago, and is the largest crater in the entire Solar System. Mercury also has land features called scarps. These formed when Mercury's iron core cooled. The shrinking of the iron core caused folds. (Willard 2006)

There are three parts to a planet; surface or crust, mantle or middle layer, and the core or center. Mercury has the largest core, or center. It is made up of iron, and that makes Mercury a very dense planet. (Willard 2006)

Mercury does not have any moons orbiting around it. More information was obtained about Mercury when in 1974 and in 1975, the NASA spacecraft Mariner 10 took flight. The first plan was to observe Venus; however, a gravity assist provided Mariner 10 the thrust to flyby Mercury. We were able to get a clear snapshot of a planet that is difficult to see with a telescope from Earth due to the Sun's glare (Margaret 2001). We can see Mercury both with and without a telescope. It is just that when we see Mercury, the sky is always bright, because it never strays too far away from the Sun. To find out more information about Mercury and its atmosphere, we will need to wait until 2011. This is when the Messenger probe is due to arrive! Messenger was launched on August 3, 2004 from Cape Canaveral, Florida. It will take seven years to complete this journey. (Garlick 2007)

Mercury is an airless, waterless, Sun-baked planet with a very small amount of oxygen, sodium, and helium. The high temperature of Mercury allows these gases to escape. This will not detour our trip to Mercury, because we can enjoy the beautiful crater that is the size of Texas!

Venus

In 1961 we received information from Earth-based radar about Venus. Now, many years and several missions later, we have clear images of Venus, our neighbor.

The second planet from the Sun, Venus was once called the Earth's twin. This is only because Venus and Earth are about the same size and weigh about the same. We have other elements in common, but there are also many elements that we do not have in common. For one thing, Venus is the hottest planet in the Solar System. Venus is also an orange color and its atmosphere is made of carbon dioxide (97%) and nitrogen. The poisonous carbon dioxide traps the heat. Venus is 12,104 km (7,521 miles) in diameter and 107.8 million km (67 million miles) from the Sun. Back in 1962, Mariner 2 measured the temperature of Venus to be almost 900 degrees Fahrenheit!! Now that is hot! If you were to land on Venus in a spaceship, you and your spaceship would melt in less than an hour (Margaret 2001). Not only would you melt, but you would be crushed to death. If you landed on Venus, the pressure in the atmosphere is strong enough to crush a human and even a car.

Venus has a different way of rotating. Instead of the Sun rising in the east and setting in the west, on Venus it is the opposite. Not only does Venus spin clockwise as seen from the Northern hemisphere), but it spins very slowly. It makes the rotation in 243 Earth days. Venus circles around the Sun in 225 days. If you think about it, a year in Venus is shorter than a day in Venus! (Margaret 2001).

Venus has very few craters; however it does have mountains, canyons, valleys and volcanoes. One such mountain is Maxwell Montes, and it is 7 miles high. Another land mark is a volcano named Maat Mons. It is about the size of Mount Everest at 5.5 miles high. There are no oceans or any type of water on Venus. Because of the heat, water would boil and evaporate quickly. Venus does have highlands very similar to our continents. Aphrodite Terra is about the size of South Africa, and Ishtar Terra is about the size of Australia. There are many volcanoes found on Venus, and one of them measures at least one mile high and 259 miles across. (Kerrod, 2000)

So what is so exciting about Venus? Well you can see it from Earth. Venus is called a morning star, and an evening star. This is because when Venus is on the left side of the Sun, you can see it in the morning. When Venus is on the right side of the Sun, you will see Venus at night after the Sun sets (Kerrod, 2000). Venus is named after the Roman god of love and beauty, so to encourage space travel, tell the students they might find true love on their voyage!

NASA's probe Magellan in 1989, the European Space Agency's Venus Express in 2006, and Messenger probe in June 2007, have provided us with excellent photographs of Venus.

Earth

Our home! Earth is the third planet from the Sun, putting us at 93 million miles away. We are 12,756 km (7,926 miles) in diameter, almost the size of Venus. We are just a little bit larger! Our rotation around the Sun takes 365 ¼ days. Every four years of 365 days we have a Leap Year with 366 days to make up for the ¼ day. We spin on our axis taking one Earth day or 24 hours, really 23 hours and 57 minutes. We are part of the terrestrial planets along with Mercury, Venus and Mars, because we have a rocky surface. Earth is not named after a Roman god but in German Earth means, "dirt." That is a strange name considering that the Earth's surface is mostly water. 71 percent of the Earth's crust is covered with water, with 97 % of that being salt water and only 3% fresh water (Willard 2006).

Earth has a strong gravitational pull. This is needed to keep us on our planet. Gravity keeps us on Earth, makes objects fall to the ground when we drop them, and keeps our Moon orbiting around us. Gravity is also the force that keeps the Earth and the other planets orbiting the Sun. Our Moon is 384,400 km (238,855 miles) away from us (Kerrod, 2000). There is a belief that the Earth's strong gravitation pull captured the Moon. Others believe that the Moon was formed when a body hit the Earth over 4 billion years ago. A piece of the object merged with the other parts and formed our Moon (Willard 2006).

The Earth is made up of several layers. The atmosphere, crust, upper and lower mantle, and outer and inner core. The core is very hot, 11,000 F or more! No one has dug down that far, but scientists believe that is about its temperature. The core is also made up of different kinds of metals. The inner core is made of solid metals and the outer core is made of liquid metals. Materials such as iron, silicon and magnesium make up the mantle layers. The lower core is soft while the upper level of the mantle is hard. The outer layer of Earth is made of rock called the crust. This crust is made of marble, granite and shale. Our crust is covered with soil, soft ground, plants and water.

Our atmosphere contains nitrogen (78%), oxygen (21%), and 1% of argon, carbon dioxide and water vapor. These gases make our atmosphere or air. The atmosphere stretches to 400 mile high with the thick air close to the surface and the thin air higher up. 99% of our air is found in the two lower levels: the Troposphere and the Stratosphere. In the Stratosphere there is a layer of gas called ozone. This ozone layer is important to human life on Earth. Its job is to protect us from the dangerous ultraviolet rays and radiation from the Sun. If we are exposed to too much ultraviolet our skin will burn. Mesosphere temperatures are very cold. They may be as cold as -100 F! Earth's temperature ranges according to the location. The temperature range is -126 F to 136 F and with global warming those temperatures are changing (Margaret, 2001).

Earth has freshwater (rivers and lakes), saltwater (oceans), mountains, volcanoes and deserts. Earth's land is constantly moving causing shifts underneath. The soft rock at the top of the Earth's crust moves, causing the hard rock core to also move. These plates come together and form large mountains such as the Himalayas. Even the plates under the ocean move about (Kerrod, 2000).

Earth's weather is always changing and so unpredictable! Just ask the weatherman (Meteorologist)! We have seasons: winter, spring, summer, and fall, because of the different angle of the Earth's rotation axis with the Sun. When we receive the most direct light, it is summer. Surprisingly, this is not when we are closets to the Sun. When we receive the least direct light, then it is winter. Earth also has rain, snow, hail, heat waves and tornados. The weather is controlled by the Earth's temperatures and air flow.

At this time in our Solar System, Earth is the only planet to have life. Earth is home to over one million species of living things: plants, animals, and simple life forms.

Once the students finish their imaginary trip into outer space, they are welcomed back to our planet, Mother Earth.

Mars

For many years we fantasized about Martians living on Mars. In 1965, Mariner 4 flew past Mars, and saw no forms of civilization. Today we have had Viking 1 and Viking 2 touch down on the surface, test the soil, and still have found no evidence of life. Today NASA has two rovers, Spirit and Opportunity, analyzing the atmosphere and composition of the rocks. Why are we so interested in finding life on Mars? Do we want a neighbor?

Our close neighbor is the red planet Mars. The red color comes from the iron oxide and olivine on its surface. Even the sky around Mars is a red color. We can see this reddish planet during our nighttime. Even though it is a close planet, Mars is 34 million miles from Earth when Earth and Mars are on the same side as the Sun. When Earth and Mars are on the opposite side of the Sun, then Mars is 248 million miles away. Encourage the students to travel when the two planets are together! Mars is also 228 million km (142 million) miles from the Sun. It is the fourth planet from the Sun. Mars is 6,794 km (4,222 miles) in diameter. Temperatures vary from one place to another, but the average is -81F. The highest temperature is 23F, and the coldest is -125F. That is cold! I do not know why anyone would want to live on Mars! (Price 2003).

Mars has a very interesting mythological story behind its name. In ancient roman times, Mars was given its name after the god of war. This god of war was in love with Venus, the goddess of love. This love mismatch carried into the Solar System. Mars was a strange red color associated with blood, and Venus was blue and beautiful (Price 2003).

Mars has a rotation period similar to Earth's, at 24 hours and 37 minutes. Its orbital period is 687 Earth days. Winter, spring, summer and fall last twice as long as on Earth. I would encourage my students going on the imaginary trip to go during the summer time when the temperature is much warmer! The only things you have to be careful of are the huge dust storms that occur during this time. Strong winds over 250 miles per hour blow dust all over the planet, making it difficult to see (Prince, 2003). These storms can last for weeks, so tell the students to plan their trip accordingly!

Carbon dioxide (95%), with very little oxygen and nitrogen, make up the Mars atmosphere. Mars also does not have an ozone layer to protect it from the ultraviolet rays from the Sun. Mars is a cold desert with huge canyons, boulder strewn plains, volcanoes and polar ice caps. The soil on Mars is a reddish color from iron oxide. Mars is described as a cold desert. There is no liquid water on Mars. There has been some evidence that water did exist at one time on Mars, billions of years ago, and that some may still exist under the surface near the poles. (Prince, 2003)

Mars has two moons. Deimos is very small at just seven miles wide. Phobos is a little larger at 18 miles long. Our Moon is 3,476 km (2,160 miles) wide. When on Mars the Phobos moon looks much larger than it is because it is very close, and orbits very quickly. Every time Mars spins one time around, Phobos circles around Mars three times!

Earth and Mars have some similarities and some differences. One thing that is very different is the color of the sky. At sunset on Earth, our sky is an orange-pink color and in the morning our sky is a blue color. On Mars, this is the opposite! The day sky is orange and the night sky is blue! (Prince, 2003). This color difference between Earth and Mars is due to the air or atmosphere.

Silver Surfer

Space Travel began with a telescope and a dream. Once we were able to see into outer space, it has been man's dream to go there. In 1926, Robert H. Goddard built and launched a liquid fueled rocket that was able to travel some 184 feet. He then expanded his invention until it could overcome the gravity of Earth. From then on it was a race into space. Who would be the first one in outer space? To better understand the historical timeline of Space Travel, I will use a large chart with dates and a brief explanation of what important event occurred. (See Appendix 2).

Movies about Space are very inaccurate, and students sometimes can not distinguish fact from fiction. Students must realize that many movies about space are for entertainment, not factual. Students must also understand that the Universe is so large we can only reach planets close to us. We now have the technology to send Robot probes into Space or use high powered telescopes of all types to view the planets, stars, Sun and moons.

So how do we get there? We take a rocket shi[p. Rockets are the most powerful of all engines used to get us into space. The earliest known rocket was invented by the Chinese in the early 1200's, to protect their country from being invaded by the Mongol. We use rockets to launch us into space escaping Earth's gravity. Rockets use both solid and liquid propellants. A solid propellant is dry like the powder in fireworks, while the liquid propellant needs an engine to mix the fuel with an oxidizer. An oxidizer is oxygen in solid or liquid form.

For humans to fly into low Earth orbit, they can use the Space Shuttle. Students will understand the Shuttle dynamics if they have a good picture to view. NASA or www.novaspace.com has pictures for students to view. Also the following site is excellent and can be utilized to visually view the launch process.

http://www.howstuffworks.com/space-Shuttle.htm.While explaining the Shuttle's functions they can visualize the concept clearly. The most interesting fact for the children to envision is the speed at which the Shuttle must launch to go past Earth's gravity. The escape velocity is 25,000 miles per hour! Their parent's car goes 65 miles per hour! At liftoff the Shuttle has two solid rocket boosters and three liquid fuel engines. These launches are needed to lift the 4.5 million pound Shuttle off Earth! The Shuttle is also about 56 m. (184 ft.) long including the fuel tank! To get a clear picture of the size of the Shuttle and for the children to understand the size relationship though visualization, go to http://www.nasa.gov/images/content/181716main_mating.jpg. After only a two minute flight the two solid rocket boosters have served their purpose and parachute back to Earth. Space Missions will use these rockets again in future flights. These rockets have preformed their jobs and are no longer needed so they will return to land. The rockets will have launched the Shuttle up about 28 miles in two minutes. After 8 minutes, the Shuttle has used the fuel in the external tank and that too is rejected burning up as it reenters Earth's atmosphere. This piece is destroyed and will not be used again. Now the OMS or Orbital Maneuvering System takes over. If the students have a good representation of a Shuttle in flight they will see that the Shuttle is upside down. The OMS job is to change the position from one orbit to another. The Shuttle is really in free fall held in by Earth's gravity. The Shuttle is nose first, but upside down (Prince, 2003).

What goes up must come down. The Shuttle must enter Earth at just the right angle or it will burn up or bounce off the atmosphere and hurl into space. The Shuttle makes a series of S-shaped turns as it begins its approach, landing back on Earth. The Shuttle needs a 15,000 foot long runway. It lands doing 200 miles per hour (Price 2003).

The first reusable Space vehicle was the Columbia Space Shuttle which was launched from the Kennedy Space Center in 1981. The Shuttle in 1981 carried two astronauts but today the Shuttle can carry seven crew members. Each astronaut has a job or is responsible for a particular aspect of the mission. Astronauts have difficult jobs due to the limitations of space. Since there is no gravity, they float throughout their mission. This is like sea sickness only in outer space. Is takes a few days for your body to adjust to this condition. This is not the most serious problem to your body, as you venture into space. Without gravity your muscles become weak and begin to deteriorate. Your bones become very weak also and astronauts have bone density difficulties when back on Earth; their bones break very easily. The astronaut's heart rate slows down also. An astronaut needs to be not only mentally and educationally prepared for the trip, but also physically (Weiner 1999).

Training to become an astronaut is difficult. It is also difficult getting accepted into the NASA space program. An astronaut to be must pass the NASA Class I space physical. This means that he or she must have 20/20 vision, their blood pressure in a sitting position must be 140/90 ot lower, and they must be between 64-76 inches tall. Every two years NASA selects 100 new astronauts into their program out of thousands of applicants. The candidates must have an excellent high school ACT or SAT score, with excellent grades throughout their education. They must have graduated from an accredited university and have at least three years of work experience beyond their degree.

These work experiences need to be related to a responsible professional experience such as a master's or doctoral degree. Today, most astronauts have advanced degrees. Their work in college is in technology, science and math. Before flying into space they must have over 1,000 hours of airplane flight time. Once they have met the criteria and are accepted into the NASA (National Aeronautics and Space Administration) program, training begins at the Johnson Space Center in Houston, Texas. The astronauts train in flight safety, technology of space travel, and also continue with science and math courses. They receive formal training by first reading manuals and computer-based lessons. After that session an astronaut to be participates in SST or

Single System Training. Here they train with an instructor about the details of operations about each system. Each astronaut trains to function in a weightless environment. This is called SMSS or Shuttle Mission Simulators. They do this in an underwater tank and in special simulated missions. An astronaut in training needs to swim three lengths of a 25 m pool, tread water for 10 minutes, and stay in an altitude chamber, where the atmospheric pressure changes from high to low. The last step is called MCC or Mission Control Center. Here they train with a flight controller for 300 hours! Once their training is complete, they are ready for space travel.

A Commander is then designated to command the Shuttle. His or her job is full responsibility for the Shuttle, the crew, success of their flight, and safety. That is a very important job. Next is the Pilot. That job is to control and operate the Shuttle, like the pilot of an airplane. All on- board operations are controlled by the Mission Specialists. They perform experiments and space walks. Next are the Payload Specialists. Their responsibilities are to operate the Shuttle's scientific equipment. This is very different from the ancient astronomers that looked to the stars and Moon, observing and wondering, what is out there and how can we get there.

Why do we want to go into space? It is human nature to explore the unknown. We are very curious and inquisitive people. We want to unravel the mysteries of the Universe and solve the origin of the Solar System. We want to predict weather and improve navigational systems. In a joint project with other countries, we want to see if life exists elsewhere or are we the only planet with living creatures? Space is a puzzle we want to solve.

What comes next in space travel and where should we go? Well like I said in the beginning, "Been there, done that". We are now looking into space exploration in a different way. Today scientists dream of a Moon Station, trips to Mars, and searching for life on outer planets. Now we have a robot named Rocky on Mars analyzing rocks and determining if life ever existed on this planet. Somewhere in my research I found an article on future space travel. It reported that we have a special machine to translate in 10 different languages if communication is heard from far away. I only hope someone speaks Martian!

Activity 1: Making the cover of the Space Illustrated Magazine

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Material:

*Two pieces of lightweight cardboard (cereal boxes or similar) cut ½ to 1 inch larger than the size of the paper

*Tape

*Contact paper or space pattern wrapping paper 1 to 1 ½ inches longer than cardboard

*Glue

*Scissors

Directions:

Place two pieces of the cardboard side by side with a 1 inch space between them. Tape the cardboard pieces

together. Place the cardboard on top of the wrapping paper and glue together. Leave 1 inch border around sides. Fold the four sides over the cardboard and glue. Now work on the pages to put in the magazine. (See Appendix 4) Once your articles are complete, stack them in a pile. Place two blank pages on top and on the bottom. Glue the blank pages to the inside of the cardboard covers. You magazine is now ready for all to read! Once the magazine cover is made, have student view other Space magazines such as The Weekly Newsmagazine of Science: Science News, or Science World. This will aid in the format needed to write their magazine.

Activity 2: Making the Space Rocket

Prior discussion about space vehicle properties is vital before the students begin the activity. In the *Silver Surfer* part, information about Space travel should give the students prior knowledge before participating in the building of the rocket ship. It would also be helpful for students to observe pictures of different rockets, shuttles and launchers with can be found on the NASA website.

Materials:

Paper towel tubes, toilet paper tubes, construction paper, pencil, markers, tape, glue, ruler, scissors, card board, foil, and decorations

Direction:

Plan your space ship first by sketching it on paper to visualize if you have the correct elements to go to space and back. Use the tubes needed, construction paper and other accessories. Glue or tape together. Cut four (4) slits on one end of the tube about 2 ½ inches long. Use a ruler and mark. Make sure the slits are opposite of each other to make four equal sections. Use a different color construction paper and cut out two triangles that are five inches long on the top and four (4) inches long on the two sides. Cut a slit in the two triangles. For one cut start, at the top point and cut down half way. The other triangle cut at the bottom upward to the half way point. Join the two triangles together at the slits. Place the two triangles on the top of the tube and decorate. Now you are ready to test your space rocket.

Activity 3: Planet Hollywood

Purpose:

Students have a difficult time making a conceptual picture of distance and size. Throughout my unit I discuss the size of a planet and its distance from the Sun or from Earth. This activity will help the students understand the vastness of space and the distance and size of a planet by means for a concrete hands-on activity. Students should also observe the elements of thrust, angle and launching needed to have a successful flight into space. Before participating in the playground activity, students should practice launching a Shuttle on http://www.sciencenetlinks.com/interactives/gravity.html . This will allows the students with not only a fun

game but also an explanation of why their Shuttle might not reach the designated target.

Objectives:

Students will utilize their notes on Mercury, Venus, Earth and Mars along with teacher information on Jupiter, Saturn, Neptune and Pluto (dwarf planet) to form a visual conception of our Solar System.

Material:

Large Beach ball, basketball, soccer ball, softball, grapefruit, golf ball, walnut, acorn, marble, kidney bean, tape measure, and a copy of Index 3.

Procedure:

Explain to the students that a model of the Solar System is going to be made in the playground area or baseball field so that can understand the size and distance of the planets. Make sure to explain the "shrunk down" process. Have the students pretend the Solar System just shrank down and landed on the baseball field. Using a tape measurer, the teacher and the students will place the objects above using the distance chart below.

Distance and Size:

Sun - Home Plate - *explain size relationship

Mercury - 1 yard (from Sun) Marble

Venus - 2 yards - Walnut

Earth - 3 yards - Golf ball

Mars - 5 yards - Acorn

Jupiter - 16 yards - Basketball

Saturn - 30 yards - Soccer ball

Uranus - 60 yards - Softball

Neptune - 100 yards - Grapefruit

*Pluto - 125 yards - Kidney bean (dwarf planet)

Evaluation:

Prior to telling the students which object coincides with the planet, let them hypothesize and have them record their conclusions. Once the project is over they can compare their hypothesis and the actual representation in a classroom discussion later.

Appendix 1

Vocabulary words that students will need to know are listed below with the definition.

A pre-reading or prior reading activity will stimulate the student's interest, along with identifying words relevant for discussion. Students will pronounce the words and display them on a word wall or in their notebooks. These words will become vital for the writing of the Space Magazine in the next section. Words can also be added if needed as research continues.

Words:

B>orbit-movement of an object around another one
B>rotate/rotation- turn/turning/to spin in a circle
B>gravity- the attraction or pull of a mass object
B>atmosphere-layer of gases around a planet
B>astronomer- a person who studies space
B>axis- imaginary line through planet from north to south pole
B>crater- large depression or hole
B>terrestrial- Earth like
B>mantle-layer of rock under Earth's crust
B>Solar System- the collection of planets, asteroids, comets and dust in space
B>light-year- a measuring unit used by astronomer's for distances outside the Solar System. One light-year is the distance light travels in one year. (5.87 trillion miles)
B>Milky Way- the galaxy we live in

Appendix 2

T chart is a large piece of paper, usually with lines, in the shape of the letter T. If those are not available the teacher or student can use a marker and divide the paper down the middle, labeling the top with the planets. On one side of the T, one planet is labeled; on the other side of the T the other planet is labeled. On the second T chart two different planets are labeled on the top. In the columns under each planet there are several bullets identifying what will be documented during research. The following areas will be researched: Location (as in 1 st), origin of name, size, distance from Sun, (in km, then miles) distance from Earth, temperature, rotation (days and how), orbit, atmosphere and land structure.

Appendix 3

Space History Timeline: The early Space Race between the Russians and the Americans is interesting. Good competition makes people work harder. This Historical Timeline emphasizes on "First" and a guide to American Space Travel. Students can research all the Space Travel from the 1950's to the present.

Historical Space Travel Timeline

*In November, 3, 1957 *Sputnik 2* took a dog named *Laika* in orbit
* April 12, 1961, *Yuri Gagarin* became the first human in space
* *John Glenn* became the first American in space February 20, 1962
* *Mariner 2* flies by Venus December 14, 1962
*June 16, 1963 *Valentina Tereshkova* is the first woman in space
* *Neil Armstrong* and *Buzz/Edwin Aldrin* from *Apollo 11* are the first to walk on the Moon July 20, 1969
* *Apollo 17* is the last trip for humans on Moon, December 1972
* *Viking 1* is the first probe searching for life to land on Mars, July 20, 1976 (no humans)
*Shuttle *Columbia* is first reusable spacecraft, April 12, 1981
* In 1983, *Sally Ride* becomes the first American woman in space
* *The Challenger Space Shuttle* explosion kills seven crew members including *Christina McAuliffe* a teacher on January 28, 1986
* *Voyager 2* passes Uranus in 1986 and in 1989 passes Neptune
* April 24, 1990; *Hubble Space Telescope* in orbit but blurry visions causes no clear pictures until 1993
* *The International Space Station* launched in January 29, 1998
* *Hubble Space Telescope* discovers two Moons around Uranus, 2003

Several reports on Astronauts are on www.enchantedlearning.com/explorers/space.shtm for the students to read.

Appendix 4

Questions for the interview with the Space Crew:

*What was the reason you and your team went into Space?
*What was the major difference between your planet and planet Earth?
*How is Earth the same as you planet?
*What are some valuable reasons for exploring your planet?
*How long was your trip and did you have difficulties with your flight?
*Did the change in gravity affect your body?
*If you had to do something different what would it be?
*How far away is your planet from Earth and the Sun?
*Did the difference in temperature affect your health?
*Why do you think it is important that we go to outer space?
*What foods and other items did you bring along on the trip?

I will also give the students the opportunity to develop their own questions to ask the astronauts. Language Arts strands can also be included in this section. A typical New

Haven Question might look as follows: If you could change the name of your planet, what new name would you give it and why? Give details to support your answer.

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Websites

http://www.atozteacherstuff.com/Themes/Space/ (additional lesson plans on the Solar System and Space travel)

www.enchantedlearning.com/explorers/space.shtm (subscription of $20.00)

www.enchantedlearning.com/subjects/astronomy/abcdictionary (subscription of $20.00 to join but worth the money)

http://hea-www.harvard.edu/ECT/the_book/Chap5/Chapter5.html (Chapter 5 has a great lesson plan for Space and the other Chapters are also very good for other lesson plans on School related topics)

http://www.howstuffworks.com/space-Shuttle.htm (all the how stuff works links are very information and interesting for students, on a higher level so some modification for 4 th graders and younger is needed)

http://www.kidskonnect.com/Astronauts/AstronautsHome.html (good kid's link)

http://www.nasa.gov/audience/foreducators/k-4/features/ (all the NASA links are very good and informative with excellent pictures)

http://www.nineplanets.org/ (good information on the Planets)

http://novaspace.com (Good pictures)

http://science.howstuffworks.com/space-shuttle10.htm (excellent for Shuttle information and Space outfit and Space supplies needed in the Shuttle)

http://www.sciencenetlinks.com/interactives/gravity.html (excellent interactive link to show thrust and gravity)

http://www.sciencenetlinks.com/lessons.cfm?DocID=141 (provides a wealth of science resources and lesson plans)