



Curriculum Units by Fellows of the National Initiative
2021 Volume IV: The Sun and Us

Bringing the Solar System into Our Classroom

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Overview

“Space is for everybody. It’s not just for a few people in science or math, or for a select group of astronauts. That’s our new frontier out there, and it’s everybody’s business to know about space.”¹

— Christa McAuliffe, Teacher and Challenger Astronaut

Sadly, Christa McAuliffe did not get to teach from space as she had planned, however, space is out there for all to see and learn about. This curriculum unit will examine the Sun, the planets, and the solar system. This unit will bring the Sun, planets, and the solar system into my classroom. If my second-grade students were in school fifty years ago, they would be coming to class with space-themed lunch boxes. The topic of space would be in the news and students would hear about it frequently. They would know that space is for them. When I came to my school, the solar system was not included in the curriculum instruction. Each year I would add lessons on space or the solar system as they related to the instruction, but it always seemed pieced together and felt like it was taught in isolation. This curriculum unit will provide a foundational framework for the students to investigate the Sun, planets, and solar system. This unit will allow students to create reference materials for themselves to utilize. The students will be able to participate in songs created about objects in the solar system. They will also participate in a board game to practice and reinforce their knowledge. The culminating event will be a “Space Day” event in which the second graders will present their completed reference materials and teach a board game to the current first graders. This unit will bring the Sun, planets, and solar system into our classroom and allow the students the opportunity to look to the sky as people have done for thousands of years. It will allow them to wonder and think about the Sun, the planets, and the solar system. This curriculum unit will teach my students that space is for everyone ³/₄ space is for them.

Demographics

I teach in the city of Pittsburgh, Pennsylvania. Pittsburgh is a mid-sized city in the southwestern part of the state of Pennsylvania. Pittsburgh Public Schools is a public-school district with 54 schools. I teach second grade at Langley K-8, one of the 11 kindergarten through eighth-grade schools in the district. Langley K-8 is located in the West End section of Pittsburgh. The students come from the neighborhoods of Sheraden, Elliot, and Crafton. Langley K-8 is a Community School which provides a number of services and support for students and families through community partnerships. Langley K-8 is a Title 1 School with 89% Economically Disadvantaged students. The students at Langley are 68% African American, 18% Multi-racial, 12% Caucasian, 1% Hispanic, 1% Asian. The students score well below the proficiency level in reading, math, and science on state assessments. Many of our students experience homelessness and food insecurity. Langley K-8 has approximately 30% transient students. The neighborhoods of Sheraden and Elliot are located in food deserts. Neither area has a supermarket and the students have limited access to nutritious and economical food. The students at Langley K-8 struggle with oral language skills. About 20% of the second-grade students receive speech and language support for expressive language. Approximately 70% of the second-grade students are reading far below grade level as measured by literacy indicators. By second grade, about 50% of the students have not achieved mastery of letter identification and phonological skills. Upon entering third grade, historically each year about 30% of the former second-grade students are referred for the special education process. This unit has incorporated oral language and singing in a science classroom. Oral language, or talking, is natural for the human brain. Human brains are hard-wired for speech. No matter where a baby is born in the world, to begin to talk, a baby, in the absence of any neurological or physical deficits, just needs input-someone to talk to them. However, if young children do not get enough input-if they do not hear enough spoken words and engage in meaningful conversations, a gap appears in language skills. This gap has been examined over the years by many researchers. The most notable study during the War on Poverty Era was from the work of Betty Hart and Todd Risley. Their study of young children and the language that they hear and experience in their households from their families or caregivers varied substantially. There were “Meaningful Differences”² in what children hear and how they interacted with language and speech. These differences were created out of economic differences in households. The Hart and Risley study calculated a 30 million-word gap for children from low-income environments by age three. These gaps or differences in children in low-income environments have significant implications for students learning and academic success. More recently, this study has come under criticism for the calculation of the number of words of the actual gap: 3 million vs. 30 million. Regardless of the number, one can argue that there is a substantial difference in the number of words that children in economically disadvantaged households are exposed to before attending school.³ This difference can have profound implications for the academic success of young children in these environments. My school, Langley K-8 in Pittsburgh, PA has approximately 89% economically disadvantaged students. In my second-grade classroom, many students often had difficulty repeating sentences that were longer than five words. Even after multiple repetitions, some students would still be unable to repeat the sentences. The difficulty in repeating sentences and information persisted for some students over the school year. Few if any students ever graduate out of speech services by the end of second grade. Rather, they continued to receive weekly language support into the intermediate grades (3-5). My curriculum unit was created with the idea that my students may have experienced gaps in their language skills and that this unit could help build these language skills as they study the science content.

Content Objectives

The curriculum unit has three objectives. First, this unit will provide my second-grade students with a foundational level of knowledge on the Sun, planets, and the solar system. The Sun, planets, and solar system are not taught in our school curriculum until fifth grade, yet solar events are happening every single day in our world. Our students must learn about the solar system as early as possible to put all events in proper context. This unit will examine the Sun, the Moon, the planets, Pluto, asteroids, meteoroids, and comets in detail. The students will utilize videos, books, and project-based activities to create and reinforce their knowledge on the concepts of the Sun, the planets, and the solar system topics.

The second content objective is centered around increasing the capacity of my students' oral language. Oral language, or speaking and listening, is a state standard for my second-grade students. The goal of this objective is for the students to increase their oral language skills. About 20% of our second graders receive speech services in the area of expressive language and about 70% of the second-grade students are reading below grade level. This goal will address both of these issues. The students will learn songs created about the Sun and the planets to practice their oral language skills. In addition, the students will practice their oral language skills by participating in two games created around the science content. These games have language practice embedded in the game questions and responses.

The third and final objective for the curriculum unit is for the students to use play to improve their social and emotional skills while they reinforce their understanding of the solar system. According to the National Association for the Education of Young Children (NAEYC), young children learn best through play. Play and learning go hand in hand.⁴ The students will be able to develop their social and emotional skills by participating in two board games. These board games: "Planet Race!" - "Inner Planet and "Outer Planets" will allow the students to work in small cooperative groups. The board gameplay will incorporate social and emotional concepts of turn-taking, rule-following, winning, and losing all while practicing solar system concepts.

The Sun, Planets, and the Solar System

Humans have been looking at the sky since ancient times. Long before technology has given us information about the objects in space, humans have been creating meaning about the objects that they see when they look up into the sky. My second-grade students live in an area that is dominated by poverty, food insecurity, and violence. It has not been unusual to have multiple building lockdowns during the school year that would delay dismissal at the end of the day. Police cars and sirens are a frequent occurrence in the community. Yet, when my students look to the sky and space, they see the same sky and space that everyone else does. If my students learn about what is out there in our solar system, they will be able to see a vast opportunity that is available to everyone by engaging them in the study of our solar system.

The Sun

The Sun is a star. It is the center of our solar system. The Sun is the nearest star to Earth. It is the center of the solar system and its heat and energy make life possible on Earth. The Sun is a ball of gas. It is classified as a G2V class yellow star. The innermost part of the Sun is called the core. This inner part or core of the Sun is about 27 million degrees Fahrenheit. It is hotter than the outside of the Sun. The surface of the Sun shows dark spots called Sunspots. These spots look dark because they are a little cooler than the other parts of the

surface of the Sun $\frac{3}{4}$ which is very hot. The Sun is constantly releasing energy and extra bursts of energy are released from the sunspots. This release of energy is called a solar flare. Solar flares travel from the Sun into space. Our atmosphere on Earth helps to protect us from the solar flare. However, it can cause harm to satellites and radio communications. The Sun sends different kinds of light to Earth. Visible light is the light that you can see. Infrared light is the energy that we can feel as heat. Ultraviolet light is energy that we cannot see but ultraviolet light can burn our skin.

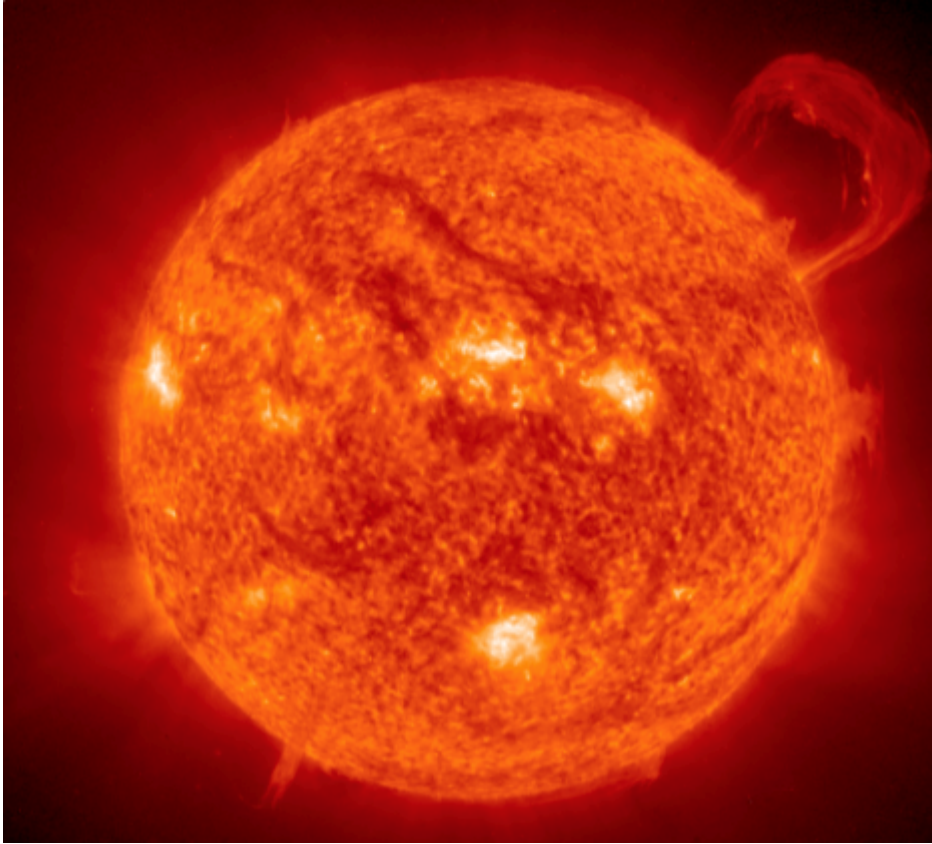


Figure 1: The Sun – Figure credits: NASA SpacePlace

Inner Planets - Terrestrial Planets and the Moon

There are four inner planets in our solar system that revolve around our Sun. The four inner planets are Mercury, Venus, Earth, and Mars. These planets are terrestrial. Terrestrial planets are planets that are composed of rocky or solid surfaces. The only planet in our solar system that is known to have living things is Earth. Our journey in this unit begins with our planet Earth.

Earth -An Inner Planet

From space, our home planet Earth resembles a blue marble with sections of white, green, brown, and yellow colors. The Earth is the only known planet with life. Earth is a terrestrial planet. A terrestrial planet is rocky. Earth has mountains, canyons, and valleys. Earth is the third planet from the Sun. It has Venus on the Sun side and Mars on the side away from the Sun. The Earth has an atmosphere. You can think of the atmosphere like a jacket. The atmosphere helps keep the Earth warm and safe from meteoroids. The atmosphere also gives us oxygen to breathe and is where weather happens. The Earth's surface is over 70% water. Water is essential to life on Earth. The Earth takes about 24 hours to rotate around its axis. The Earth spins or rotates

clockwise on the axis. The axis is the imaginary line that runs through the middle of the Earth from the North Pole to the South Pole. Daytime is when the side of the Earth is facing the Sun. Nighttime is when the side of the Earth is facing away from the Sun. The days add up to 365 $\frac{1}{4}$ days in an Earth year. Every four years, Earth has a leap year. The leap year adds one more day to February. This additional day makes up for the $\frac{1}{4}$ part of a day that is missing each year. The Earth has one Moon.

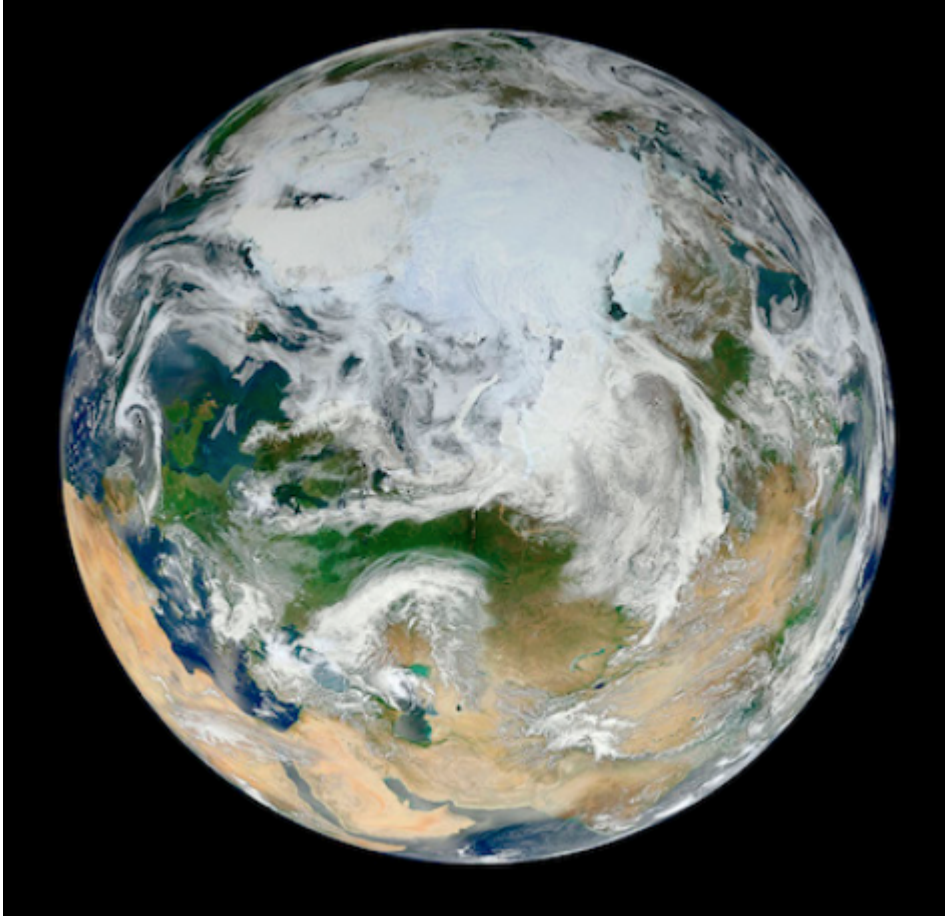


Figure 2: The Earth - NASA SpacePlace

The Moon

The Earth has one moon, called the Moon. The "M" in moon is capitalized when it is referring to the Earth's Moon. The Moon is rocky and has craters. Craters occur when a meteoroid or asteroid crashes onto the Moon's surface. Unlike the Earth, the Moon does not have an atmosphere to protect itself from meteoroids or asteroids. The Moon does not have a light source, instead, when you see the Moon, the light that you see (or moonlight) is light from the Sun being reflected off the Moon. The Moon takes about 28 days to move around the earth. The Moon goes through eight phases as it revolves around Earth. These phases make it seem like the Moon is changing its shape. However, the shape that we see is just the reflection of the Sun's light on the Moon as it orbits or travels around the Earth. The Moon rotates and moves around Earth at about the same speed, so we only see one side of the Moon. The side we do not see is called the "far side" of the Moon.

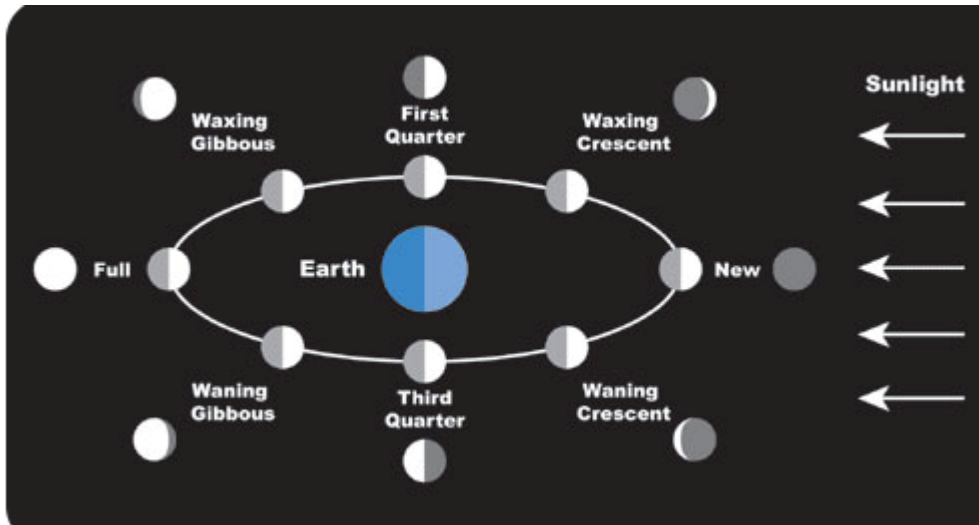


Figure 3: Phases of the Moon - NASA SpacePlace

International Space Station

The International Space Station is a space station that orbits the Earth. It was created as a place where countries of the world would be able to send astronauts to live and do research in space. The space station took years to assemble. Astronauts from different countries live and work together. NASA has a website where you can follow the astronauts' location and work that they are doing. Part of the website is devoted to educators and students where you can learn more about activities that happen onboard the station. You also can watch Question and Answer sessions with the astronauts and students from around the country.

Mercury - An Inner Planet

Mercury is the smallest planet. It is also the closest planet to the Sun. Mercury is a terrestrial planet i.e., it is made of rock and metal. Mercury does not have any moons. One day on Mercury is equal to 59 Earth days. One year on Mercury is equal to 88 Earth days. This means that Mercury has long days and short years.

Venus - An Inner Planet

Venus is the second planet from the Sun. Venus is the hottest planet in our solar system. The temperatures on Venus are so hot, that metal would melt. Venus is a terrestrial or rocky planet. Venus does not have any moons. It is about the same size as Earth and is often called the Earth's twin. Venus has mountains and volcanoes. It has a thick atmosphere that traps heat and makes it like a greenhouse. Venus spins on its axis very slowly, so the days are long. One day on Venus is equal to 243 Earth days. Since the Sun rises every 117 days, it rises twice a year, but it is still the same day. Venus (and one other planet Uranus) rotates counterclockwise on its axis. On Venus, the Sun rises in the west and sets in the east.

Mars - An Inner Planet

Mars is the fourth planet from the Sun. Mars is a terrestrial or rocky planet. It is a cold and dusty planet. Mars has a thin atmosphere. Mars has seasons just like Earth. It is called the Red Planet because of the rusty iron that is in the ground. Mars has two moons: Phobos and Deimos. Mars has been visited by several rovers. Most recently, Mars was visited by the rovers Curiosity in 2012 and Perseverance in 2021.

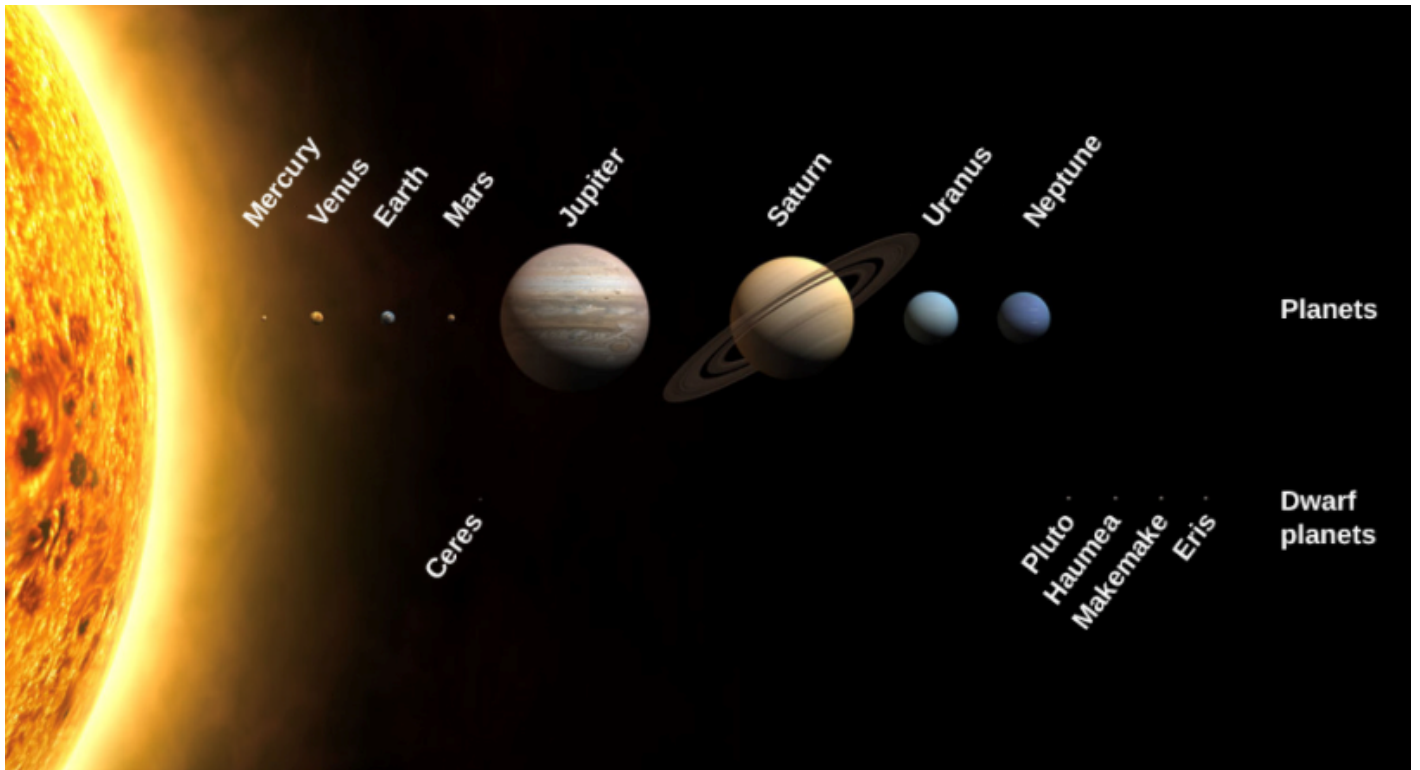


Figure 4 - Solar System showing the size of planets compared to each other (orbits not represented) Figure credit: OpenStax-Astronomy

The Outer Planets

There are four outer planets: Jupiter, Saturn, Uranus, and Neptune. These outer planets are called giant planets due to their large size. The outer planets are sometimes referred to as Jovian Planets; Jovian means Jupiter-like. Jupiter and Saturn are called gas planets due to the gas that makes up their surfaces. Jupiter and Saturn do not have solid surfaces. Uranus and Neptune are the other two outer planets. Uranus and Neptune are called Ice Giants because of the icy materials on the planet's surfaces.

Jupiter - Outer Planet

Jupiter is the largest planet in our solar system. A gas planet means that the surface is not solid, however, the core maybe solid. Jupiter is the fifth planet from the Sun. One day on planet Jupiter is about 10 Earth hours. Jupiter has 79 confirmed moons. Its surface is covered by swirling clouds. These clouds look like stripes on Jupiter's surface due to the winds that stretch them. Jupiter has a Great Red Spot that is a storm that has lasted for hundreds of years.

Saturn - Outer Planet

Saturn is the sixth planet from the Sun. Like Jupiter, it is a gas planet. For a long time, it was known for its rings. The rings were originally thought to be handles by Galileo. However, we know today that all four gas giants have rings. The rings of Saturn are made of rock and ice. There are seven rings around Saturn with space in between them. While Saturn is not the only planet with rings, they are the most visible. Saturn has a thick atmosphere. One day on Saturn is 10.7 Earth hours. Saturn has 53 moons.

Uranus - Outer Planet

Uranus is the seventh planet from the Sun. It is an ice giant. It rotates on its side which is different than all of the other planets. Uranus is like Venus in that it rotates counterclockwise on its axis. Only Uranus and Venus rotate this way. Uranus's surface has a blue color due to the methane gas in its atmosphere. Uranus has 27 moons. One day on Uranus is a little more than 17 Earth hours.

Neptune - Outer Planet

Neptune is the eighth and furthest planet from the Sun. It is a dark, cold, and windy planet. It is an Ice Giant. Neptune does not have a solid surface. Its surface is a thick soup-like place made up of water, ammonia, and methane. The methane gives Neptune its blue color just like Uranus. One day on Neptune is about 16 Earth hours. Neptune has rings, but they are hard to see. Neptune has 13 moons. It was visited by The Voyager 2 spacecraft. This is the only spacecraft to visit Neptune.

Dwarf Planets

Pluto

Pluto is a dwarf planet. When Pluto was discovered, it was called a planet because it was thought that it might be similar to a terrestrial planet. It wasn't a gas planet because it did not have the same characteristics as the four gas giants near it. However, in 2006, Pluto was reclassified from a planet to a dwarf planet. Pluto has an elliptical orbit that is different from the other planets in our solar system. Pluto's orbit is tilted. Pluto is an icy place with a surface temperature that is very cold. It has five moons. The largest moon, Charon is almost as big as Pluto. Pluto and Charon orbit each other.

Comets, Asteroids, Meteoroids, Meteors, and Meteorites

Comets

Comets are small objects that are made of ice and dust. Most comets come from the area well past Neptune. Comets orbit the Sun. Comets are made of ice and dust but as they move closer to the Sun, the ice and dust vaporize and look like a tail.

Asteroids

Asteroids are small rocky objects in space. They are leftover parts of rocks from when the solar system was created. Asteroids can be several hundred miles across or several feet across. Asteroids have irregular and uneven shapes. No two asteroids look the same. Asteroids orbit the Sun. There is a large asteroid belt between the planets of Mars and Jupiter. This is called the Main Asteroid Belt and is where most of the asteroids are located in our solar system.

Meteoroids, Meteors, Meteorites

Meteoroids are small rocky objects. A meteoroid can bump or crash into another meteoroid. If that happens, a small piece might break off and enter the earth's atmosphere. When the meteoroid enters the atmosphere, it becomes vaporized or burned up. Sometimes many meteoroids enter the earth's atmosphere. This is called a meteor shower. The meteors look like a bright streak of light, but it isn't light, just the hot glowing air. Sometimes people call them shooting stars, but that is not correct because meteors are not stars. If a meteor

hits the Earth's surface, it is called a meteorite.

Teaching Strategies

This unit will utilize the following teaching strategies.

Picture Books

Picture books to introduce the students to the topic and activate any prior knowledge while creating interest in the topic. The picture books will expose the students to the solar system topics and vocabulary. The pictures books chosen for this unit have been written by several different authors. After the students have been introduced to the picture books, the picture books will be added to the classroom library and be available for student use.

Direct Instruction by use of PowerPoint presentations

The Sun, planets, and solar system information will be conveyed to the students via lectures and direct instruction. The lectures will utilize PowerPoint presentations to convey the information to students. Many of the students are still developing their reading and literacy skills. Direct instruction will allow students to access information that is above their independent reading level.

Flip Books

Flipbooks will be utilized by the students to record three facts on each topic of the unit. The flipbooks will be created during the daily instruction. Flipbooks are an engaging way for students to organize and store the planet information. Creating the flipbooks as the students learn about the topics will allow the information to be organized. The students to use as a reference throughout the unit.

Solar System Songs

Why Sing? Singing is a part of human speech. Singing is a way of creating musical sounds with a voice. Throughout history, poems and stories were sung or chanted before they could be written down. Singing is a great way to engage children in language. Songs are fun to sing and engaging for young children. Singing can engage children in learning experiences. The songs in this unit were written by incorporating the scientific facts of the solar system unit. The words of the songs were created using rhymes and set to a rhythm. Singing these songs will expose children to rhyme and rhythm. The songs written for this unit allow students to be exposed to poems about the solar system topics that they are learning. Incorporating rhythm in these songs will give the kids an opportunity to kinesthetically move around by clapping along or moving their bodies to the beat. Students will be able to have repeated listening experiences with these songs. Using music to remember things gives rhythm and rhyme to a human brain that helps it remember information.⁵ This unit on the Sun, the planets, and the solar system will incorporate singing in the learning of the planet facts. Singing and will be included to aid in student mastery of scientific facts. Songs about the Sun, the Moon, and the planets will be utilized to help students master the facts about the topics. Each song will be introduced with the concept. The songs can be repeated for additional practice. This unit includes ten songs about the Sun, the Moon, and the eight planets in our solar system. The songs were written with six lines for each topic. The

solar system songs will help the students achieve the first two content objectives of providing a foundational level of knowledge about the solar system. The songs will give students repeated practice on the science facts. The songs will also help students achieve the second curriculum objective of increasing students' oral language skills. Singing allows for all students to be able to engage in the topic orally and can provide practice for these skills when songs are repeatedly sung.

Sun

I'm *the Sun* that you know

Giving Earth warmth for life to grow

A hot ball of gas, yes that's me

Center of the solar system for all to see

I'm called G2, that's what they say

27-million-degree core? That's just my way

Mercury

I am Mercury, number 1

I am the first planet from the Sun

Smallest, rocky, and terrestrial that's me

I have no moons for you to see

I spin slowly, that's my way

One day on Mercury is 59 Earth days

Venus

Venus is next, I'm second from the Sun

Terrestrial, rocky, but moons I have none!

I'm the hottest of the planets, that's for sure

Metal would melt and be no more!

I'm like a greenhouse with my thick atmosphere

I spin opposite on my axis that is clear

Earth

I am our terrestrial rocky home

The only planet where life is known

I'm the third planet from the Sun

My one moon is spelled with a capital "M"

With my surface covered over 70% of H₂O

I am the best planet for life that we know

Moon

I am the Moon that you see in the sky

Astronauts did more than just pass me by

My shape changes for all to see, but

Please don't say I am made of cheese

My surface has craters all over the place

So look up and wave to me here in space

Mars

I'm a terrestrial rocky place

A cold and dusty desert in your face

I'm the 4th planet from the Sun

I have seasons just like Earth has done

I'm the Red Planet 'cause of my rusty iron ground

Perseverance and Curiosity drove all around

Jupiter

Largest planet I am the one

I am the 5th planet from the Sun

Great Red Spot is a big old storm

1 day is 10 Earth hours that's the norm

I am a gas planet with 79 moons

My swirling cloud stripes would make anyone swoon

Saturn

I am the 6th planet from the Sun
With seven main rings, that's how it's done
My rings are made of rock and ice
I have a thick atmosphere-oh how nice!
53 moons and a gas planet that's me
Known since ancient times for all to see

Uranus

Hello from the 7th planet from the Sun
I rotate on my side and that is fun!
I am a gas planet with methane you see
Blue is the color that it gives me
I'm like Venus you must know
I rotate counterclockwise-what a show!

Neptune

The eighth planet and last from the Sun
I am dark, cold, and windy that's no fun
A gas planet that is true
My color is also blue
I have 13 moons for all to see
The Voyager 2 visited me

Pluto

I used to be the 9th planet you see
Then things changed 'cause of how my orbit be
I am a cold icy place that lies almost on its side
My orbit is an oval what a way to take a ride

I'm now a dwarf planet, that's what they call me

Out here past Neptune, that's where I'll be

Asteroids, Meteoroids, and Comets

Asteroids and meteoroids are rocky things in the sky

Comets with a tail simply go flying by

Meteors can hit the Earth's atmosphere

That's when we see flashes of light that appears

Meteorites happen when meteors hit the ground

Meteorites from ancient times are still around!

Using Board Games in a Science Classroom

Jean Piaget's work with children showed that children learn best through play. They learn and make meaning of things around them when they can engage in opportunities that are safe, inviting, and playful. Further, play develops several early childhood skills for young learners. Young children learn social skills through play. Social skills such as patience, persistence, risk-taking, and problem-solving are all skills that children need to develop as they move through school and life.⁶

This unit will incorporate two board games as part of the unit instruction. These board games will divide the unit into two parts. The first game is Planet Race! Inner (terrestrial) Planets, the Sun, and the Moon-essentially the first half of the unit. The second game is Planet Race! Outer Planets will encompass the outer planets (giant or Jovian planets) and the asteroid belt-the second half of the unit. The board games will allow the students to engage in social interactions with each other while reviewing science content. By using play and a board game, the students can interact with the content in a low-risk way. They can get feedback from the adult playing or other students. The students will be able to develop skills of memorizing, remembering, naming, matching, and classifying while playing the games.⁷ Both games will have the students choose a planet to "race to". The students will use a spinner to move around the board. The students will land on a space and pick a card for that category that they landed on. The students will read questions on the cards and respond. If the student answers correctly, they keep the card and remain on the space. If the response is incorrect, the card is returned to the bottom of the stack and the student moves back the number that they spun. The first student to reach their planet wins! In the event of a tie, the player with the most cards wins.

Word Wall

A word wall will be utilized as a resource during the unit for vocabulary words. This word wall will incorporate the vocabulary words that the students will learn throughout the unit. This word wall will provide a resource for students to utilize as they learn and master the science content. The word wall should be displayed in the classroom so that the students will have access to the words during the school day. This unit includes 15 vocabulary words. The list of vocabulary words for the word wall includes but is not limited to axis, rotate, counterclockwise, revolve, terrestrial, crater, reflect, phase, core, release, visible, rover, confirmed, visible, vaporize.

Resources

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Reading List for Students

There are several picture books for the students in second grade to explore the solar system topics. The books were chosen from a variety of authors and can be purchased on the internet.

- *Planet Name Game (Dr. Seuss/Cat in the Hat)(Step into Reading)* is a beginning reading book for students to learn the name of the planets.
- *My First Book of Planets: all about the Solar System for Kids* by Bruce Betts, Ph.D. is a book with photos

and facts for kids.

- *A Place for Pluto* written by Steve Wade is a book that addresses Pluto's journey from a planet to a dwarf planet. This book personifies Pluto and discusses social and emotional issues of belonging, feelings, and acceptance.
- *Earth, Moon, Sun! One in a Billion, Mars! Earthling's Welcome* are written by Stacy McAnulty. These books personify the title topics and are written in the first-person point of view.
- *Mercury, Venus, Saturn* by Baby Professor are informative books with colorful images.
- *Jupiter* by J.P. Bloom has easy-to-read text and colorful images.
- *Neptune, Uranus* books by Steve Foxe give illustrations and planet facts.

Classroom Activities

There are nine classroom activities for the students to complete in this unit. There are hands-on activities that can be completed in small groups or as a whole class. The activities reinforce the science concepts for the Earth, the Moon, the Sun, Saturn, asteroids, and comets. The complete description of these activities (activities 1-7) is listed on the NASA Science Space Place Explore Earth and Science! the portion of the NASA website. In addition to the activities presented, this website is designed for children to learn about space.

1. Earth – Students will create a stained-glass window ornament of Earth. Students will create this by using a paper plate cutout with the Earth's template attached and blue, green, and white tissue paper.
2. The Moon – Students will practice creating the phases of the moon: full, new, first, and third quarters shapes with Oreo cookies. A template is included on the NASA website.
3. The Sun – Students will create the Sun with Sunspots by placing orange and yellow icing on a sugar cookie and adding small (mini) chocolate chips to represent the Sunspots.
4. Saturn – Students will create a hanging CD Saturn. The students will place 2-inch styrofoam balls (cut in half) on the middle of both sides of the CDs. Glitter will be applied to the CDs to cover create Saturn's rings. This will also cover any writing on the CDs.
5. Asteroid potatoes – Asteroid shapes will be created out of mashed potatoes, butter, and cheddar cheese. The asteroids should be irregular in shape and size.
6. Comets – Students will create a comet. Different lengths of ribbon will be tied to a popsicle stick. The ribbons represent the comet's tail. Pieces of foil will be shaped in a ball shape. around the ribbons that are tied to the stick. A ball of foil will be attached to a popsicle stick to form the comet. The ball of foil represents the nucleus of the comet.
7. Coloring pages for the solar system are located on the NASA kids section of the website. These pages will give students fine motor skill practice and further practice with the science content.
8. Ultraviolet-sensitive beads (UV) beads – Students will experience the change in color that ultraviolet-sensitive beads can have when presented with Sunlight and Sunscreen.
9. Planet Race! Inner/Outer Planets – Students will practice science skills as they race around the game board. The game was created with a socially distanced option. The game boards for the planets can be separated.

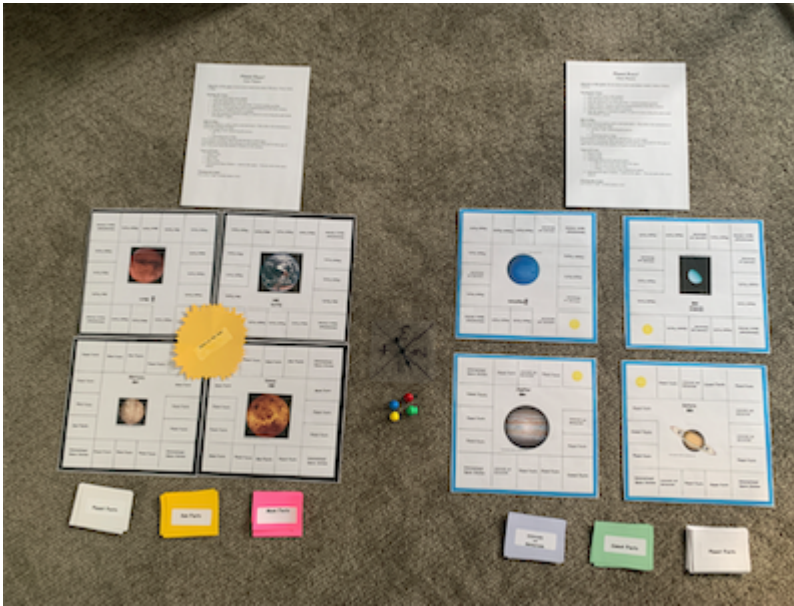


Figure 5: Planet Race! Inner/Outer Planets

Appendix on Implementing District Standards

This unit will utilize science standards from the Pennsylvania Learning Standards for Early Childhood, Grade 2, and the Next Generation Science Standards (NGSS), Second Grade.⁸

Pennsylvania Learning Standards for Early Childhood, Grade 2. 2016⁹

This unit will utilize the science standards from the Pennsylvania Learning Standards for Early Childhood. The three key areas of learning: Scientific Thinking and Technology-Exploring, Scientific Inquiry, and Discovery, Language and Literacy Development, and Approaches to Learning through Play-Constructing, Organizing, and Applying Knowledge.

Standard Area 3.3: Earth and Space Sciences

Big Idea – The earth is part of a larger solar system, consists of structure, processes, and cycles which affect its inhabitants.

- What structure, processes, and cycles make up the earth?
- How do we know that earth is part of a larger solar system?

Standard Area 3.3A: Earth Structures, Processes and Cycles

- Participate in simple investigations of earth structures, processes, and cycles to answer a question or test a prediction (3.3.2.A.7)

Standard Area 3.3B: Earth and Space Sciences – Origin and Evolution of the Universe

- Observe and record location of Sun and moon in the sky (3.3.2.B.1)
- Observe and record changes in the appearance of the moon over a month (3.3.2.B.1)

Standard Area 1.5: Speaking and Listening

Big Idea – Active listeners make meaning from what they hear by questioning, reflecting, responding, and evaluating. Effective speakers prepare and communicate messages to address the audience and purpose.

- What do good listeners do?
- How do active listeners make meaning?
- How do speakers effectively communicate a message?

Standard Area 1.5.2.A: Comprehension and Collaboration – Collaborative Discussion

- Participate in collaborative conversations with peers and adults in small and larger groups

Standard AL.1: Constructing and Gathering Knowledge

Big Idea – Children actively construct knowledge through routines, play, practices, and language. Children use a variety of strategies to gather information based upon their individualized approach to learning.

- What can I learn from my everyday experiences, including play?

Standards Area AL.1.2C: Constructing and Gathering Knowledge – Stages of Play

- Engage in cooperative, purposeful, and interactive play experiences that enhance learning.

Standards Area 16.2 Establishing and Maintaining Relationships

Big Idea – Early adult-child relationships, based on attachment and trust, set the stage for life-long expectations that impact children’s ability to learn, respect adult authority, and express themselves

Standard Area 16.2.2.C Communication

- Explain the impact of communication on interactions with others

Next Generation Science Standards (NGSS) Second Grade

This unit will utilize the science standards from the Next Generation Science Standards (NGSS), Second Grade. The focus will be on Unit 2, Earth’s Systems: Processes that Shape the Earth.

Disciplinary Core Ideas

- The History of Planet Earth - Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1)
- The Roles of Water in Earth’s Surface Processes - Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3)

References

¹ Christa McAuliffe.

² Hart and Risley 2-28.

³ Pondiscio, “The making of an edu-myth:The 30-million-word gap has not been debunked”

⁴ Bongiorno, “10 Things Every Parent Should Know About Play”

⁵ Lutz 21.1.

⁶ Collins 12-19.

⁷ Kirikkaya 1-5.

⁸ New Generation Science Standards.

⁹ PA Early Learning for ECE.

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